



PROCEEDINGS

OF THE

SECOND ANNUAL ACQUISITION RESEARCH SYMPOSIUM

**Acquisition Research:
The Foundation for Innovation**

May 18 -19, 2005

Published: 1 May 2005

Approved for public release, distribution unlimited.

Prepared for: Naval Postgraduate School, Monterey, California 93943



ACQUISITION RESEARCH
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

The research presented at the symposium was supported by the Acquisition Chair of the Graduate School of Business & Public Policy at the Naval Postgraduate School.

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NPS-AM-05-004



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Preface and Acknowledgements

A close tie exists between defense acquisition practice and acquisition training. Acquisition practice entails exercising skills and techniques in project management, contracting, logistics, test and evaluation, and other functional areas, while acquisition training imparts those skills and techniques. Thus, training teaches the good practice of acquisition.

Quite different sorts of connections exist between acquisition research and acquisition practice. To be sure, research may support and inform practice, for example, with studies of how existing practices may be improved. On the other hand, research may also challenge the *status quo* with investigations into questions such as whether current practices are adequate and whether some techniques should be jettisoned in favor of new skills. Research also transcends practice in at least two ways. First, to the extent that it touches acquisition policy, research informs development of the rules, regulations, statutes, and procedures that govern practice. Second, and in our view more importantly, research may reshape our basic understanding of the definition of “acquisition” itself.

We assert that the prevailing meaning of defense acquisition mainly reflects an accretion, over decades of practice, of the habits of action of acquisition participants and observers. We believe that this rather narrow, experience-oriented concept of acquisition may at least partially explain why many problems persist and indeed often seem to repeat themselves. In other words, our limited concepts and understandings of acquisition place limits on our abilities to solve acquisition problems.

If our assessment is valid, then what is called for is a purposeful move toward the kind of research that could challenge this taken-for-granted perspective of defense acquisition. We hold it as axiomatic that this move must provide, at minimum, for scholarly research and that it must include interdisciplinary research in acquisition. Research that satisfies norms of good scholarship in terms of method, evidence, and argumentation will have power and potential to compel change. Research that examines acquisition through the lenses of a variety of disciplines—accounting, law, economics, finance, psychology, history, to name a few—will broaden our perspectives both of the basic nature of the defense acquisition endeavor and of the variety of tools at our disposal for attacking its problems.

The goal of promoting scholarly and interdisciplinary research in defense acquisition has motivated the Naval Postgraduate School’s Acquisition Research Program since its inception in 2003, and with that goal in view we publish these Proceedings of the 2nd Annual Acquisition Research Symposium. We trust that these Proceedings may serve to move defense acquisition toward a greater acceptance of and reliance upon research as “The Foundation For Innovation.”

The studies presented at the 2nd Annual Acquisition Research Symposium show much progress toward our goal, especially as compared to the humble start represented by last year’s symposium. Some metrics:



	1 st Annual Acquisition Research Symposium <u>(2004)</u>	2 nd Annual Acquisition Research Symposium <u>(2005)</u>
# Prepared presentations	9	36
# Academic institutions participating	8	16

We believe that this growth is attributable in part to a widening recognition among scholars of the interesting problems that defense acquisition poses for their respective fields of study. It is also attributable to the foresight and vision of several high-level acquisition practitioners and policy-makers who serve as sponsors for the Acquisition Research Program. We gratefully acknowledge their ongoing support and leadership:

Assistant Secretary of the Navy (Research, Development and Acquisition)

Commander, Naval Sea Systems Command

Program Executive Officer (Ships)

Program Executive Officer (Integrated Warfare Systems)

Commander, Defense Contract Management Agency (International)

We also thank the Naval Postgraduate School Foundation and acknowledge its generous contributions to this symposium.

James B. Greene, Jr.
Rear Admiral, U.S Navy (ret)

Keith F. Snider, PhD
Associate Professor



Acquisition Research Program

RADM James B. Greene, USN (ret.) – Acquisition Chair, Naval Postgraduate School
<insert bio>

Keith F. Snider – Associate Professor of Public Administration and Management in the Graduate School of Business & Public Policy at the Naval Postgraduate School in Monterey, California, where he teaches courses related to defense acquisition management. He also serves as Principal Investigator for the NPS Acquisition Research Program and as Academic Associate for NPS acquisition curricula.

Professor Snider has a Ph.D. in Public Administration and Public Affairs from Virginia Polytechnic Institute and State University, a Master of Science degree in Operations Research from the Naval Postgraduate School, and a Bachelor of Science degree from the United States Military Academy at West Point. He served as a field artillery officer in the U.S. Army for twenty years, retiring at the rank of Lieutenant Colonel. He is a former member of the Army Acquisition Corps and a graduate of the Program Manager's Course at the Defense Systems Management College.

Professor Snider's recent publications appear in American Review of Public Administration, Administration and Society, Administrative Theory & Praxis, Journal of Public Procurement, Acquisition Review Quarterly, and Project Management Journal. He is a member of the American Society for Public Administration, the Public Administration Theory Network, the Inter-University Seminar on Armed Forces and Society, the Project Management Institute, and serves on the editorial board of Acquisition Review Quarterly.

Karey L. Shaffer – Program Manager, Acquisition Research Program

A special thanks to our editor Jeri Larsen for all that she has done to make this publication a success, and to Jason Hayman and Ian Mitchell for production and graphic support.



Announcement and Call for Proposals

The Graduate School of Business & Public Policy at the Naval Postgraduate School announces the **3rd Annual Acquisition Research Symposium** to be held **May 17-18, 2006 in Monterey, CA.**

This symposium serves as a forum for the presentation of acquisition research and the exchange of ideas among scholars and practitioners of public-sector acquisition. We seek a diverse audience of influential attendees from academe, government, and industry who are well placed to shape and promote future research in acquisition.

The Symposium Program Committee solicits proposals for panels and/or papers from academicians, practitioners, students and others with interests in the study of acquisition. The following list of topics is provided to indicate the range of potential research areas of interest for this symposium: **acquisition and procurement policy, supply chain management, public budgeting and finance, cost management, project management, logistics management, engineering management, outsourcing, performance measurement.**

Proposals must be submitted by **December 1, 2005**. The Program Committee will make notifications of accepted proposals by **January 15, 2006**. Final papers must be submitted by **April 15, 2006** in order to be included in the Symposium Proceedings.

Proposals for papers should include an abstract along with identification, affiliation, and contact information for the author(s). Proposals for panels (plan for 90 minute duration) should describe the panel subject and format, along with participants' names, qualifications and the specific contributions each participant will make to the panel.

Send proposals via e-mail to info@researchsymposium.org.

Further Symposium details (hotel, registration, etc.) will be posted at www.researchsymposium.org.



Table of Contents

Wednesday, May 18, 2005

Plenary Panel—Acquisition Research

A Strategy for Defense Acquisition Research

Panel—Competitive Sourcing

A Transaction-Cost Economics View of DoD Outsourcing.....

*Unique Transaction Costs in Defense Market(s): the Explanatory Power of
New Institutional Economics*

Panel—Requirements/Capabilities

*Cost Performance Tradeoffs for the Army to Purchase One Type of
Unmanned Aerial Vehicle to Support the Armor and Infantry Wartime
Requirements.....*

Spiral Development.....

*The New Joint Capabilities Integration Development System (JCIDS) and
Its Potential Impacts upon Defense Program Managers.....*

Panel—Market-Based Government Cases.....

Market-based Government: The Results to Date.....

Louisville Depot Case

Public-Private Partnering Case

Developing Systems in a Changing Environment: An Army Example

Panel—Organizational and Business Process Reengineering Issues

An Extension and Test of the Communication-Flow Optimization Model.....

*Determining the Best Loci of Knowledge, Responsibilities and Decision
Rights in Major Acquisition Organizations.....*

*From Market to Clan: How Organizational Control Affects Trust in
Defense Acquisition.....*

Panel—Out-sourcing, Employment & Public Policy

*Military Out-sourcing: Observations, Opportunities, Conflicts and
Recommendations*

Out-sourcing as an Engine of Growth for the United States

Out-sourcing and Privatization: Creating Value at What Cost?.....



Panel—Acquisition Logistics/Support.....

A Decision Support Model for Valuing Proposed Improvements in Component Reliability

DoD Radio Frequency Identification Mandate: The Implementation Experience

Logistics Transformation Through Sense-and-Respond Logistics Network.....

Thursday, May 19, 2005

Keynote Speaker: *John J. Young, Jr., Assistant Secretary of the Navy, Research, Development & Acquisition*

Panel—Performance Measurement.....

Choice and Change of Measures in Performance-Measurement Models.....

Performance Measurement in Defense Acquisitions: A Case Study of the Navy

Impact of Diffusion and Variability on Vendor Performance Evaluation

Panel—Financial Management in Programs

Business Case Analysis and Contractor vs. Organic Support: A First-Principles View.....

A Framework for Calculating Indirect Costs and Earned Value for IT Infrastructure Modernization Programs

Navy Acquisition via Leasing: Policy, Politics, and Polemics with the Maritime Propositioned Ships.....

Panel—Working with Contractors

Commodity Sourcing Strategies: Supply Management in Action.....

Best Practice in Technology Acquisition: Early Licensing of Technology before or during Prove-out Phase

Contractor Past Performance Information (PPI) In Source Selection: A Comparison Study of Public and Private Sector

Panel—Financial Management & Budgeting

National Defense Budgeting and Management of Systems Acquisition and Procurement.....

A Critical Examination of the DoD's Business Management Modernization Program.....



<i>Cost As an Independent Variable (CAIV): Front-End Approaches to Achieve Reduction in Total Ownership Cost.....</i>	
Plenary Panel—Contracting for Deployed Forces	
<i>The Yoder Three-tier Model for Optimal Planning and Execution of Contingency Contracting</i>	
<i>Joint Contingency Contracting</i>	
<i>Contractors on the 21st Century Battlefield.....</i>	
Plenary Panel—Real Options in Acquisitions	
<i>Using KVA and Real Options for IT Acquisition: Case Example</i>	
<i>Managerial Real Options Practice in Large System Acquisition: Empirical Descriptions and Comparison with Theory.....</i>	
Acquisition Research Program—Research Products	



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Plenary Panel—Acquisition Research

Wednesday, May 18, 2005	Plenary Panel—Acquisition Research
8:00 a.m. – 10:00 a.m.	<p>Chair: Dr. Jacques S. Gansler, former Under Secretary of Defense for Acquisition, Technology and Logistics; presently Vice President for Research, Director and Roger C. Lipitz Chair, Center for Public Policy & Private Enterprise, School of Public Policy at the University of Maryland</p> <p>Discussants:</p> <p>Rear Admiral Charles S. Hamilton III, US Navy, Program Executive Officer for Ships (PEO SHIPS)</p> <p>Richard W. McKinney, Director, Space Acquisition, Office of the Under Secretary of the Air Force</p> <p>Brigadier General Roger A. Nadeau, US Army, Commanding General, US Army Research, Development and Engineering Command</p>

Chair: The Honorable Jacques S. Gansler—Vice President for Research and the Roger C. Lipitz Chair in Public Policy and Private Enterprise, University of Maryland.

Previously, Dr. Gansler served as the Under Secretary of Defense for Acquisition, Technology and Logistics from November 1997 until January 2001. In this position, he was responsible for all matters relating to Department of Defense acquisition, research and development, logistics, acquisition reform, advanced technology, international programs, environmental security, nuclear, chemical, and biological programs, and the defense technology and industrial base. (He had an annual budget of over \$180 Billion, and a workforce of over 300,000.)

Prior to this appointment, Dr. Gansler was Executive Vice President and Corporate Director for TASC, Incorporated, an applied information technology company, in Arlington, Virginia (from 1977 to 1997), during which time he played a major role in building the company from a small operation into a large, widely-recognized and greatly-respected corporation serving both the government and the private sector.

From 1972 to 1977, he served in the government as Deputy Assistant Secretary of Defense (Materiel Acquisition), responsible for all defense procurements and the defense industry, and as Assistant Director of Defense Research and Engineering (Electronics) responsible for all defense electronics Research and Development.

His prior industrial experience included: Vice President (Business Development), ITT (1970-1972); Program Management, Director of Advanced Programs, and Director of International Marketing, Singer Corporation (1962-1970); and Engineering Management, Raytheon Corporation (1956-1962).

Dr. Gansler has served on numerous Corporation Boards of Directors, and governmental special committees and advisory boards: including Vice Chairman, Defense Science Board; Chairman, Board of Visitors, Defense Acquisition University; Director, Procurement Round Table; Chairman, Industry Advisory Board, University of Virginia, School of Engineering; Chairman, Board of Visitors, University of Maryland, School of Public Affairs; member of the FAA Blue Ribbon Panel on Acquisition Reform; and senior consultant to the "Packard Commission" on Defense Acquisition Reform.



Additionally, from 1984 to 1997, Dr. Gansler was a Visiting Scholar at the Kennedy School of Government, Harvard University (a frequent guest lecturer in Executive Management courses). Throughout his career, Dr. Gansler has written, published, and taught on subjects related to his work, and has been a frequent speaker and Congressional witness. He is a Member of the National Academy of Engineering and a Fellow of the National Academy of Public Administration.

Additionally, he is the Glenn L. Martin Institute Fellow of Engineering at the A. James Clarke School of Engineering, an Affiliate Faculty member at the Robert H. Smith School of Business and a Senior Fellow at the James MacGregor Burns Academy of Leadership (all three at the University of Maryland). During 2003–2004, he served as Interim Dean of the School of Public Policy at that institution.

Dr. Gansler holds a BE (Electrical Engineering) from Yale University, a MS (Electrical Engineering) from Northeastern University, a MA (Political Economy) from New School for Social Research, and a PhD (Economics) from American University.

Discussant: Rear Admiral Charles S. Hamilton III, US Navy—Program Executive Officer for Ships (PEO SHIPS)

Rear Admiral Charles Samuel Hamilton, a native of Amityville, NY, graduated from Duke University with a Bachelor of Science in Zoology in May 1974. He was commissioned in the Navy in May 1974 through the Naval Reserve Officer Training Candidate (NROTC) Program at Duke.

Rear Adm. Hamilton's sea tours include Electronics Material Officer and Combat Information Center Officer onboard *USS Hawkins*, DD 873 (1974 to 1976); Fire Control Officer and Missile Officer onboard *USS Coontz*, DDG 40 (1976 to 1978); Operations Officer onboard *USS Callaghan*, DDG 994 (1981 to 1984); Executive Officer, *USS Fox*, CG 33 (1986 to 1988); and Commanding Officer *USS O'Brien*, DD 975 (1991 to 1993).

Rear Adm. Hamilton's shore tours include Anti-Submarine Warfare Program Analyst and Administrative Assistant to Director, Program Resource Appraisal Division (OP-91), Office of the Chief of Naval Operations (1984 to 1986); Head *Aegis* Destroyer Section (OP-355F) and Financial Coordinator, AEGIS Cruiser Destroyer Branch, Office of the Chief of Naval Operations (1986 to 1988); and Military Staff Specialist for Naval Warfare in the Office of the Under Secretary of Defense (Acquisition & Technology) (1994 to 1996).

In May 1996, Rear Adm. Hamilton became Program Manager for the Arsenal Ship, which was designed to provide massed precision fires in support of Fleet Commander's warfighting requirements. After completing the first two design phases and passing significant acquisition reform lessons learned to the DD 21 Program Office, Rear Adm. Hamilton closed down the Arsenal Ship Program in March 1998.

From April 1998 to February 2000, Rear Adm. Hamilton served as Deputy for Fleet in the Program Executive Office Theater Surface Combatants (PEO TSC-F). In this position, he was responsible for Fleet Introduction and Lifetime Support of 120 surface combatants (DDG 51, CG 47, DDG 993, DD 963, FFG 7).

Rear Adm. Hamilton served as Program Executive Officer for Surface Strike (PEO (S)) from February 2000 until November 2002. As PEO (S), he managed the *Zumwalt*-class DD 21/DD (X), Naval Surface Fire Support (NSFS), Advanced Land Attack Missile (ALAM), Integrated Power System (IPS), and Affordability Through Commonality (ATC) Programs, as well as the Littoral Combat Ship initiative.

Rear Adm. Hamilton became Deputy Program Executive Officer for Ships (PEO Ships) in November 2002 and in April 2003 was named Program Executive Officer for Ships. PEO Ships provides the Navy with a single, platform-focused organization responsible for the research, development, systems integration, construction, and lifecycle support of current and future surface combatant, amphibious and



auxiliary ships to include: DD, FFG, DDG, CG, DD(X), LCS, MCM, MHC, LPD-17, LHD, LHA(R), Sealift Ships, CLF Ships, Special Mission Ships, Coast Guard Deepwater Support, Small Boats and Craft, Command Ships, and MSC vessels.

Rear Adm. Hamilton's graduate education includes Naval Postgraduate School, Monterey, Calif., where he graduated with distinction, receiving a Master's of Arts in National Security Affairs (1981), and the National War College where he graduated with distinction and was awarded a Master of Science in National Security Strategy (1994).

Rear Adm. Hamilton's awards include the Defense Superior Service Medal (Oak Leaf Cluster in lieu of second award), Legion of Merit (Gold Star in lieu of second award), Meritorious Service Medal (with three Gold Stars), Navy Commendation Medal and various unit and service awards.

Discussant: Richard W. McKinney—Director, Space Acquisition, Office of the Under Secretary of the Air Force

Richard W. McKinney, a member of the Senior Executive Service, is Deputy Director, Space Acquisition, Office of the Under Secretary of the Air Force, Washington, DC. In the absence of the principal, he directs development and purchasing on space and missile programs to Air Force major commands, product centers and laboratories dealing with acquisition programs. His responsibilities include crafting program strategies and options for representing Air Force positions to Headquarters US Air Force, the Office of the Secretary of Defense, Congress and the White House.

Mr. McKinney is a 1973 distinguished graduate of the Air Force ROTC program. He is certified level three in the acquisition areas of program management, acquisition logistics, and systems planning, research, development and engineering. Prior to assuming his position as Deputy Director, Mr. McKinney was a private consultant. He retired from the Air Force in the rank of colonel in May 2001 after 28 years active duty. He was appointed to the Senior Executive Service in 2002.

EDUCATION

1973 Bachelor's degree in business administration, Washington State University, Pullman
1976 Squadron Officer School, Maxwell Air Force Base, Alabama
1980 Master's degree in business administration, University of Montana, Missoula
1982 Bachelors degree in electrical engineering, Air Force Institute of Technology, Wright-Patterson AFB, Ohio
1987 Armed Forces Staff College, Norfolk, Virginia
1987 Advanced Program Management Course, Defense Systems Management College, Fort Belvoir, Virginia
1992 Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, DC
2002 Federal Executive Institute, Charlottesville, Virginia

CAREER CHRONOLOGY

1. September 1973 - November 1973: student, combat crew training, Vandenberg AFB, California
2. November 1973 - August 1977: deputy missile combat crew commander, later, combat crew commander, 341st Strategic Missile Wing, Malmstrom AFB, Montana
3. August 1977 - August 1980: faculty member, Squadron Officer School, Maxwell AFB, Alabama
4. August 1980 - March 1982: student, Air Force Institute of Technology, Wright-Patterson AFB, Ohio
5. March 1982 - June 1985: project manager, Peacekeeper Intercontinental Ballistic Missile Program, Air Force Systems Command, Norton AFB, California
6. June 1985 - July 1986: executive officer to the Commander, Ballistic Missile Office, Norton AFB, California
7. August 1986 - January 1987: student, Armed Forces Staff College, Norfolk, Virginia
8. January 1987 - June 1989: Program Element Monitor, Global Positioning System and Titan IV,



Headquarters US Air Force, Washington, DC

9. June 1989 - July 1991: executive officer to the Assistant Secretary of the Air Force for Acquisition, Headquarters US Air Force, Washington, DC

10. July 1991 - June 1992: student, Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, DC

11. June 1992 - March 1993: Chief for Plans and Programs, Oklahoma City Air Logistics Center, Tinker AFB, Oklahoma

12. March 1993 - July 1993: Director of Technology and Industrial Support, Oklahoma City ALC, Tinker AFB, Oklahoma

13. July 1993 - June 1995: Director of Propulsion, Oklahoma City ALC, Tinker AFB, Oklahoma

14. June 1995 - July 1999: System Program Director, Evolved Expendable Launch Vehicle Program Office, Space and Missile Systems Center, Los Angeles AFB, California

15. July 1999 - May 2001: Deputy Director, Directorate of Space and Nuclear Deterrence, Office of the Assistant Secretary of the Air Force for Acquisition, Washington, DC

16. May 2001 - January 2002: private consultant, Washington, DC

17. January 2002 - April 2002: Deputy Director, Directorate of Space and Nuclear Deterrence, Office of the Assistant Secretary of the Air Force for Acquisition, Washington, DC

18. April 2002 - present: Deputy Director, Space Acquisition, Office of the Under Secretary of the Air Force, Washington, DC

AWARDS AND HONORS

Legion of Merit with Oak Leaf Cluster

Meritorious Service Medal with three Oak Leaf Clusters

Air Force Commendation Medal

Air Force Outstanding Unit Award with Oak Leaf Cluster

Air Force Organizational Excellence Award with six Oak Leaf Clusters

Combat Readiness Medal

OTHER ACHIEVEMENTS

1977 Outstanding Junior Officer of the Year, Air University

1998 David Packard Award for excellence in acquisition, Department of Defense

1998 John J. Welch, Jr. Award for excellence in acquisition management, US Air Force

PROFESSIONAL MEMBERSHIPS AND ASSOCIATIONS

Institute of Electrical and Electronics Engineers

Executive Resources Board Development Panel

Air Force Association

Discussant: Brigadier General (P) Roger A. Nadeau, US Army—Commanding General, US Army Research, Development and Engineering Command

Brigadier General Nadeau, a native of Rhode Island, was commissioned in 1974—following graduation from the University of Rhode Island—as a Distinguished Military Graduate of the Reserve Officers Training Corps. In 1987 he earned a Master's Degree in Business Administration from the Florida Institute of Technology and, in 1996, a Master's Degree in National Resource Strategy from the National Defense University in Washington, DC. His military education includes the Armor Officer Basic Course, Armor Officer Advanced Course, US Army Ranger School, Command and General Staff College and the Industrial College of the Armed Forces. Prior to assuming duties as the DCG for SOSI, Brigadier General Nadeau served as the Program Executive Officer for Ground Combat Systems. He was responsible for developing, acquiring, fielding and sustaining Army Ground Combat Systems. Some of the systems included: the Abrams tank systems, the Bradley Fighting Vehicle systems, the Stryker Brigade Combat Team vehicles, Future Combat Systems, Paladin, Joint Lightweight Howitzer and Robotic Systems. He has worked previously as the PEO in CS & CSS with 220 different programs. He has also served as the



Deputy for Systems Acquisition (DSA), Aviation and Missile Command (AMCOM). As the DSA, Brigadier General Nadeau was responsible for the development, fielding, sustainment, and divestiture of selected Army aviation and missile systems. Other previous duties include tours as the Assistant Deputy for Systems Management and Horizontal Technology Integration in the office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology; the Chief of Staff to the Assistant Secretary of the Army (Acquisition, Logistics and Technology)/Army Acquisition Executive; the Project Manager for Tank Automotive Weapons Systems, United States Army Tank-automotive and Armaments Command, Warren, Michigan; Product Manager for the Breacher Program, Program Executive Office, Armored Systems Modernization in Warren, Michigan; and Abrams tank systems coordinator/liaison officer, Office of the Assistant Secretary of the Army (Research, Development and Acquisition), Washington, DC.

Brigadier General Nadeau's troop time includes service as Battalion Executive Officer, 1st Battalion, 37th Armor, 1st Armor Division, United States Army Europe and Seventh Army, Germany and Southwest Asia during Desert Storm.

Brigadier General Nadeau's awards and decorations include the Legion of Merit (4 Oak Leaf Clusters), Bronze Star, Meritorious Service Medal (3 Oak Leaf Clusters), Army Commendation Medal, Parachutist Badge, Air Assault Badge, Ranger Tab, and Army Staff Identification Badge.



A Strategy for Defense Acquisition Research

Presenter: The Honorable Jacques S. Gansler, former Under Secretary of Defense for Acquisition, Technology, and Logistics, is the University of Maryland's Vice President for Research and the Roger C. Lipitz Chair in Public Policy and Private Enterprise. As the third-ranking civilian at the Pentagon from 1997 to 2001, Professor Gansler was responsible for all research and development, acquisition reform, logistics, advance technology, environmental security, defense industry, and numerous other security programs. Before joining the Clinton Administration, Dr. Gansler held a variety of positions in government and the private sector, including Deputy Assistant Secretary of Defense (Materiel Acquisition), assistant director of defense research and engineering (electronics), executive vice president at TASC, vice president of ITT, and engineering and management positions with Singer and Raytheon Corporations. Throughout his career, Dr. Gansler has written, published, and taught on subjects related to his work. He is a Member of the National Academy of Engineering and a Fellow of the National Academy of Public Administration. Additionally, he is the Glenn L. Martin Institute Fellow of Engineering at the A. James Clarke School of Engineering, an Affiliate Faculty member at the Robert H. Smith School of Business and a Senior Fellow at the James MacGregor Burns Academy of Leadership (all three at the University of Maryland). During 2003–2004, he served as Interim Dean of the School of Public Policy at that institution.

ABSTRACT: Creating a more efficient acquisition system is a top priority for the Department of Defense (DoD). High-quality research in the area of acquisitions is necessary to catalyze positive and lasting changes to improve the performance of the acquisition process, reduce acquisition cycle times, and reduce the costs of DoD acquisitions—even as it must confront rapidly changing external and internal environments.

Earlier attempts at acquisition reform have made some progress, but there is still much room for improvement. Multiple (and sometimes competing) pressures stress the resources of the Department of Defense, the acquisition process, and acquisition workforce; these pressures include: budget constraints, a changing threat environment, technological innovations, force transformation, human-capital management, a shrinking industrial base, and the high ethical standards required of government employees.

Change is often resisted out of fear of the unknown; however, if the DoD does not make substantial changes to meet budgetary pressures and other external drivers, the department will find it increasingly difficult to modernize and transform its forces to face the evolving global threats.

Small investments in acquisition research (out of the total annual expenditures of over \$200 Billion on R&D, production and support) have the potential to yield significant benefits. This paper examines broad trends that impact the DoD's acquisition system and presents a detailed research agenda to guide future projects; such projects will ultimately improve performance, reduce costs, speed up delivery time, and position the Department of Defense to meet the challenges of the 21st century.

Acquisition research objectives have been categorized into 11 major areas; each objective targets one or more of the overarching goals of improving performance, reducing cycle time, and reducing costs. Research questions and a matrix were designed to: 1) focus attention on key areas positioned to have the most immediate impact on the acquisition community, 2) illustrate the interconnected nature of these subjects, and 3) recommend areas that would benefit from well-designed, systematic research.



The paper also outlines a model for research-program governance structure to promote and oversee the proposed research agenda. This proposed framework would encourage exploration that leverages DoD resources—in conjunction with those of the broader academic community—to evaluate existing policies, processes, and procedures and to suggest ways to improve warfighting capabilities and acquisition processes overall.



Panel--Market-Based Acquisition

Wednesday, May 18, 2005	Competitive Sourcing
10:15 a.m. – 11:45 a.m.	<p>Chair: Raymond Franck, Naval Postgraduate School</p> <p>Discussant: Bernard Udis, Universities of Colorado at Boulder and of New Mexico at Albuquerque</p> <p>Papers:</p> <p><i>“A Transaction Cost Economics View of DoD Outsourcing”</i></p> <p style="padding-left: 40px;">Francois Melese, Naval Postgraduate School</p> <p style="padding-left: 40px;">Raymond Franck, Naval Postgraduate School</p> <p><i>“Unique Transaction Costs in Defense Market(s): the Explanatory Power of New Institutional Economics”</i></p> <p style="padding-left: 40px;">John Driessnack, CCE/A PMP, MCR Technologies, LLC</p>

Chair: Raymond Franck, Senior Lecturer. BS, USAF Academy; PhD, Economics. Harvard University. Retired from the US Air Force in 2000 in the grade of Brigadier General—after 33 years of service—and joined the NPS faculty. Service at NPS has included interim chairmanship of the newly formed Systems Engineering Department. Has presented papers at meetings of the Western Economic Association International (WEAI), Southern Economic Association, Military Operations Research Society and at various DoD conferences. Has published in Defense & Security Economics, Conflict Management and Peace Science, Defense Economics and other journals. Is a member of WEAI and the American Economic Association.

Discussant: Bernard Udis, Universities of Colorado at Boulder and of New Mexico at Albuquerque



A Transaction Cost Economics View of DoD Outsourcing

Presenter: Francois Melese, Associate Professor, received his BA in Economics from the University of California at Berkeley in 1977, MA in Economics from the University of British Columbia, Canada, in 1979, and PhD from the University of Louvain, Belgium, in 1982. He was previously a Research Fellow at the Institut de Recherches Economiques et Sociales (IRES), University of Louvain, Belgium, and Assistant Professor of Economics at Auburn University. He has published papers in the Quarterly Journal of Economics, the Southern Economic Journal, Energy Economics, the International Trade Journal and Defense Analysis. He has presented papers at meetings of the American Economic Association, the European Economic Association, the Southern Economic Association, the World Econometric Society, as well as meetings of the International Association of Science and Technology for Development. He is a member of the American Economic Association, Southern Economic Association, Operations Research Society, and the Research Society of American Scientists—Sigma XI. Professor Melese joined the faculty of DRMI in June 1987.

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Presenter: Raymond Franck, Senior Lecturer. BS, USAF Academy; PhD, Economics. Harvard University. Retired from the US Air Force in 2000 in the grade of Brigadier General—after 33 years of service—and joined the NPS faculty. Service at NPS has included interim chairmanship of the newly formed Systems Engineering Department. Has presented papers at meetings of the Western Economic Association International (WEAI), Southern Economic Association, Military Operations Research Society and at various DoD conferences. Has published in Defense & Security Economics, Conflict Management and Peace Science, Defense Economics and other journals. Is a member of WEAI and the American Economic Association.

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ABSTRACT: Many goods and services required for government operations can be provided through commercial markets. Public officials, therefore, face a number of “make-or-buy” decisions. Transactions Cost Economics (TCE) offers a useful foundation for characterizing “make-or-buy” decisions, which this paper explores. Our dual objective is to synthesize key principles of TCE and to apply TCE to federal outsourcing. One especially useful insight is that transaction costs vary widely, and depend in known ways upon the attributes of the outsourcing action. This means, among other things, that one size should not fit all in outsourcing decision processes.

DISCLAIMER: This paper contains judgments and conclusions of the authors. It does not necessarily reflect any policy or position held by the Departments of Navy or Defense.

¹ Primary contact for administrative and editorial matters.



1. INTRODUCTION

In launching the reinventing government movement, Osborne and Gaebler (1992) renewed interest in reviewing government support activities to assess whether savings might exist from outsourcing more government work to the private sector. At the federal level, these assessments have taken the form of public-private competitions governed by OMB Circular A-76, published by the Office of Management and Budget (OMB, 2003).

A key insight of Transactions Cost Economics (TCE) is that a firm's boundaries are principally defined by its "make-or-buy" decisions (Coase, 1937). Similarly, the boundaries of the US Military are increasingly shaped by public-private (make-or-buy) competitions. Another key insight of TCE is that while production-cost savings are necessary to warrant outsourcing, they are not sufficient. Besides the usual quality, schedule and security concerns,² the risk of opportunistic behavior and the often considerable costs of managing external transactions need to be factored into the calculations.

The Department of Defense uses the term "Competitive Sourcing" to describe its public-private competitions.³ A recent study by Gansler & Lucyshyn (2004) reveals that since 1995, competitive sourcing initiatives have involved more than 65,000 Department of Defense (DoD) civilian positions and yielded an average estimated savings of 44 percent of baseline costs, for a cumulative total of \$11.2 billion dollars. Although contractors won a slight majority of these competitions (56 percent), the trend appears to favor public providers. By 2003, in-house bidders won nearly twice as many competitions as contractors.⁴

Along with successive waves of defense acquisition reforms, the issue of competitive sourcing has become a central fact-of-life. What fraction of the defense budget should government "make" (or in-source) in the public sector, and what fraction should it "buy" (or out-

² Enterprise operations involve information, some of which is proprietary, classified or otherwise sensitive. Close coordination with an outside supplier of goods or services involves the exchange of information, some of which is sensitive. Passing this information outside corporate boundaries accordingly decreases ability to control its dissemination. Thus, involving outside suppliers involves risks of compromising corporate (or government) secrets.

³ Table 2 lists the top 15 items outsourced by the Pentagon from 1998 to 2003.

⁴ The number of bids won by the in-house "most efficient organization" in many cases reflects costs that do not properly account for capital expenses—costs that are generally sunk, and which public-sector organizations have difficulty estimating. However, the A-76 process inserts an aspect of competition in providing the services in question; therefore, these public-private competitions can, and often do, result in savings to the government regardless of who wins. In testimony to the Congress in 2000, the General Accounting Office (GAO) reported Department of Defense estimates that 286 of the A-76 competitions completed since 1995—involving some 10,660 government positions—may have generated savings of \$290 million in fiscal year 1999 (General Accounting Office, 2000). Part of these estimated cost savings occurred even when the government supplier retained control. Although difficult to calculate, it is likely even more savings were generated from newly contestable internal government markets—or the threat of entry—introduced by A-76 competitions in federal operations (Baumol, et al., 1982). Notably absent from these calculations, however, is an explicit account of the costs of conducting the competitions, and the transaction costs associated with implementing newly redesigned programs and the burden of ongoing contract administration—including costs of negotiating, writing, monitoring and enforcing federal contracts. This is a central theme that is addressed in the rest of the paper.

source) in private markets?⁵ TCE offers a powerful analytical framework to help answer government's make-or-buy decisions, and in the case of outsourcing, to guide the type of contract.

TCE views organizations as a web of contractual relationships. Each relationship—the acquisition of an input, employment of a worker, the exchange of a product or service between supplier and customer—is a transaction. Understanding the basic characteristics of a transaction turns out to be the key to answering the “make-or-buy” decision.⁶

Two costs typically drive an organization's “make-or-buy” decisions: production costs and transaction costs. Conventional economic analysis focuses on production costs (economies of scale and scope, learning curves, etc.). The “buy” (or outsourcing) option is routinely prescribed whenever external production costs are substantially lower than internal production costs. Although recognizing the importance of production cost savings in the decision to outsource, TCE emphasizes another key factor: transaction costs (e.g., search and information costs, bargaining, decision and contracting costs, and monitoring and enforcement costs).⁷ As Oliver Williamson—regarded as the father of TCE—rhetorically queries:

What [...] does zero transaction costs mean? All of the relevant information is freely available and can be costlessly processed by the participants? Comprehensive contracting is feasible? Actions can be costlessly monitored? Decisions will always be made in a benign way? (1999, p.316)

Some transaction costs typically faced by organizations dealing with outside suppliers are the costs associated with: source selection, periodic competition and renegotiation, contract management, and measuring and monitoring performance.

Coase (1937) was among the first to discuss how, since market transactions are costly to manage, “by forming an [internal support] organization and allowing some authority to direct resources [internally], certain [transaction] costs are saved” (p. 392). However, the cure—vertically integrating transactions inside the firm (or “make”)—can be worse than the disease.

Examples of transaction costs that occur inside an organization include the costs of managing and monitoring employees and purchasing inputs. In fact, supplanting the market price mechanism requires internal coordination that involves some risks. These include the risk of internal opportunistic behavior (costly lobbying for higher salaries or budget increases), multi-

⁵ Note that if bureaucratic power increases with the size of a bureau (as suggested by Mueller, 1987), then Niskanen's (1968) theory of budget-maximizing bureaucracy lends support to Wagner's (1976) prediction that the public sector share of national income will tend to rise over time—in this example there would appear to be a built-in bias favoring the “make” decision.

⁶ Non-core business transactions commonly outsourced by private companies include: IT services, back-office accounting, benefits management, customer service, engineering design, help-desk management and operations, human resource management, legal services, facilities management, physical and electronic security, printing services, mailroom management and operations, payroll services, some procurement activities, secretarial and administrative support, internal audit and accounting, temporary staffing, transportation, distribution and shipping services, and warehouse management and operation.

⁷ Transaction costs include costs of seeking out buyers and sellers and arranging, policing and enforcing agreements or contracts.

tasking (“what gets measured gets done”), and sub-optimization (success achieved at lower levels at the expense of the overall welfare of the organization).

The TCE literature evaluates both internal and external transactions to help guide make-or-buy decisions. While the literature focuses almost exclusively on business decisions, the goal of this paper is to integrate and apply key principles of TCE to guide government decisions.

Government make-or-buy decisions mostly take the form of public-private competitions, or “competitive sourcing.” The next section offers an overview of competitive sourcing. Section 3 provides a brief review and synthesis of the TCE literature. Section 4 discusses new insights generated by TCE that can help guide government’s competitive-sourcing decisions, as well as its choice of contract type. Section 5 offers a useful table that summarizes our results along with a few policy recommendations.

2. COMPETITIVE SOURCING

Every organization has to decide how much of its production and support activities will be conducted within the boundaries of the organization (“make”), and how much will be performed outside the organization (“buy”).

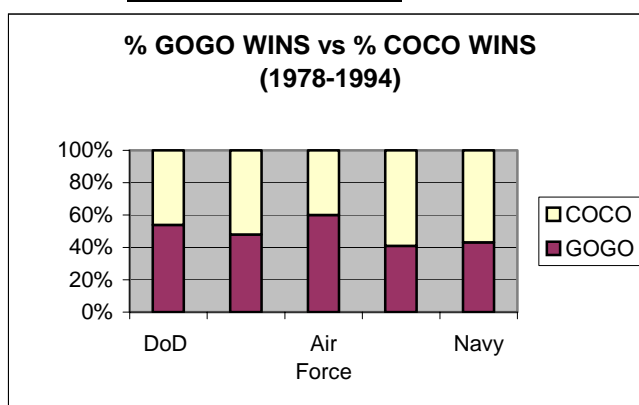
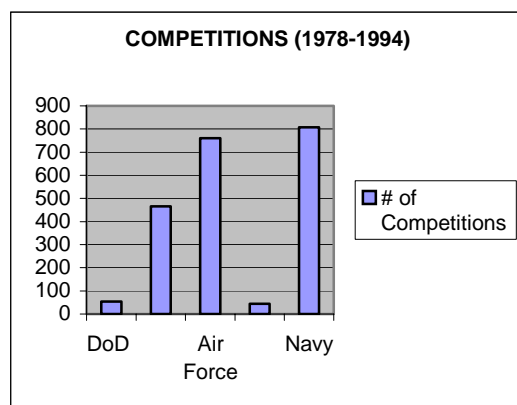
Table 1 illustrates the outcome of over two thousand competitive-sourcing competitions conducted by the US Military over the period 1978-1994 (Trunkey, et al., 1996). The competitions resulted in nearly an even split between continued public provision and decisions to outsource.

TABLE 1. Public-Private A-76 Competitions in the Military

GOGO=Government Owned Government Operated
COCO=Contractor Owned Contractor Operated

Trunkey, et al., 1996

	COMPS	% GOGO WINS	% COCO WINS
DoD	54	54	46
Army	466	48	52
Air Force	760	60	40
Marines	44	41	59
Navy	807	43	57
		49	51



The typical competitive sourcing process can be broken down into six steps: 1) Identify Functions to be Competed; 2) Evaluate the Functions to be Competed (define baseline costs and performance); 3) Prepare a Comprehensive Request for Proposals (RFP); 4) Identify Potential Vendors (perform due diligence); 5) Select a Vendor (or multiple vendors); 6) Negotiate a Contract (including price and performance targets and incentives for improvement).

The first two steps involve defining the product or service; the next two involve evaluating alternative sources of supply (public and private); and the last two focus on choosing a provider. TCE emphasizes a final step, occasionally overlooked in the make-or-buy decision process: the costs of managing the contract, including evaluating and monitoring performance.

It always helps to look forward and reason back. If it appears managing the contract (including future competitions and/or renegotiations), and evaluating and monitoring performance are likely to be costly (in terms of dollars or disputes), then this expense should be taken into account in the original make-or-buy decision, as well as in negotiating the contract type.

OMB Circular A-76 governs the military's competitive-sourcing initiatives. It requires the classification of all activities into two categories: "commercial" or "inherently governmental." Attachment A (Inventory Process) guides the selection of government activities deemed "commercial" in nature. Commercial activities are those "subject to the forces of competition." Attachment B (Public-Private Competition) specifies the competitive-sourcing process.⁸ Finally, Attachment C (Calculating Public-Private Competition Costs) specifies the rules and procedures for cost calculations.

The A-76 Competitive Sourcing Process in Brief

The competitive sourcing process governed by OMB Circular A-76 consists of several stages summarized below:

1. Create an inventory of agency activities, classify them as commercial or governmental, and determine how to bundle the competition(s).
2. Announce intention to undertake a competitive sourcing study, both to the affected government work force and to potential commercial sources.
3. Develop and announce the terms of the competition to include expectations (Performance Work Statement, PWS), various study teams, and a quality-assurance plan (QASP). Specify the criteria for source selection.
4. Issue a solicitation, or Request for Proposal (RFP), seeking bids from the commercial sector.
5. Develop the in-house alternative. This consists of a management plan, cost estimate, performance plan, and transition plan from the current organization to the "Most Efficient Organization" (MEO). This alternative is automatically one of the finalists.

⁸ Actually, at least two competition processes—the streamlined process is discussed in Attachment B, Section C, and the standard process in Section D.

6. Compare the public (in-source) alternative with qualifying private (out-source) proposals both in terms of cost and in meeting the terms of the PWS.
7. Award the contract (issuing agreement) after appeal if applicable. The decision to out-source requires that the private alternative offer cost savings of at least 10 percent or \$10 million below the MEO, whichever is less.
8. Transition to the in-house organization (if applicable) or to the winning commercial source.
9. Conduct post-award contract administration (if applicable) and quality assurance.

The concept of competitive sourcing takes many of its lessons from the private sector. There are a number of very good reasons for private firms to consider outsourcing, among them are: production costs, “agency” costs and “influence” costs.”

A. Production Costs

Firms specialize in certain goods and services because they have a competitive (or comparative) advantage at performing them. As they specialize, firms increase their proficiency (work down their learning curve) and continuously improve. Within a competitive market, firms earn rewards for those improvements, and are motivated to operate at the most efficient scale.⁹

Competitive markets provide powerful incentives for participating firms to discover and produce product mixes that minimize costs. That is, firms in a competitive market are also motivated to fully realize economies of scope.¹⁰ This can boost profits and fend off rivals. The more competitive the market, the more firms are motivated to pass on savings to customers. Prices charged in competitive markets are close to marginal costs, and are constantly driven down due to competition, as well as economies of scale, scope and learning.¹¹

A critical task that faces every organization is to identify its core competencies, those activities in which they have a competitive (or comparative) advantage. Internal production of non-core competencies is unlikely to be efficient when compared to what is available in the market. In general, production rates are too small to fully realize available economies of scale. Only by happy coincidence would the organization's demand for goods of a particular type correspond with the most efficient scale or scope of production. Finally, in-house production

⁹ Firms in perfectly competitive markets will move toward the lowest point of their long-run average cost curve in pursuit of profit. That is, these firms can be expected to take full advantage of economies of scale.

¹⁰ If two products can be produced together more cheaply than they can be produced separately, then there are economies of scope. Opportunities for economies of scale and scope pretty much define the firm's natural “horizontal boundaries.”

¹¹ The difference between marginal cost and price varies inversely with the price elasticity of demand for the vendor's product. An inherent feature of competitive markets is the availability of a large number of close substitutes for any firm's product. Therefore, price elasticities of demand are quite high, and the difference between marginal cost and price are correspondingly quite small. (In the limiting case of perfect competition, price elasticity of demand for any firm's product is infinite, and price is equal to marginal cost.)

may only be required and/or operate intermittently, limiting the opportunities to exploit further economies from learning-by-doing.¹²

B. “Agency” and “Influence” Costs

In-house production is synonymous with “sole source.” With captive customers, a monopoly government activity has little incentive to cut costs or improve product quality. The “agency” problem involves finding creative (low-cost) mechanisms that align incentives to induce an activity to perform diligently and in ways consistent with the overall goals and objectives of the organization.¹³

Management oversight is one such mechanism, but it carries a cost. Oversight requires time and effort and, therefore, a commitment of resources. Moreover, it is often associated with costly lobbying efforts to influence decisions that favor one part of the organization at the expense of others. Influence activities can increase costs and undermine the effectiveness of an organization, leading to sub-optimization. Outsourcing part of the production chain may avoid some agency and influence costs that are part of internal transaction costs.

3. TRANSACTION COST ECONOMICS (TCE)

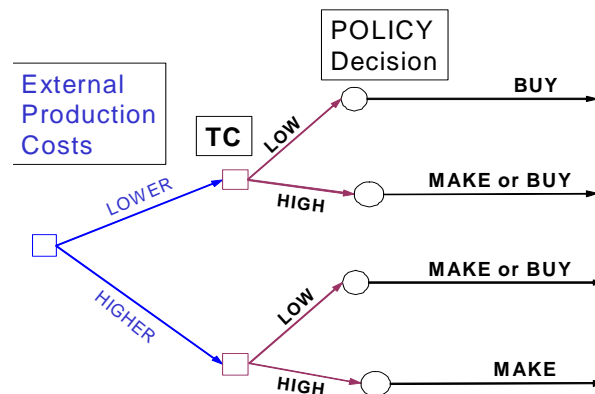
Organizations tend to specialize in those “core” activities in which they have a comparative advantage, and “transact” with outside suppliers (or out-source) to acquire other goods and services. A key contribution of TCE is to introduce the nontrivial costs of managing these transactions into the “make-or-buy” decision. The question is whether resource inputs or intermediate activities should be produced internally (vertically integrated), or should be “out-sourced”—i.e., purchased in spot markets or contracted through suppliers. The two costs that drive the “make-or-buy” decision in TCE are production costs and transaction costs. Answers to the make-or-buy decision ultimately define the boundaries of an organization.

Figure 1 offers a simple “make-or-buy decision tree.” Here the prescription to in-source (make) or out-source (buy) accounts for both production and transaction costs. For instance, if the organization is conducting an activity where there exists “LOWER” *external* production costs, and out-sourcing would involve “LOW” transaction costs (TC), then the policy decision is to “BUY” (or out-source). The higher the expected transaction costs (to manage the supply relationship), the lower external production cost (or the greater production cost savings) must be to support the decision to “BUY” or out-source.

¹² With extended production runs, firms become more proficient with the processes involved, and, therefore, able to achieve lower cost. As Besanko (2000, p. 91) puts it, “cost advantages [...] flow from accumulating experience and know-how.”

¹³ This is frequently referred to as the “principal-agent problem.” Methods to address it are sometimes grouped as “agency theory” (Kreps, 1990; Besanko, 2000).

Figure 1. Competitive Sourcing Decision Tree



In TCE, the decision to outsource depends on an expectation of positive net savings, where: $\text{Net Savings} = \text{Production Cost Savings} + \text{Transaction Cost Savings}$. In Figure 1, if *external production costs* are “HIGHER” than *internal production costs*, and *external transaction costs* are also “HIGH,” then the policy decision is to “MAKE” (or in-source). However, it is possible for an internal production cost advantage to be offset by sufficiently high internal transaction costs. In this case, if “HIGHER” external production costs can be offset by sufficiently “LOW” external transaction costs, it might still pay to “BUY” (or out-source).¹⁴ Higher external production costs could still look like a bargain to an organization if that organization suffers from sufficiently high internal *transaction costs* to conduct that activity.

Two key components of the “make-or-buy” decision are highlighted in TCE: coordination and motivation. The issue of coordination arises from the economic opportunity for specialization and exchange. Traditional economic analysis focuses on *productive* (cooperative) exchanges between parties that specialize in different activities. These transactions often generate substantial gains for the parties involved. The gain or “surplus” generated through specialization and exchange can take the form of more and better output, delivered more quickly, and with fewer resources. TCE recognizes these potential gains, but also acknowledges the dark side of the coordination problem—motivation.

TCE predicts parties involved in a transaction may benefit from cooperation and, thereby, generate a surplus. However, since they are assumed to be self-interested and opportunistic, they will not necessarily have the motivation to do so—particularly when specific assets¹⁵ are involved and information is imperfect (incomplete or uncertain) and asymmetric.

¹⁴ At first glance, introducing transaction costs into the mix suggests lower external production costs (or positive production cost savings) are necessary but no longer sufficient to justify outsourcing. Now we can see that production cost savings may not even be necessary to justify outsourcing!

¹⁵ Asset specificity comes in a variety of flavors: human, location, physical, etc. These are assets that generate high returns in the context of a specific transaction, but offer very little value outside that relationship.

The interaction of opportunism with imperfect and asymmetric information raises the possibility of unproductive bargaining/influence or rent-seeking activities.¹⁶ The ultimate outcome—a balance of productive efforts and unproductive bargaining—depends on the characteristics of the transaction and the incentive structures that govern the parties involved.¹⁷

In TCE, the successful resolution of resource-allocation problems rests on designing mechanisms (markets, contracts, organizations, etc.) that allow opportunistic individuals to overcome their collective-action problems in pursuit of gains from exchange (Williamson & Masten, 1999).

A. Coordination Difficulties

Efficient production requires extensive synchronization of a number of complex activities. This is especially true in the practice of “lean” production, featuring “just-in-time” deliveries with attendant reduction in inventory costs. The more complex the transaction, the more difficult (costly) coordination with an outside enterprise will be. There may be more commonality of objectives between two divisions of the same enterprise than with an outside firm. Also, any disagreements about deliveries, schedules and similar issues are generally settled more quickly and in ways more suitable to the enterprise if it has authority over all parties. (One way to have that authority is to vertically integrate and produce everything in-house.)

B. Motivation Difficulties

Out-sourcing important parts of one's business means depending on the chosen supplier. This dependence may be of trivial importance. For example, the purchase of paper clips involves a one-time transaction for office supplies.¹⁸ If a paper-clip source proves unsatisfactory for some reason, it's readily possible to find another supplier.

On the other hand, outsourcing a major management information system involves a long-term, highly-complex relationship. During the process of executing the agreement, the supplier acquires expertise in the specific system, which confers a form of human asset specificity.

At some point, the relationship is transformed from a customer operating in a competitive marketplace with a number of suppliers to a relationship between a single buyer and single seller. At this point, close-in bilateral bargaining replaces the impersonal (arms-length) arrangements of the competitive marketplace.

Outsourcing relationships of this type entail a *basic transformation* of the supplier from competitive bidder (prior to source selection) to sole supplier (after source selection). Having one supplier with unique expertise (human and physical asset specificity) confers monopoly

¹⁶ The concept of unproductive bargaining and rent-seeking is usually attributed to Tullock (1971), Krueger (1974), and Bhagwati (1980) (also Tullock, 1993). A key insight of this literature is that costly bilateral bargaining by two parties for a bigger share of the surplus they jointly create can dissipate or even eliminate that surplus (Tullock, 1971).

¹⁷ There are other factors as well. For example, Wolff and Reed (2000) find significant evidence that, *inter alia*, the nature of, and access to, assets in a joint venture are important in predicting the balance of positive sum (productive) and zero sum (unproductive) outcomes for the participants.

¹⁸ Actually, a series of one-time purchases of paper clips.

power, especially if there are no close substitutes for this particular contractor's services. Accordingly, the customer is now vulnerable to "opportunistic behavior"¹⁹ from the contractor. Unforeseen circumstances may prompt large charges for special services for which there are no readily available substitutes.²⁰ The supplier may, in fact, exploit its power in the relationship to renegotiate the basic agreement to the buyer's disadvantage, threatening to dissolve the agreement. The TCE literature refers to this as a "hold-up."²¹

Whereas out-sourcing opens possibilities of production cost savings, it exposes the organization to the costs of managing the out-sourcing relationship and to the risks of bad (opportunistic) behavior on the part of out-sourcing partners.

C. Relationship Specific Investments (Investments in Transaction-Specific Assets)

Relation-specific investments can improve the efficiency of some transactions. Investments in specific assets can take on a variety of characteristics, including:

Site Specificity: e.g., investments that locate the supplier's production facility close to its customer;

Physical-Asset Specificity: e.g., specialized investments by the supplier (in plant and/or equipment tailored to the customer's needs) that are much less profitable if shifted to serve other customers;

Human-Asset Specificity: e.g., specialized investments by the supplier's work force (in skills and knowledge) oriented toward the primary customer's needs that are less valuable in transactions with other customers.

Dedicated-Asset specificity: e.g., investments in excess capacity which provide a contingency in the event of a surge in demand.

Relation-specific investments increase risks to both parties. Having made specialized investments, the supplier becomes the most efficient provider, and thus can potentially raise its price—and still remain the least-cost supplier. At the same time, if the supplier makes specific investments in assets that are only valuable in the context of its relationship with a specific buyer, then this makes it more vulnerable to that customer. If parties to the transaction behave opportunistically, they can capture the value of investments made by the other. For example, either party can "hold up" the other by threatening to change the terms of the relationship. So, whereas relation-specific investments increase the total gains from the outsourcing arrangement, they also increase the risks of opportunistic behavior in which either party can hold up the other. The danger is that if neither party feels like it can recover the full costs of its

¹⁹ Williamson (1996) defines "opportunism" as "self-interest seeking with guile."

²⁰ Besanko (2000) and others have labeled the transition from one prospective buyer and many sellers to one buyer and one seller, from competitive market to a one-on-one relationship as the "fundamental transformation." This transformation occurs, at least to a certain extent, after the completion of every source-selection process.

²¹ An even worse case is the possibility that a holdup might be unilaterally executed. According to Besanko (2000), "a holdup problem arises when a party in a contractual arrangement exploits the other party's vulnerability due to relationship-specific assets."

investment in the relationship/transaction (say through a continuation or renewal of the contract), then those efficiency-generating investments will not be made, possibly resulting in higher costs, schedule delays and lower quality.²² The Appendix provides a notional example illustrating the vulnerabilities of both parties in an outsourcing relationship featuring a high degree of asset specificity.

D. Resolving the Hold-Up Problem

While corporate partnerships and relation-specific investments increase the benefits to both parties, they make both vulnerable to opportunistic behavior, or a holdup, by the other party. Vulnerability to these events can be significantly decreased through well-crafted contracts. However, contracting (a) involves expenditure of resources, and (b) cannot completely eliminate risks associated with opportunistic behavior from partners.²³

The process of contracting includes drafting the relevant documents, negotiating a version of the contract that is signed, taking actions to enforce that contract, and renegotiating when needed. These tasks entail, at minimum, the services of skilled people who develop local knowledge of the specific business relationship. There may also be costs associated with litigation, to include both direct (e.g., monetary) and indirect (e.g., time delay) components. Furthermore, the basic contract may well need considerable administrative and management attention throughout its life, even if full-scale renegotiation is not undertaken. Accomplishing these tasks satisfactorily involves expenditure of resources and management attention. These “transactions” costs can negate a significant portion of the savings involved with outsourced production.

That the future is not amenable to perfect prediction is a well-known fact of life. The obvious implication is that a contract cannot foresee all possible contingencies throughout the period of its execution. That’s true regardless of the skill of the legal staff and the expertise of the contracting personnel.²⁴ In some cases, this is not worrisome, as, say, for the one-time purchase of paper clips. However, in long-term, complex outsourcing relationships, this may prove very costly during the execution of the contract. This problem is further complicated when there is asymmetric information.

Even the enforcement of clearly written contracts may be problematic. It may be difficult to specify, measure, and demonstrate material breach of contract. Furthermore, it is impossible to foresee all situations in which a contracting party might wish to demonstrate that breach.

Because contracts cannot completely hedge against risks of opportunistic behavior, other risk-reduction measures may prove advantageous. The organization out-sourcing an

²² The result of opportunistic behavior may be adverse selection, ex ante choice of an inferior option (e.g., production technology), or moral hazard—increasing risk that if a relationship-specific investment is made, that the other party will exploit the terms of the contract to “hold them up.” For example, changes in specifications are frequently used by contractors as an excuse for raising prices and profits under government contracts, especially when specific investments by the contractor create a barrier to the entry of other competitors.

²³ Costs associated with contracting and the holdup risks remaining are major components of “transactions costs.”

²⁴ This is a manifestation of what’s sometimes called “bounded rationality.”

activity may retain some in-house (perhaps standby) capability to provide the good or service in question.²⁵ This, and similar measures, could enhance bargaining position in the event of renegotiation or contract-enforcement actions.

Changing the ownership of assets associated with relation-specific investments is another strategy that can reduce the scope for opportunistic behavior. For example, this may take the form of government-furnished equipment in some federal transactions or GOCO (“Government-Owned, Contractor-Operated”). However, such hedging measures also entail costs, and can likewise dissipate the potential gains from outsourcing.

The conventional wisdom in the transaction costs literature is that the decision to out-source should not be taken lightly. While the potential production-cost savings may well be tempting, there are associated costs and risks, albeit less obvious. They are less important (and might be negligible) for simple, one-time transactions where alternate suppliers are readily available. They can be critically important when the out-sourcing arrangement is such that there is only one supplier readily available in a complex and lengthy relationship.

Hence, the decision to out-source must weigh production cost savings against the costs and risks associated with a critical source of supply being outside the firm’s control. Those are generally referred to as the transaction costs of the out-sourcing relationship. Thus, out-sourcing is preferred only if the total costs are less than the costs of production with the firm’s (in-house, organic) assets. That is, a firm should out-source only if:

$$\text{Net Savings} = \text{Production Cost Savings} + \text{Transaction Cost Savings} > 0.$$

4. IMPLICATIONS OF TCE FOR COMPETITIVE SOURCING

A fundamental insight of TCE is the importance of uncovering both production and transaction costs associated with the “make-or-buy” decision. The policies and procedures that govern competitive sourcing appear in OMB Circular A-76. A summary of the steps involved in conducting these public-private competitions appears in Table 1.²⁶ TCE reveals key characteristics of transactions that make them “good” or more “challenging” candidates for out-sourcing.

A. “Good” Candidates for Outsourcing

If a transaction requires little in the way of specific assets (no hold-up problem), and involves a product or service that is: a) standard and well-defined (IFB), b) easy to measure (limited complexity and mild information asymmetry), c) routinely used (recurring/frequent purchases), d) not subject to change (limited demand uncertainty), and e) is offered by competing suppliers, then there is little room for negotiation (price and performance are market-driven), and the marginal benefit of unproductive bargaining (or opportunistic behavior) is nearly zero. With little room for bargaining over such routine and uncomplicated transactions, substantial production and transaction cost savings can be expected from out-sourcing, or from purchasing directly in spot markets (say over the Internet). Moreover, since administrative, incentive, and enforcement costs tend to be low for standard goods and services produced in

²⁵ This is sometimes called “tapered integration” and is related to the concept of “contestable markets.”

²⁶ The results outlined in the next two sections were generated by a simple mathematical game theory model of out-sourcing that incorporates key principles of TCE (See Melese, F. & Franck, R., 2003).

competitive markets, the marginal cost of engaging in the transaction is small, and the marginal cost of unproductive effort is high. This encourages greater effort and investment in the transaction and, *ceteris paribus*, tends to generate a larger surplus, *S*, or a higher return to outsourcing.

In general, the less complex and uncertain a transaction, the easier it is to write an explicit contract that covers all relevant contingencies. Moreover, the lower the administrative and enforcement costs of that contract, the higher the expected marginal cost of ex-post bargaining or opportunistic behavior, and the lower the expected return from that activity. This reduces the scope for optimal ex-post bargaining, thus lowering transaction costs associated with outsourcing. The favorable characteristics of these so-called “good” candidates tend to encourage greater productive effort that in turn contributes to a larger surplus enjoyed by both parties, increasing the returns from outsourcing.

B. More “Challenging” Candidates for Out-sourcing

More challenging candidates include transactions that involve a non-standard (or highly differentiated) product or service, and thus take place in a bilateral, contractual setting. In this case, assuming no specific assets are required, the results (bargaining or opportunistic behavior, effort or investment in the relationship, and surplus generated) depend on the degree of contractual ambiguity governing the transaction, as well as on any administrative and enforcement costs involved. However, as complexity, uncertainty, and opportunism due to specific investments increase, so does the marginal benefit of bargaining or ex-post renegotiation. This increased risk results in higher external transaction costs that need to be offset by more substantial production cost savings in order to justify outsourcing.

Productive investment (or effort) involves two types of assets: general and specific. The greater the ratio of specific assets to total investments required in the relationship, the greater the risk of “hold-up.” Moreover, as the threat of bilateral dependency increases, the more incomplete the contract becomes (and the lower the penalty for reneging or renegotiation), the marginal cost to each party of engaging in unproductive bargaining or influence activities becomes lower. In the face of incomplete contracting, the hold-up problem poses a hazard Williamson calls “maladaptation.” The risk of maladaptation is captured here as an increase in the return to both parties in unproductive bargaining or influence activities. As the marginal return to bargaining increases and the marginal cost decreases, a greater amount of unproductive bargaining, and a lower productive effort or investment can be expected—which erodes the surplus that can be enjoyed by both parties to the transaction.

Any time ex-ante competitive bidding among suppliers is transformed into an ex-post, bilaterally dependent relationship, additional governance structures may be required to induce cooperative adaptation. The challenge is to write a contract with enough precision to encourage desired performance, but enough flexibility to allow productive adaptation (adjustments), as circumstances require. But in the case of complex transactions and uncertain outcomes, “bounded rationality” precludes comprehensive ex-ante contracting (contracts are inherently incomplete) which raises the possibility of gains from (unproductive) ex-post, opportunistic renegotiation (e.g., the “hold-up” problem).

Contracting, therefore, offers an imperfect solution to opportunism. Additional governance mechanisms (rules and regulations, GOCO, etc.) can help settle disputes and adapt to new conditions. Likewise, ex ante efforts are useful for screening reliability and reputation or to safeguard and protect transaction-specific investments. These structures can

include anything from agreements to share and verify cost and performance information through incentive contracts (e.g., sharing gains of continuous process improvement), to government ownership of facilities and tooling to reduce the potential for opportunism, to the careful crafting of dispute settlement mechanisms.

If such agreements turn out to be too costly to implement and enforce—or “maladaptation hazards” are too great—then out-sourcing can give way to in-sourcing, or vertical integration. When asset specificity, bounded rationality, and opportunism make contracting problems too difficult or costly, these problems can be relieved by internalizing transactions.

However, when transactions are integrated within an organization, transaction-cost calculations must also include internal costs of managing, monitoring, and motivating activities and personnel, with low-powered incentives. Some key challenges of internal production previously discussed include sub-optimization, strategic internal lobbying for resources, multitasking, and the difficulty of coordinating and monitoring the quality, quantity, cost, timeliness and improvement of goods and services.²⁷

It is instructive to return to OMB Circular A-76 and examine the threshold cost-savings criteria required to declare a victor in public-private competitions. The results of our analysis suggest the one-size-fits-all threshold of greater than 10% estimated production cost savings before a federal activity is out-sourced should be reviewed. In the case of what we termed “good” candidates for out-sourcing, the threshold production savings specified in OMB A-76 can be reduced considerably, since external transaction costs tend to be low or negligible. In contrast, for the “more challenging” candidates, the 10 percent or \$10 million threshold of production cost savings might need to be raised to account for the likelihood of substantial external transaction costs required to govern the ongoing relationship—including scope for encouraging productive effort and discouraging unproductive bargaining (hold-ups and renegotiation).

C. What It All Means in the Defense Sector

The key contribution of this paper is to apply lessons from TCE to develop new insights into public-private competitions. This effort leads to two important policy recommendations. First, different rules should apply to different transactions to declare a victor in public-private competitions. Second, if the private sector wins, then the optimum choice of outsourcing contract depends on certain key characteristics of the transaction.²⁸

²⁷ In the first interpretation of the model—an out-sourcing or external, bilateral, monopoly bargaining setting—we considered ex-post adaptation (bilateral negotiation) between parties to a transaction (based on various assumptions regarding the complexity, uncertainty, and degree of asset specificity involved in the transaction). In a second interpretation of the model—an in-sourcing or internal, bureaucratic (hierarchical) setting—productive and unproductive activities (monitoring and measurement, shirking, and rent-seeking, etc.) engaged in by a principal (the boss or internal customer) and agent (the worker or internal supplier) can be studied using the stylized game model developed earlier.

²⁸ These characteristics include: the extent of any relation-specific (site, human or physical) assets that might be required for the transaction, complexity (the degree of uncertainty about demand, quality, cost, etc.), frequency of the transaction, information (asymmetries), market structure, etc.

Transaction costs include all the costs of out-sourcing a product or service including: search, bargaining, contracting and enforcement costs. An organization can out-source in two ways: on the spot market or through short- or long-term contracts. The method chosen depends on some key characteristics of the transaction.

Spot-market (“off-the-shelf”) purchases will minimize transaction costs if transactions involve buying standard inputs in competitive markets. Usually, these purchases require no relationship-specific investments in specific assets, so there is no hold-up problem. Transactions best governed by spot-market purchases typically involve a product or service that is: a) standard and well-defined, b) easy to measure (limited complexity, and mild information asymmetry and uncertainty regarding cost, quality and schedule), c) either occasionally or routinely used (although frequent and recurring purchases by other buyers occur in the marketplace), and d) is offered by multiple competing suppliers. In this case, spot-market purchases minimize transaction costs, and price and performance are driven by market forces, not through negotiations.

However, even in the case of standard products and services, if transactions involve specialized investments by either the buyer or the seller, there is a hold-up problem. This could manifest itself as under-investment in specific assets or opportunistic behavior once those investments are in place. Understanding this *ex ante*, TCE recommends the buyer and seller try to reduce the likelihood of a hold-up (or minimize transaction costs) by adopting a short- or long-term contract.

The four main contract types specified for out-sourcing under OMB A-76 are: Sealed bid firm-fix price (Fixed Price = FP), Cost sharing and Incentive Fee (Cost Plus = C+), and time and materials (TM). Table 2 details the types of out-sourcing contracts under which the top 10 military contractors operated over the period 1998-2003.

Table 2. The Top 15 items DoD Outsourced from 1998 to 2003

Category	Cost (\$bil)
Research & Development	140.2
Aircraft & Airframe Structural Components	86.5
Professional, Administrative & Mgmt Support Services	73.6
Construction of Structures & Facilities	42.4
Equipment Maintenance, Repair & Rebuilding	42.4
Maintenance & Repair of Real Property	34.4
Data Processing & Telecom Services	33.0
Ships, Small Craft, Pontoons and Floating Devices	31.2
Communications and Detection Equipment	28.3
Medical Services	24.6

Fuels, Oils and Lubricants	24.5
Engines, Turbines and Components	23.3
Guided Missiles	22.8
Utilities, Food Service, Janitorial and Housekeeping	22.6
Transportation, Travel and Relocation Services	18.1

(Markison, 2004)

If the Performance Work Statement (PWS) describing the desired product, service or project can be specified precisely (IFB), and there are no transaction-specific assets involved, then FP-type contracts have the benefit of creating cost-reducing incentives that reward the buyer through ex-ante competition between potential suppliers. In this case, FP contracting increases contractor incentives to invest in cost reduction, and ex-ante competition can transfer these cost-savings directly to the buyer. Since there are few unresolved issues, little or no costly renegotiation occurs ex-post.

In contrast, if the Performance Work Statement (PWS) cannot be specified precisely (RFP) or there are significant specific assets involved in the transaction, then some surplus will be eroded by the threat of ex-post negotiation. This loss from bargaining activity is part of the cost of using a FP contract in this case. The more complex and uncertain the transaction, the less complete the PWS, the greater the cost in using FP, and the more attractive other contracting options become.

However, Bajari and Tadelis (1999) demonstrate that providing cost incentives in a contract is more likely than not to lead to disagreements, spoiled relationships and ex-post friction in interpreting the outcomes. In fact, avoiding these frictions and reducing the advantages of renegotiation can be accomplished by investing in a more complete PWS, and by adopting alternative mechanisms (reputation, GOCO, etc.) to reduce the return from opportunistic behavior.

TCE suggests that the degree of completeness of the PWS and the contract is an optimizing decision by both parties that reflects their trade-offs between an ex-ante investment in the PWS and contract design, and the potential ex-post cost of opportunistic renegotiation. Moreover, since the principal insight of TCE is that the choice of optimal governance structure depends on the characteristics of the transaction, the dual focus of any out-sourcing evaluation should be: a) to sort transactions into categories based on their principal characteristics (asset specificity, uncertainty, complexity, and frequency), and b) to evaluate the costs and consequences of alternative contracts, organizational structures and mechanisms available to govern those transactions. Table 3 attempts to do just that.

D. An Out-sourcing Risk Assessment Method

A thesis by Powell proposes a method for managers to assess the risks associated with a proposed out-sourcing action. Basically, aspects of the new relationship are related to a stoplight scheme. For example, if there is a high degree of asset specificity involved, there would be a red light in that category, and a higher degree of risk is indicated. Powell intended the light scheme to increase visibility of areas where management attention is important, and where managers ought to focus their risk-reduction efforts.

That application is certainly valid, but there's another wrinkle. The study of Transactions Cost Economics indicates that risk-reduction measures (even if highly effective) are not risk-elimination panaceas. Accordingly, one can expect an overall out-sourcing action with a large number of assessed red and yellow lights will be more costly and risky during its execution, even with due diligence in risk reduction.

What follows is a variation of Powell's stoplight scheme.

a. **Asset Specificity.**

RED. Source becomes specialized, with no close substitutes or competitors readily available. Example: only qualified supplier for a specific, highly-specialized task—such as suppliers of spare parts for aging weapon systems.

GREEN. Routine (non-specialized) goods or tasks; competitors or close substitutes readily available. Example: purchase of standard commercial items, such as paper clips and other office supplies.

b. **Complexity.**

RED. A large-scale task covering a large geographic area. Complexity of task severely limits qualified bidders. Example: large-scale, complex IT support; such as NMCI.

GREEN. A simple, routine task or standard product. A large number of qualified bidders. Example: office supplies.

c. **Length of Relationship.**

RED. A long-term relationship, which strains ability to foresee problems during original contract negotiations. Complexity and asset specificity exacerbate this problem. Example: IT support, such as NMCI.

GREEN. Out-sourcing is a one-time transaction, or can be structured as a series of one-time transactions. Example: purchase of office supplies.

d. **Frequency.**

RED. Specialized, complex task or service from which there is significant learning-by-doing. Incumbent contractor has significant competitive advantage over potential competitors. Example: contract maintenance for specialized aircraft, such as E-4s.

GREEN. Routine, standard task, service or product, in which a number of firms have significant expertise. Example: copy machine repair.

e. **Time Sensitivity.** (added)

RED. Quick performance of task or delivery of product is essential for satisfactory performance. Example: repair of combat aircraft, or warship subsystems.

GREEN. Quick delivery of products or accomplishment of task is not essential for satisfactory performance. Satisfactory performance can include some delays. Example: copy machine repairs.

f. **Operational Significance.** (added)

RED. Unsatisfactory performance significantly degrades operational capability or compromises safety. Example: repair of combat aircraft or warship subsystems.



GREEN. Unsatisfactory performance involves, at most, administrative inconvenience and longer time to accomplish routine tasks. No compromise of operational readiness or safety. Examples: delays in copy machine repairs and temporary lack of office supplies.

Table 3 provides a brief summary of the scheme above. Table 4 essays notional characterizations of three out-sourcing candidates.

TABLE 3. Assessing Like Nature of Transactions Costs

CHARACTERISTICS	DESCRIPTIONS		
	GREEN	YELLOW	RED
Market Structure: Supplier Power (post selection)	Many Suppliers		One Supplier
Nature of Tasks	Simple, general		Complex, specialized
Frequency of Tasks	Occasional		Continuous
Time Sensitivity: Implications of Late Performance	Inconvenience		Lost Operational Capability or Compromised Safety
Importance: Implications of Unsatisfactory Performance	Inconvenience		Lost Operational Capability or Compromised Safety
Asset Specificity	Little		Most

TABLE 4. Notional Assessments of Outsourcing Candidates

Characteristics			
	Office Supplies	Packing Parachutes	24/7 IT Service
Market Structure: Supplier Power (post selection)	GREEN: always a number of alternate suppliers	GREEN: little private expertise accrues to contractor	RED: highly specialized knowledge accrues to contractor
Nature of Tasks	GREEN: simple	RED: complex and specialized	RED: complex and highly specialized
Frequency of Tasks	GREEN: a series of one-time spot purchases	YELLOW: depends on training or operations cycles	RED: service required quite frequently
Time Sensitivity: Implications of Late Performance	GREEN: administrative inconvenience	RED: disrupts training or operations	RED: could significantly lessen operational capability
Importance: Implications of Unsatisfactory Performance	GREEN: administrative inconvenience	RED: compromise of safety and loss of operational capability	RED: loss of operational capability
Asset Specificity	GREEN: none	GREEN(?): little	RED: significant

5. CONCLUDING REMARKS: ONE SIZE DOES NOT FIT ALL

Transactions costs are not the only consideration for make-or-buy decisions. If that were so, then one might conclude the government should generally in-source production of complex weapon systems and out-source janitorial services. For good reasons, the opposite is the more typical practice.²⁹

The goal of this paper was to integrate and apply key principles of TCE that previously focused on the firm as a guide to government out-sourcing. TCE recognizes organizations enter into bilateral contracts with suppliers, workers, managers, customers, firms, and other organizations that require costly governance (coordination and incentive) mechanisms. In evaluating transactions for their “make-or-buy?” decisions, firms typically consider both production costs and the cost of managing transactions, or transaction costs. It is time for government to do the same.

The implications of this paper suggest that in the case of out-sourcing a transaction where complexity, uncertainty and asset specificity can lead to renegotiation, the choice of

²⁹ However, advocates of the arsenal system could argue (and have) that the hazards illuminated by TCE indicate production of some complex weapon systems should be done internally.

governance structure will drive productive effort and unproductive bargaining. Ideally, contracts can be written that specify measures of performance, conflict resolution procedures, and conditions under which the contract can be modified, as well as provisions for sharing gains from transaction-specific investments. In reality, the tradeoff (as it applies to out-sourcing) might be stated as follows. On the one hand, efforts to suppress opportunism contractually are limited by the costs of writing and enforcing contractual agreements; they rise with the complexity, uncertainty, and asset-specificity associated with the transaction. This works against out-sourcing. On the other hand, while integration within the organization mitigates these problems, internal principal-agent issues arise that sacrifice the high-powered incentives of the market and consequently require greater monitoring and administrative costs. This works in favor of out-sourcing.

In summary, like private firms, government “make-or-buy?” decisions should look beyond production cost savings and forecast likely transaction costs associated with out-sourcing. Moreover, government rules that prescribe particular contract types should be based on the four principal characteristics of transactions (asset specificity, uncertainty, complexity and frequency), and should offer contracts and mechanisms that encourage productive effort, protect transaction-specific investments, and discourage unproductive bargaining, influence and rent-seeking activities.

Our central conclusion is indeed that one size does not fit all. This has interesting implications both at the management and policy level. Those managing competitive sourcing processes do well to keep in mind that not all A-76 competitions are the same. The costs (direct and indirect), risks, and associated management attention that attend out-sourcing vary greatly with the nature of the goods and services under consideration. Moreover, TCE tells a lot about the size of the transactions costs and risks associated with out-sourcing. One implication affects the conduct of the A-76 competition. Out-sourcing decisions that involve a lot of red and yellow lights (in Table 3) warrant more management attention up front. In particular, managers should invest more in formulating Performance Work Statements and in drawing up the contract(s) which govern the relationship to include provisions for dispute resolution and contract renegotiation. Avoiding large costs and management headaches later is worth some extra resources and management attention early on. Moreover, both defense managers and contracting officers should vary contract types with the assessed nature of the out-sourcing action. Thus, for example, purchase of standard office supplies are handled nicely with very simple, fixed-price contracts—while long-term IT services contracts entail much more complete and complex contracts with appropriate incentive and governance provisions.

We should also recognize that one size does not fit all at the policy level,. In a very real sense, the A-76 criteria include transaction-cost considerations because the out-sourcing proposal must beat the in-house proportion by a certain margin in order to get the contract. However, as TCE amply demonstrates, the likely size of transactions costs varies greatly. Moreover, those costs vary in an orderly fashion with respect to certain key characteristics we’ve discussed above. It’s time to take this pattern into account. The winning margin should vary according to the nature of the out-sourcing relationship being considered—more than the current A-76 standard for some, less for others.

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APPENDIX

RELATION-SPECIFIC INVESTMENT AND POTENTIAL FOR HOLDUP: A HYPOTHETICAL EXAMPLE³⁰

Boutique Motor Corporation (BMC) features highly decorative cup holders in its automobiles. General-purpose plastics suppliers can provide those unique cup holders for \$4 per unit. BMC, however, forms a long-term relationship with Mom & Pop Plastic Fabricators (M&P) to get those cup holders at a cheaper price, say \$3 per unit for 500,000 cup holders per year. As part of its part of the relationship, M&P modifies (and specializes) its plastic molding machinery to make the distinctive BMC cup holder more efficiently. M&P invests \$1 million in the modifications, and can then produce each unit for \$1 each.³¹ M&P's modified plant can still produce general-purpose cup holders, but average variable cost goes up to \$2.90 per unit with the special-purpose machinery. The prevailing market price for general-purpose cup holders is \$3 per unit.

In this simple example, M&P's costs are as follows:

$$\text{Total Cost} = \$140,000 + \$1 * Q,$$

where Q is annual production (500,000 for BMC), and annual payments of \$140K will retire a debt of \$1 million at 6.64% (APR) over ten years. If M&P produces only for BMC, then total cost is \$640,000. Revenues from BMC are \$1.5 million (500,000*3).

Thus, M&P earns profits of \$0.86 million per year as a result of the relationship with BMC; it would absorb losses of 90K per year if it diverted its production capacity to 500,000 general-purpose cup holders.³² Likewise, BMC adds \$0.5 million to its profits since it pays \$3 per unit for its cup holders, instead of \$4 (500,000*[4-3]). In short, the agreement provides significant benefits to both parties. The total benefit (or "surplus") is \$1.45 million (.86+.09+.50) after the relationship between the two companies is formed.

However, this total surplus can be contested. Suppose BMC demands M&P lower its price to \$2. If that happens, then M&P's profits decrease to \$0.36 million (500,000*2 – 640,000), and BMC's profits increase by \$0.5 million. At the same time, M&P may insist on a price increase to \$3.50 per unit. If that happens, then M&P's profit increases to \$1.11 million

³⁰ Besanko (2000) has a similar example on page 153.

³¹ Marginal Cost = Average Variable Cost = \$1.

³² Before making its relationship-specific investment (or prior to the transformation), M&P reckons its advantage as \$0.86 million per year minus its profits as a general-purpose supplier. After the investment, M&P's benefit from the relationship with BMC is \$.95 million per year with production of 500,000 per year. (If M&P were to produce those cup holders at variable costs of \$2.90 per unit and sell them at \$3.00, it would incur a loss of \$90K per year [revenue = \$1.50 million; cost = \$1.59 million]).

and BMCs benefit declines to \$0.25 million.³³ In short, BMC and M&P can dispute shares of the total benefit from the relationship.³⁴ As indicated, the standard term for such attempts to alter the relationship is “holdup.”

³³ It’s unlikely that a holdup by either party would be presented this crudely. BMC might plead hard times and assert the need to negotiate lower prices from suppliers. M&P might point to increases in input costs, and assert the need for a higher price in order to remain in its relationship with BMC.

³⁴ There are obvious limits to this behavior. If M&P demands more than \$4 for each cup holder, then BMC would find it advantageous to buy its cup holders from other sources (at \$4). Likewise, if BMC forces the price below \$1.10, then M&P would choose to make general purpose cup holders and sell them for \$3 per unit (at a unit cost of \$2.90).

Unique Transaction Costs in Defense Market(s): the Explanatory Power of New Institutional Economics

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ABSTRACT: Concerns about the US Military-Industrial complex have seemed a permanent fixture in the DoD. Initial studies outlined the uniqueness of the market, but continued utilization of classic economic approach continues with little explanatory power. This paper offers an alternative approach using transaction-costs analysis and the explanatory power of the New Institutional Economic and Public Choice School. The approach provides explanatory power in the defense markets' mix of the invisible and visible hands at work and provides a framework for assessing viable policy alternatives that could provide increased efficiency while maintaining our principles of freedom.

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INTRODUCTION

In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex.

**President Dwight D. Eisenhower Farewell Address,
January 17, 1961**

Still much of the public discussion of weapons acquisition problems proceeds as if the terms “competition,” “price,” “buying,” and “seller” had the meanings they do in a market system.
(Peck & Scherer, 1962)

As the United States shifted from arsenals to more and more utilization of private firms in the acquisition of weapon systems, concerns grew about the military-industrial complex. Those concerns were most famously noted by President Dwight D. Eisenhower in his farewell address in 1961. He warned, “we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex.” By this point, the defense market(s), or the “military-industrial complex,” had grown to become a considerable economic factor. The Korean War and Cold War (generally) had driven defense spending to over 10% of Gross Domestic Product (GDP) for most of the 1950s. With such financial concerns, interest grew in the weapons acquisition process; and in the late 1950s, Harvard Business School conducted an extensive study of the industry (Peck & Scherer, 1962). The stated purpose of the study was:

to determine the nature of the relationship between the government and weapons contractors in the acquisition of advanced weapons and to analyze the effects of these relationships on weapons performance and the speed and cost of their acquisition. The project will also recommend changes in government and business policies and practices having a direct and significant impact on relationships between government and weapons contractors.

In their conclusion, the authors note that their analytical descriptions did not:

yield a simple model in which a few functional relationships set forth how an economic process operates. Although such models have been the stock-in-trade of economists, they have their limitations. Undoubtedly such a model could be developed for the weapons acquisition process. Yet given the present state of knowledge about the process, there is little assurance that the right simplifications would be made, or that the various functions would be expressed correctly, or that the interactions of those functions would yield an accurate description of what goes on in weapons acquisitions.

To date, over 40 years later, no model or basic framework has emerged that provides an effective “description of what goes on in weapons acquisition.”

Traditional neoclassical economic assessments of ineffective and inefficient weapons procurement have been published since the first analyses by Peck and Scherer, but none seem to have explanatory power. Most pick up on the seemingly justified negative assessments given the poor performance of some weapon systems in the 60’s and 70’s. Most have not extended Peck and Scherer’s assessment that the “uncertainties and risks mark the weapons acquisition process as unique,” nor their opinion that:

substantial uncertainties and risks vitiate the use of familiar economic and administrative concepts borrowed from established institutions. The notion of a market system is one



such inapplicable set of concepts. Still much of the public discussion of weapons acquisition problems proceeds as if the terms “competitions,” “price,” “buyer,” and “seller” had the meaning they do in a market system.

Peck and Scherer outline specific issues in each area and conclude, “the concepts of a market economy are not a fruitful point of departure from formulating weapons acquisition policy.” This conclusion is vital because its profundity has not been duplicated in published form since.

Unfortunately, the emphasis in the past 40 years has been on trying to get the defense market(s) to act like a viable commercial market. Jacques Gansler (1980, 1995) in his first book, *The Defense Industry*, noted numerous problems with the operation of the defense market. He suggested, “to attack all of these problems, the government must implement a set of coordinated policies aimed at creating a viable market economy in each sector of the defense industry. In fact, the solutions must begin with a clear recognition that each sector has unique problems requiring special corrective actions” (1980). The book outlines the unique problems with a central planning approach so numerous adjustments can be made to solve the “unique problems.” His book ends with a seven-point plan with a focus on creating a “viable free market” and “integration of civilian and military business.” The approach seems to try to fix the market(s) so it would fit into one of the economists’ “simple models” that can be brought to equilibrium neatly on the economic professor’s blackboard. Gansler and others continued to write assessments with predictions of continued failures in the defense market and the resulting poor military capabilities. He noted in 1982 that “reports [referring to four reports from 1980 on the predicted problems with the defense industry; one of these was his book], coming from a wide diversity of backgrounds, concluded that there are serious problems with the defense industry. As a result, the United States is paying over \$50 billion a year for military equipment and not getting its money’s worth. Nor can the industry supplying this equipment expand rapidly enough to make a difference in the outcome of any conflict of likely duration” (Gansler, 1982). But, it was this expansion in the early 80’s by the Reagan administration that provided the fundamental system that performed so well just nine years later in Desert Storm.

Post-Desert Storm, Gansler and others continued to lay out a prescription of strategies for fixing the market, noting the need for the specialized defense firms to be more commercial-oriented and to build systems that have dual uses, both commercial and military. He warned that “if the Pentagon does not implement such an integration strategy soon, defense contractors will remain specialized, highly subsidized, inefficient, and ineffective at doing anything except building a few expensive weapons systems” (Gansler, 1993). In his book, *Defense Conversion*, Gansler noted the continued contractions of defense firms and the continued need for defense firms to be more commercial-like and less defense-specialized (Gansler, 1995). Each assessment seems to utilize neoclassic economic models which (in general) ignore the frictions—those uncertainties and risk noted by Peck and Scherer—in the market and attempt to find a way to equilibrium. Gansler’s long list of prescriptions pushed for government interventions that would make the complex acquisition system more like the commercial market and, thus, more able to achieve this equilibrium. Many of these prescriptions were not implemented, however, even when he was appointed as the senior acquisition official for the Defense Department during the second term of the Clinton Administration. His attempts to encourage defense firms to expand into commercial business generally failed; the industry continues to consolidate and has narrowed its focus on government business (Driessnack, 2003). So, even when the economist was placed in charge to implement his prescriptions, they did not happen. The military and the industrial complex resisted and still continue to evolve away from the policy thrusts. The policies of the past didn’t work because they have been



derived from the neoclassic models of the market. A new approach which heads the warnings from Peck and Scherer is needed.

NEW INSTITUTIONAL ECONOMIC VIEW OF THE MILITARY-INDUSTRIAL COMPLEX

So, what is the model by which the military-industrial complex should be analyzed? The researcher, in a previously published study, introduced how New Institutional Economic framework provides insight for the dynamics behind the consolidation of the defense industry and challenges the notion that the defense market(s) were inefficient (Driessnack, 2003). The approach took the transactional cost (TC) analysis of firms into the defense market(s) and provided insights into the drives behind the consolidations. The consolidations are indications of a unique and functioning market(s). In that previous text, I noted:

Williamson calls for a test for remedies and states, our “test of whether an outcome is inefficient needs to recognize the constraints imposed by TC just as much as we respect resource and technology constraints.” He defines this idea[, explaining] that “an outcome for which no feasible superior alternative can be described and implemented with net gains is presumed to be efficient.” The terms “feasible” and “implemented” need to be understood to be in the economic and political processes, in our case the US Constitution and the evolved political and administrative processes that influence the rules, both formal and informal, of the market. (Driessnack, 2003)

Economist emphasis on rational choice and frictionless efficient markets has limited the models to an extent that they miss the complexity of the environment they are trying to model. Douglass North states:

Integrating institutional analysis into static neoclassical theory entails modifying the existing body of theory. But devising a model of economic change required the construction of an entire theoretical framework, because no such model exists. Path dependence is the key to an analytical understanding of long-run economic change. The promise of this approach is that it extends the most constructive building blocks of neo-classical theory—both the scarcity/competition postulate and incentives as the driving force—but modifies that theory by incorporating incomplete information and subjective models of reality and the increasing returns characteristic of institutions. The result is an approach that offers the promise of connecting micro level economic activity with the macro level incentives provided by the institutional framework. The source of incremental change is the gains to be obtained by organizations and their entrepreneurs from acquiring skills, knowledge, and information that will enhance their objective. (North, 1999)

It is this preoccupation with the neoclassical static models that researchers must break away from in order to build a framework at the transaction level first before we apply the lesson from neoclassical economics. North is not the only one that outlines the critical nature of the institution in the market. The firms and their management come to play in deciding roles in the efficiency of the economy. This suggestion is outlined by Chandler in the *Visible Hand, the Managerial Revolution in American Business*. In the defense market(s), the management starts with the DoD Under Secretary of Acquisition, Technology, and Logistics (AT&L). The USD (AT&L) and other key members of the separate services (Army, Air Force, and Navy) comprise the senior management team over the military-industrial complex (the overall Defense Market(s)). Yet, this group’s (and, thus, the AT&L’s) policies are almost completely ignored in



the diagnoses of the industry's consolidation and the prescriptions for a remedy (Driessnack, 2003).

The use of New Institutional Economics was expanded by Driessnack and King (2004) with a case study of the F/A-22 program which demonstrated the explanatory insight from a transactional-costs (TC) analysis. The approach provided insights into the governance structure on the F/A-22 program (relative to the various defense contractors) and the continued emphasis on cost even after the prime contract competition was a decade in the past. Likewise, the researcher, in a case study on the Air Force Tanker Lease program, utilized the institutional framework along with Public Choice and Austrian economic insights (Driessnack, 2004). In its conclusion, the study notes:

the uncertainty and risks in the market that [drive] changes to these institutions and thus change the calculus of the individual players is a critical dynamic that needs to be added to our assessments of the market. We need to recognize the limits of the bureaucratic and congressional institutions and engage the driver of transaction costs to better understand how alternative mechanisms could be employed to further lessen their impact. Our assessments need to consider the "feasibility" of alternatives given a broad working of the institutions and the complex environments and realities of risks and uncertainties. (Driessnack, 2004)

It is the assessment of the institutions and the feasibility of the alternatives that provides the explanatory power.

That such explanatory power can come from New Institutional Economics and the transactional-cost analysis should not be surprising. The focus at the transaction level has proven to be very enlightening and has been recognized in the award of two Nobel Prizes: in 1990 to Ronald Coase and 1993 to Douglas North. North, in his Nobel lecture, noted:

Neo-classical theory is simply an inappropriate tool to analyze and prescribe policies that will induce development. It is concerned with the operation of markets, not with how markets develop. How can one prescribe policies when one doesn't understand how economies develop? The very methods employed by neo-classical economists have dictated the subject matter and militated against such a development. That theory in the pristine form that gave it mathematical precision and elegance modeled a frictionless and static world. When applied to economic history and development it focused on technological development and more recently human capital investment, but ignored the incentive structure embodied in institutions that determined the extent of societal investment in those factors. In the analysis of economic performance through time it contained two erroneous assumptions: one that institutions do not matter and two that time does not matter. (North, 1999)

North was focused on the development of economies, but his methods, generally those of New Institutional Economics, are enlightening in regards to the problems outlined over 40 years ago by Peck and Scherer. North continues to explain the critical nature of understanding the institutions that drive the market(s):

Institutions form the incentive structure of a society and the political and economic institutions, in consequence, are the underlying determinant of economic performance. Time as it relates to economic and societal change is the dimension in which the learning process of human beings shapes the way institutions evolve. That is, the beliefs



that individuals, groups, and societies hold which determine choices are a consequence of learning through time—not just the span of an individual's life or of a generation of a society but the learning embodied in individuals, groups, and societies that is cumulative through time and passed on intergenerationally by the culture of a society.

This then drives us in the defense market(s) to include the evolving Public Choice field in economics which enjoyed Nobel Prize winner James Buchanan in 1986.

The integration of New Institutional Economics and Public Choice was first outlined by the researcher in 2003. That study explained that, “to further understand the story of the defense firm consolidation[,] we will need to add an additional lens from the insights of the Public Choice community” (Driessnack, 2003). The combination of the New Institutional view of the firm and the Public Choice view of the dynamics from the political communities should provide the detailed framework in which insight into the whole military-industrial complex can be found. This combination falls into the Wilsonian view that institutions do matter and affect the overall calculus of the politicians and the bureaucrats (both career civilian and military officers). Yet, the theory is an expansion of the Wilsonian view in that the institutions are analyzed at a transaction-cost level. Researchers (Coase, 1988; North, 1999; Williamson, 1975, 1985; etc.) have looked at the formation of firms as attempts to reduced transaction costs in a manner that is superior to other alternatives in the market; likewise, we need to look at how the formation of bureaucracies (such as AT&L and the Service Acquisition Executive (SAE) organizations) at various levels of the government are also attempts to reduce transaction costs in a manner that is superior to other alternatives in the political market. The question is not whether bureaucracies are efficient in comparison to the Chicago School of factionalist transactions in a price-clearing market, but whether they are reasonable accommodations of the current market environment’s realistic transaction costs.

Dixit, in his book *The Making of Economic Policy, A Transaction-Cost Politics Perspective* (1996), reviews the principle agent problems in government through the view of transaction costs. He notes the information asymmetries and the impacts on incentive schemes; he also mentions the “economist’s standard and more direct answer to such problems (information asymmetries) is to design an appropriate incentive scheme.” Dixit comments on the studies of Wilson, Holmstrom and Milgron; these researchers have noted that incentive schemes are often found to be very low-powered; so, instead of adhering to these schemes, government agencies are subject to various constraints (Dixit, 1996). The lower-power incentives are concluded to be a product of the multitasking and multiprincipal agencies. Dixit reviews various schemes and summaries—making a distinction among:

different levels of efficiency in the outcomes. The hypothetical ideal with observable efforts and Coasean bargaining between all principles and the agent would be the first-best. Respecting the information asymmetry but allowing all principals to get together and offer a combined incentive scheme would give the second-best. If the principals cannot be so united, their Nash equilibrium is[,] in general[,] a third-best. In these formal terms, the result above says that the third-best outcome that is achieved has very low-powered incentives. (Dixit, 1996)

Dixit accepts the analysis “that government bureaucracies often have low-powered incentives and are subjected to constraints on their behaviors.” Yet, he does not accept the “often claimed to be proof inefficiency of government.” In view of transaction-costs analysis and understanding of various institutions, would the lack of incentives and proliferation of constraints actually “be a reasonable way for the system to cope with the transaction costs”? The



mechanisms that have been developed to cope with transaction costs in a political system are driven by the same forces that drive various mechanisms in the firm. The particular mechanisms are different, but they are driven by the various transaction costs realized around the construct of the rules of the game. The public-sector's rules are not the same faced by commercial firms; thus, a comparison of the mechanisms is of little use. The better analysis is to look at the role played by transaction costs—as was done in the analysis of firms in various industries by Chandler (1977), Williamson (1975, 1985) and North (1999). Applying the resulting mechanisms of such analysis on firms in particular sectors and to other firms in other sectors is of little use. Just as these New Institutional economists have found differing mechanisms in each industry, so will we find such differences in the Defense Market(s). It is likely not just a market, but an interconnected set of markets that start inside the Pentagon among bureaucracies to Prime contractors and their sub-vendors. I propose it will be most useful to view the DoD's AT&L bureaucracy as a large conglomerate firm with numerous operating divisions that are not and should not be operated under a common set of prescriptive rules.

The analysis done by many looks at particular prescriptions that would fix specific narrow concerns with reported poor incentives, adverse constraints or inefficient mechanisms. Dixit notes that we must consider the outcome of any alternatives on the full spectrum of decision making in the government. “If the best outcome we would like to see violates the incentive constraints, then an attempt to implement it may in fact end up producing something even worse than the current situation, unsatisfactory though that may be.” When judging “the performance of a policymaking system, they should admit the legitimacy of noneconomic goals and ask if a feature of the outcome that appears *prima facie* inefficient is in fact a reasonable way of striking a balance between the various interest, or multiple principals, given the transaction constraints” (Dixit, 1996).

Another view is a polycentric political system which recognizes that “multiple authorities serve overlapping jurisdictions.” McGinnis agrees with Dixit in that the polycentric games view “demonstrates that actions that seem irrational in one context may be perfectly understandable once analysis incorporates that actor's strategic interactions with other actors” (McGinnis, 2000). This approach might seem far off the New Institutional or Public Choice approach, but Ostrom and Ostrom point out the similarities in Coase's firm employee and Tulluck's “economic man.” Coase indicated that efficiency, given the set of rules (contracts), can be enhanced, while Tulluck asserts the “economic man” distorts information and, thus, degrades efficiencies. The Ostroms point out that both Coase and Tulluck recognize the limits of the firm or bureaucratic organization. That traditional theory of public administration would not recognize the limit (McGinnis, 2000). But, we also need to look at this from the other side; can not the bureaucratic organization (if established appropriately) reduce costs as the firm does in the market? Buchanan and Tulluck discuss two type of costs: external and decision making. The costs that an individual expects to have as a result of decisions that deviate from preferences and impose costs upon individuals are external. The decision-making costs are the transactional costs, the expenditures of resources and the forgone opportunities in the decision-making process (McGinnis, 2000). These costs are affected by the rules about the rules—the constitutional framework. Expected costs would reach zero if all were required to agree, but then decision-making costs would greatly increase as managers attempted to reach the unanimous agreement. The calculus of the consent is when these two cost curves intersect. Different situations drive different costs and, thus, different rules. So, to determine if the military-industrial complex is efficient or not, one must understand that this production-type function is a political-cost function which balances the external costs with the decision costs. These costs might be optimized for a particular decision, but this is too narrow of a view. The overall efficiency of any

one part of the political system must envision the impacts on an overall political cost curve—not the individual political cost curves in any one section of the political system.

Buchanan and Tullock (1962) note:

if, for those activities that have been shifted to the public section, the costs-minimization decision-making rules have not been chosen, normative statements can be made about certain changes in organization. External costs imposed on individuals through the operation of the activity may be higher than they need be, and these costs can be reduced only by a change in the decision-making rules.

This view must be understood in a broad sense of the whole system and not taken in a narrow view of one or several institutions in the government; likewise, one should realize the related costs drive each system. For the military-industrial complex, a broader assessment needs to be completed to determine if the evolving decision systems really need a change in the decision-making rules to accomplish ever-increasing efficiency and effectiveness.

Our challenge is to embrace a more complete analysis utilizing New Institutional and Public Choice tools in a manner in which we can gain explanatory capability. We will not find a perfect invisible hand, nor will we likely be able to adjust policies to obtain one for the military-industrial complex. In over 40 years, many adjustments have been made to the weapons-acquisition process to solve noted issues, but many issues outlined by Peck and Scherer still exist and have not been solved through traditional approaches. We have likely found the easy alternatives and now must work on the tougher issues. These issues require a broader view so as to improve weapons acquisition while maintaining the overall federal government principles that protect the very freedoms the military is protecting. A New Institutional and Public Choice approach to assess the current mix of the invisible and visible hands at work in the military-industrial complex will provide insight into viable alternatives that should provide an overall increase in efficiency while maintaining our freedoms.

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Panel—Issues in Program Management

Wednesday, May 18, 2005	Requirements/Capabilities
10:15 a.m. – 11:45 a.m.	<p>Chair: Reuben Pitts, Program Executive Office, Integrated Warfare Systems Discussant: John Dillard, Naval Postgraduate School</p> <p>Papers:</p> <p><i>“Cost Performance Tradeoffs for the Army to Purchase One Type of Unmanned Aerial Vehicle to Support the Armor and Infantry Wartime Requirements”</i></p> <p>Major William Snodgrass, US Army, Naval Postgraduate School Captain (P) Glenn Jenkins, US Army, Naval Postgraduate School</p> <p><i>“Spiral Development”</i></p> <p>Aruna Apte, Naval Postgraduate School</p> <p><i>“The New Joint Capabilities Integration Development System (JCIDS) and Its Potential Impacts upon Defense Program Managers”</i></p> <p>David Matthews, Naval Postgraduate School</p>

Cost Performance Tradeoffs for the Army to Purchase One Type of Unmanned Aerial Vehicle to Support the Armor and Infantry Wartime Requirements

Presenter: Major William Snodgrass, USA

Presenter: Captain (P) Glenn Jenkins, USA

ABSTRACT: The goal of this MBA Project is to investigate potential dichotomies between doctrine and practice in the employment of the Raven Small Unmanned Aerial Vehicle (SUAV). The Army's current Small UAV requirements are based upon the Future Combat System's Operations Requirements Document and has not been validated at the platoon or company level. The Raven SUAV is a Commercial off-the-Shelf (COTS) item that swiftly became the Army's Small UAV of choice for operations in Afghanistan and Iraq. Doctrine and Techniques, Tactics, and Procedures (TTP) have been written for the Raven SUAV; however, this document is not standard practice for all units operating the system abroad. The last review of the SUAV operational requirements was conducted in 2003 and left a gap by not specifically addressing its usage on the battlefield. In an attempt to fill that gap, this project will focus on real-world usage of the Raven SUAV system and compare doctrine versus practice using the Department of Defense's (DOD) Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities (DOTML-PF) model as the primary logic construct.

The report begins by providing a thorough background of the Raven SUAV to include both its evolution from a COTS item to the Army's SUAV of choice and how it has impacted the warfighter. Next, the authors provide an overview of DOTML-PF in order to provide the basis from which the comparison of doctrine and practice will be conducted. The study then takes an in-depth look at doctrine and practice using DOTML-PF as the model for revealing potential dichotomies between the two. Finally, the authors will analyze these dichotomies and recommend solutions to help mitigate shortfalls and inconsistencies in actual Raven SUAV usage on the battlefield.



Spiral Development

Presenter: Aruna Apte, is a visiting lecturer in the department of Logistics, Graduate School of Business and Public Policy, at the Naval Postgraduate School. She received her Ph.D. in Operations Research from the School of Engineering at the Southern Methodist University in Dallas, Texas. At present, she is a lecturer at the Cox School of Business at SMU. She has successfully completed various research projects involving applications of mathematical models and optimization techniques. She has over twenty years of experience in teaching operations management, operations research, and mathematics courses at the undergraduate and graduate levels. Her research interests include application of mathematical models to real-world operational problems.

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EXECUTIVE SUMMARY: In the view of many, the Acquisition process for the Department of Defense is ripe for repair. Some of the signs illustrating this can be found in cost overruns, late deliveries, and unfulfilled expectations. These necessary adjustments could be due to reasons such as misunderstanding the ultimate need of warfighters and/or ever-changing budgets. Re-evaluation is especially needed in the acquisition of weapon systems and shipbuilding. A research study conducted by the researcher regarding the Phalanx Weapon System (CIWS) is the origin of this abstract.

In the past, the acquisition process predominantly used the block approach or preplanned product improvement (P3I) process to fulfill system requirements. Both these processes require the upfront knowledge of the end-product and any possible upgrades. Therefore, either the final capability took a long time to deliver, or the product had to be fielded before it was tested and ready. Frequently, during the long lead-times of development, production and testing, the end-users' needs changed. This change prompted alterations of strategy (formulated in response to the changing face of war) by Pentagon managers; these new strategies, then, invariably led to more upgrades or more modifications of systems under construction. The diversity and complexity of these intermittently overhauled systems resulted in lower operational availability. One example is the current status of the Phalanx weapon system; this system encompasses 158 ships, 308 mounts, and 6 different baselines. The different baselines for all these mounts necessitate increases in the complexity of logistics. The need for appropriate spare parts and expertise adds burden to inventory management—increasing lifecycle cost and reducing operational availability. A possible solution to this problem is a new, evolutionary approach: a process called Spiral Acquisition.

Spiral development is an integral part of an overall plan of evolutionary acquisition. Unlike P3I, spiral development is a flexible process that can be adjusted for the changing needs of warfighters and rapid innovations in technology. The evolutionary abilities are, unlike in the block approach, in incremental changes. A “spiral” is a set of acquisition activities that are incrementally incorporated in an evolving baseline. Each increment builds on the previous spiral, increases the capability of the product, and is completed at a rapid pace. This successive and recursive set-up helps program managers control the risk of developing a product that may not meet user specifications. Lessons learned from the previous spiral help managers reduce



the uncertainty of the outcome of the next spiral. Therefore, the flexibility of the process of spiral development allows managers to adapt system development to meet the evolving needs of the warfighters and keep pace with innovations in technology.

This research study focuses on the process, promise, and limitations of spiral acquisition/development. The researcher plans to describe the process using a simple model. This study is centered on the key issues that distinguish a spiral approach from the traditional approaches implemented by the DoD.

This study will describe the fundamentals of the process of spiral acquisition: 1) increments, 2) characteristics of the increments, and 3) the capabilities they deliver. The interest of this research lies in understanding the concept of spiral acquisition as it applies, specifically, to program managers. The researcher will create a simple model incorporating successive spirals with their respective capabilities and the corresponding projects that deliver them. A fully comprehensive decision model that describes the optimal policy of whether or not to employ spiral acquisition is beyond the scope of the current study. However, this research attempts to provide a template for that future model by expressing a set of rules that will help program managers articulate what it means to acquire a product or an upgrade using spiral processes. This study does not claim that spiral acquisition is appropriate for every acquisition.

A common consequence of a spiral approach may be an increase in the diversity of parts and, hence, logistics complexity. Therefore, an ambitious extension of this research would be to explore the role of modularity in spiral acquisition. The purpose of the latter part of this study, particularly, is to understand if combining modular product designs will help the DoD reduce logistics complexity and life-cycle cost for systems such as CIWS and LCS. The hypothesis is that modularity may bring in rapid sequential innovations to the warfront—thereby avoiding both an obsolescence of technology and an increase in logistic complexity.

This research, as the topic it studies, is a work in progress. Analysis so far suggests two key issues: 1) The necessity for a template or a set of rules that will aid program managers in standardizing the eluding concept of spiral development, and 2) The role of modularity in spiral development. This research plans to address these issues and provide a possible road map.



The New Joint Capabilities Integration Development System (JCIDS) and Its Potential Impacts upon Defense Program Managers

Presenter: David Matthews, Senior Lecturer, Graduate School of Business & Public Policy and Colonel, U.S. Army (Ret.) earned a BA in 1966 and an MA in 1974. COL Matthews is a graduate of the U.S. Army Command and General Staff College, the U.S. Army War College, and the Defense Systems Management College. An Ordnance Corps logistician for the first two decades of his career, he served successively in the office of the Deputy Chief of Staff for Logistics, HQ, Department of the Army; Chief of the Logistics Division, Multiple Launch Rocket System Project Management Office; Commander of the U.S. Army logistics and materiel acquisition organization assisting in the modernization of the Royal Saudi Land Forces; and finally, as Project Manager, Army Tactical Missile System from 1990-1994. During the latter assignment, he was selected to receive the *Secretary of the Army's 1991 Project Manager of the Year Award*. In June 2003, and again in December 2004, he was selected to receive the *Meyer Award for Teaching Excellence in Systems Engineering*. He has served for the past eleven years as a Senior Lecturer at the Naval Postgraduate School teaching Project Management, Acquisition Logistics, and Defense Systems Acquisition.

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EXECUTIVE SUMMARY: The June 2003 release of the radically-revised CJCSI 3170.01C and CJCSM 3170.01 promulgating the new Joint Capabilities Integration Development System (JCIDS) literally turned the legacy Service-initiated Requirements Generation System (RGS) upside down. The decades-old “threat-driven,” “bottom-up” development process for warfare-materiel requirements was summarily replaced by a “transformational,” “capabilities-driven,” “top-down” process. The author provides an analysis, from a Program Manager’s (PM) perspective, of the potential impacts of these changes upon the acquisition community in four distinct areas: Continuity with Service legacy requirements generation expertise, PM management challenges when other PMs are responsible for supplying critical subsystems and components that will enable satisfaction of Key Performance Parameters, Total Ownership Cost implications of deploying multiple, low-density materiel configurations, and potential disconnections between Presidential Budget Requests and Congressional enactment.

First, there has been a “revolution” in the requirements generation process that needs to avoid “throwing out the baby with the bathwater.” Legacy knowledge and experience needs to be carefully considered when formulating requirements in the JCIDS process. The JCS and Service staffs need to quickly act to take the necessary policy and bureaucratic steps to ensure JCIDS entities have institutionalized access to the legacy corporate memories and records of both the former Service RGS staffs and records on a real-time, or at least near real-time, basis. This would insure all of the potential impacts and previously-learned lessons would be reviewed and considered in the formulation of all new JCIDS requirements documents.

Second, there is the issue of developmental PM dependence upon other PMs, over whom they have little or no control, for on-time delivery of crucial subsystems and components



in order to meet their Key Performance Parameters (KPPs). A new mandatory entry should be established in the quarterly Defense Acquisition Executive Summary (DAES) report. This entry would identify and provide the status of a system in regard to other PM-managed systems that the reporting PM was depending upon to achieve his/her KPPs; it would also include the status of any subsystems or components the reporting PM was managing which were critical to some other PMs' ability to meet his/her KPP requirements. Since the DAES report is reviewed and commented upon by the reporting PM's PEO, Service Acquisition Executive (SAE), and subsequently, the Defense Acquisition Executive (DAE), this mandatory communicative entry would ensure immediate visibility was given to any projected schedule and/or funding shortfalls in time to have them addressed (at whatever level necessary) to effect their timely resolution.

Third, since it is clear that the new evolutionary materiel requirements and development system has enormous potential for increasing the operation and support-cost components of Total Ownership Cost (TOC), the reduction of them needs to be addressed during the early steps in the new system's engineering process. The potential for deploying multiple, low-density materiel configurations would seem to dictate that the Services should be directed to formulate both a comprehensive Logistics Support Strategy and a Master Configuration Management Plan, as well as a Cost as an Independent Variable (CAIV) analysis for each JCIDS requirements document. These plans could then be crafted to produce the lowest practical Total Ownership Cost (TOC) for the full lifecycle of the developmental system.

Finally, it is apparent that significant potential exists for the congress to "disconnect" carefully-balanced DoD JCIDS materiel program Research, Development, Test, and Evaluation (RDT&E) and Production budget requests during the enactment process. Therefore, the DoD should clearly highlight, in its portion of the President's Budget, those RDT&E and Procurement programs that have critical interdependencies and which should be funded as a "package" to ensure that those programs can stay on their approved Acquisition Program Baselines (APB).

Key Words: Project Management, Program Management, JCIDS, Requirements Generation

The full report can be found on the Acquisition Research Program website at the link <http://www.nps.navy.mil/gsbpp/ACQN/publications/FY04/PM-04-017.pdf>



Panel—Market-Based Acquisition

Wednesday, May 18, 2005	Market Based Government Cases
1:00 p.m. – 2:30 p.m.	<p>Chair: Steve Kelman, John F. Kennedy School of Government</p> <p>Discussant: David Drabkin, General Services Administration</p> <p>Papers:</p> <p><i>"Market-based Government: The Results to Date"</i> Jacques S. Gansler, University of Maryland</p> <p><i>"Developing Systems in a Changing Environment: An Army Example"</i></p> <p><i>"Public-Private Partnership Improves Aircraft Readiness"</i></p> <p><i>"Privatizing the Naval Surface Warfare Center Depot at Louisville"</i> William Lucyshyn, University of Maryland</p>

Chair: Steve Kelman—Albert J. Weatherhead III and Richard W. Weatherhead Professor of Public Management, John F. Kennedy School of Government, Harvard University. From 1993-1997, he was the Administrator of the Office of Federal Procurement Policy at the U.S. Office of Management and Budget, where he was a leading figure in reinventing government efforts. He is a Fellow of the National Academy of Public Administration and serves on the Editorial Board of the *Journal of Public Administration Research and Theory*. He is the author of *Procurement and Public Management: The Fear of Discretion and the Quality of Government Performance* and of *Making Public Policy: A Hopeful View of American Government*. His earlier books include *Regulating America*, *Regulating Sweden: A Comparative Study of Occupational Safety and Health Policies*, *What Price Incentives?: Economists and the Environment*, and *Push Comes to Shove: The Escalation of Student Protest*. Kelman's research on public-sector operations management focuses on organizational design and change.

Discussant: David Drabkin—the Deputy Associate Administrator for Acquisition Policy and Senior Procurement Executive, General Services Administration. He is a member of the bar of the Commonwealths of Pennsylvania and Virginia and a member of the Council of Fellows and Board of Advisors of the National Contract Management Association. David was formerly the Deputy Program Manager, Pentagon Renovation Program.

David has also served as the Assistant Deputy Under Secretary of Defense (Acquisition Process and Policies), Office of the Deputy Under Secretary of Defense (Acquisition Reform) (ODUSD(AR)) and Director, Regulatory Reform and Implementation, ODUSD(AR), where he served as the Project Manager for FASA Implementation.

David is a native of Mount Vernon, New York. He is married to the former Jane Anne Saperstein of Bridgeville, Pennsylvania. Jane and David have 2 children, Aaron and Sarah. David is a Distinguished Military Graduate of Washington and Jefferson College and a graduate of the Cumberland School of Law. He chaired NCMA's Board of Advisors for two years. He serves as Co-Chairman of the Acquisition Reform subcommittee and served as the Vice Chairman of two other committees of the American Bar Association, Government Procurement and Alternative Dispute Resolution. He also chaired an inter-agency group working under the auspices of the Administrative Conference of the United States on the implementation of Alternative Dispute Resolution within the federal government.



Since graduating from law school, David served as: Deputy District Counsel and the Associate Counsel (Contract Law), the Defense Contract Management District West (DCMDW), Defense Logistics Agency (DLA); Associate General Counsel (Procurement) and the Alternative Dispute Resolution Specialist, Office of the General Counsel, DLA; Chief Counsel, Defense Contract Management Region - New York; Chief, Administrative and Civil Law Division, Headquarters (HQ), USASETAF and 5th TAACOM, Vicenza, Italy; Administrative Law Officer, HQ, V Corps, Frankfurt, Germany; Hearing Officer, Virginia Alcoholic Beverage Control Commission, Richmond, Virginia; and, the Chief, Military Justice, USASC and Ft. Gordon, Ft. Gordon, GA.

David received numerous awards recognizing his performance. Most recently he was honored for a second time as one of the Top 100 Federal IT Executives. He was also recognized by AFFIRM's Leadership Award in Acquisition & Procurement and as one of the Top 100 Federal IT Executives in 2002. He is also the recipient of: DoD Meritorious Civilian Service Award; DoD Exceptional Civilian Service Award; Office of the Secretary of Defense Award for Excellence; Defense Logistics Agency Meritorious Civilian Service Award; Department of the Army Meritorious Civilian Service Award; Department of the Army Superior Service Award; Department of the Army Commander's Award; and, CINCUSAREUR Award. David received of the Vice President Heroes of Reinvention (Hammer) Award.

David has authored several articles and manuals on contract, international and labor law and Alternative Disputes Resolution. David also served as an adjunct faculty member at Florida Institute of Technology and a visiting lecturer at the Defense Systems Management College where he taught Contract and Intellectual Property Law.



Market-based Government: The Results to Date

Presenter: The Honorable Jacques S. Gansler, former Under Secretary of Defense for Acquisition, Technology, and Logistics, is the University of Maryland's Vice President for Research and the Roger C. Lipitz Chair in Public Policy and Private Enterprise. As the third-ranking civilian at the Pentagon from 1997 to 2001, Professor Gansler was responsible for all research and development, acquisition reform, logistics, advance technology, environmental security, defense industry, and numerous other security programs. Before joining the Clinton Administration, Dr. Gansler held a variety of positions in government and the private sector, including Deputy Assistant Secretary of Defense (Materiel Acquisition), assistant director of defense research and engineering (electronics), executive vice president at TASC, vice president of ITT, and engineering and management positions with Singer and Raytheon Corporations. Throughout his career, Dr. Gansler has written, published, and taught on subjects related to his work. He is a Member of the National Academy of Engineering and a Fellow of the National Academy of Public Administration. Additionally, he is the Glenn L. Martin Institute Fellow of Engineering at the A. James Clarke School of Engineering, an Affiliate Faculty member at the Robert H. Smith School of Business and a Senior Fellow at the James MacGregor Burns Academy of Leadership (all three at the University of Maryland). During 2003–2004, he served as Interim Dean of the School of Public Policy at that institution.

The federal government spends an incredible amount of money on the purchase of goods and services. In 2003, that spending was \$230 billion, or 2% of the United States' GDP. Although it has always been the stated policy of the United States Government not to produce commercial goods or services that are available on the open market, in practice, the government often duplicates functions the private sector can provide.

The government's FY 2000 Inventory of Commercial Activities identified over 800,000 government employees who were performing commercial activities. OMB circular A-76 defines a commercial activity, "as a recurring service that could be performed by the private sector and is resourced, performed, and controlled by the agency through performance by government personnel, a contract, or a fee-for-service agreement."

To address this duplication, there is a significant change taking place in government management (federal, state, and local) from the government as the historic "provider" of public services, to the government as the "manager of the providers" of services to the public. The goal of market-based sourcing is not necessarily to move all those functions into the private sector, but to shift from an environment where government is the monopolistic provider to one that encourages competition—thereby increasing both effectiveness and efficiency.

When properly implemented, this change results in significant benefits: improved performance as well as lower costs. These benefits accrue regardless of whether the winner is the public- or private-sector supplier.

While the empirical data demonstrates the benefits of this shift, it is still not widely understood or accepted. Six concerns are generally raised:

- performance will deteriorate;
- costs will be higher;
- promised saving will not be realized over time;
- small businesses will be negatively impacted;
- large numbers of government employees will be involuntarily separated;
- and the government will lose control.

This presentation will present data to refute all six of these concerns, and will conclude with specific recommendation to increase the use of "market-based government."



Developing Systems in a Changing Environment: An Army Example

Presenter: **William Lucyshyn**, is the Director of Research and a Senior Research Scholar at the Center for Public Policy and Private Enterprise in the School of Public Affairs at the University of Maryland. Previously, Mr. Lucyshyn served as a program manager and the principal technical advisor to the Director, Defense Advanced Research Projects Agency (DARPA), on the identification, selection, research, development, and prototype production of advanced technology projects. Prior to this appointment, Mr. Lucyshyn completed a 25-year career in the US Air Force serving in various operations, staff, and acquisition positions. Mr. Lucyshyn received his Bachelor Degree in Engineering Science from the City University of New York and his Master's Degree in Nuclear Engineering from the Air Force Institute of Technology.

The first Gulf War revealed fundamental weaknesses in the Army's vast and complex logistics network. These flaws led to a lack of timeliness and inefficiency in delivering supplies, repair parts, and equipment to the units that needed them. Recognizing the need to adopt the best practices of private-sector supply-chain management, the Department of Defense (DoD) and Army leaders began strategic planning efforts directed toward logistics reform. Principal targets for reform were the Army's 30-year-old logistics information-management systems.

In August of 1997, the Army's Communications and Electronics Command (CECOM) at Fort Monmouth, NJ—the organization responsible for these antiquated systems—received direction, “to explore alternatives to modernize the wholesale logistics processes and associated information technology.” During the following two years, a dedicated LMP team accomplished detailed analysis, planning, and coordination culminating in the award of a performance-based contract that outsourced Army logistics functions to a private firm: Computer Sciences Corporation (CSC).

The management team has faced many significant management challenges that include: intense Congressional scrutiny, strong opposition from the government employee union, the necessity of working with many different stakeholders, technical challenges, and changing requirements. LMP provides an excellent case for exploring the various issues involved with public-sector strategic-planning efforts in general, and with outsourcing and performance-based contracting in particular.



Public-Private Partnership Improves Aircraft Readiness

Presenter: **William Lucyshyn**, is the Director of Research and a Senior Research Scholar at the Center for Public Policy and Private Enterprise in the School of Public Affairs at the University of Maryland. Previously, Mr. Lucyshyn served as a program manager and the principal technical advisor to the Director, Defense Advanced Research Projects Agency (DARPA), on the identification, selection, research, development, and prototype production of advanced technology projects. Prior to this appointment, Mr. Lucyshyn completed a 25-year career in the US Air Force serving in various operations, staff, and acquisition positions. Mr. Lucyshyn received his Bachelor Degree in Engineering Science from the City University of New York and his Master's Degree in Nuclear Engineering from the Air Force Institute of Technology.

The mission of the Cherry Point Naval Air Depot is to provide maintenance, engineering and logistics support for a wide variety of Navy and Marine aircraft. One of the depot's primary tasks is the maintenance, overhaul, and testing of aircraft engines. Depot engineers and logistics personnel are also responsible for a wide range of logistics management, research, and engineering issues.

In the mid-1990s, the Navy became concerned with increasing costs of managing and distributing reparable Auxiliary Power Units (APUs), as well as with the units' decreasing reliability. After considering several concepts, the Navy began to explore an innovative approach: using a public-private partnership. In the spring of 2001, the Navy signed a contract with Honeywell Corporation (and subcontractor Caterpillar Logistics) to manage its APU inventory of more than 1,000 units, with repair work to be handled by its depot at Cherry Point, North Carolina. Caterpillar Logistics, a sub-contractor to Honeywell and a third partner in the venture, was selected to handle delivery of parts and storage of completed APUs until they were needed.

The contract was signed in June 2000, and the resultant partnership has made dramatic improvements in reliability and reduction in the Mean Number of Flight Hours between Unscheduled Removal (MFHBUR). Since the government did not maintain a good cost baseline, the program savings are more difficult to quantify.



Privatizing the Naval Surface Warfare Center Depot at Louisville

Presenter: William Lucyshyn, is the Director of Research and a Senior Research Scholar at the Center for Public Policy and Private Enterprise in the School of Public Affairs at the University of Maryland. Previously, Mr. Lucyshyn served as a program manager and the principal technical advisor to the Director, Defense Advanced Research Projects Agency (DARPA), on the identification, selection, research, development, and prototype production of advanced technology projects. Prior to this appointment, Mr. Lucyshyn completed a 25-year career in the US Air Force serving in various operations, staff, and acquisition positions. Mr. Lucyshyn received his Bachelor Degree in Engineering Science from the City University of New York and his Master's Degree in Nuclear Engineering from the Air Force Institute of Technology.

During the 1995 Base Realignment and Closure (BRAC) process, the Department of Defense (DoD) recommended that the Louisville depot be closed and its workloads transferred to several DoD facilities. The depot's principal mission was to overhaul and repair the Navy's multi-platform 5-inch gun and its Phalanx close-in anti-aircraft system. The plan was to transfer the gun repair work to the Norfolk Naval Shipyard, Virginia, the Phalanx to the Naval Surface Warfare Center, Crane, Indiana, and the engineering support functions to the Naval Surface Warfare Center, Port Hueneme, California.

During the BRAC review process, the city of Louisville proposed to the Commission that the DoD privatize the depot workload in-place. The Commission found that the Navy's cost savings from the closure were overstated, that the gun systems engineering functions at Louisville are consistent with operational requirements, and that the maintenance and overhaul functions performed at the facility have contributed substantially to the effectiveness of the Department of the Navy.

As a result of the Commission's findings, the Navy decided to privatize-in-place the Louisville depot's operations, with some Navy program-management positions remaining at the privatized facility. The field-engineering support function would also be retained as a detachment at the privatized Louisville depot.

In July 1996, the Navy awarded contracts to two private corporations to work in conjunction with the depot: Hughes (now Raytheon) for the Phalanx system and United Defense for the gun-repair workload. Both contractors have made significant gains in productivity while bringing in additional work to the depot. This case will examine the results of this reconfiguration, nine years after the privatization.



Panel—Issues in Program Management

Wednesday, May 18, 2005	Organizational and Business Process Reengineering Issues
1:00 p.m. – 2:30 p.m.	Chair: Mark Nissen, Naval Postgraduate School Papers: <i>"An Extension and Test of the Communication-Flow Optimization Model"</i> Ned F. Kock, Texas A&M International University <i>"Determining the Best Loci of Knowledge, Responsibilities and Decision Rights in Major Acquisition Organizations"</i> John Dillard, Naval Postgraduate School Mark Nissen, Naval Postgraduate School <i>"From Market to Clan: How Organizational Control Affects Trust in Defense Acquisition"</i> Roxanne Zolin, Naval Postgraduate School John Dillard, Naval Postgraduate School

Chair: Mark Nissen—Associate Professor of Information Systems and Management at the Naval Postgraduate School. His research focuses on knowledge dynamics. He views work, technology and organizations as an integrated design problem and has concentrated recently on the phenomenology of knowledge flows. Mark's publications span information systems, project management, organization studies, knowledge management and related fields. In 2000, he received the Menneken Faculty Award for Excellence in Scientific Research, the top research award available to faculty at the Naval Postgraduate School. In 2001, he received a prestigious Young Investigator Grant Award from the Office of Naval Research for work on knowledge-flow theory. In 2002, he spent his sabbatical year at Stanford integrating knowledge-flow theory into agent-based tools for computational modeling. Before his information systems doctoral work at the University of Southern California, he acquired over a dozen years' management experience in the aerospace and electronics industries.

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An Extension and Test of the Communication-Flow Optimization Model

Presenter: **Ned Kock**, is Associate Professor and Chair of the Department of MIS and Decision Science at Texas A&M International University. The National Science Foundation and the Department of Defense (the latter through its External Acquisition Research Program) have funded his research. He holds degrees in electronics engineering (BEE), computer science (MSc), and management information systems (PhD). Ned has authored several books and published in a number of journals including: *Communications of the ACM*, *Decision Support Systems*, *IEEE Transactions on Education*, *IEEE Transactions on Engineering Management*, *IEEE Transactions on Professional Communication*, *Information & Management*, *Information Systems Journal*, *Information Technology & People*, *Journal of Organizational Computing and Electronic Commerce*, *Journal of Systems and Information Technology*, *MIS Quarterly*, and *Organization Science*. He is the Editor-in-Chief of the *International Journal of e-Collaboration*, Associate Editor of the *Journal of Systems and Information Technology*, and Associate Editor for Information Systems of the journal *IEEE Transactions on Professional Communication*. His research interests include action research, ethical and legal issues in technology research and management, e-collaboration, and business process improvement.

ABSTRACT

This paper reports on a quasi-experimental action research study aimed at extending and testing the communication-flow optimization model, which was developed as a result of a prior grant from the DoD's External Acquisition Research Program. The test is aimed at demonstrating the generality of the model, which is argued to apply to non-defense as well as defense-related organizations. In the study, business process redesign groups in four different US organizations (not defense-related) used two different types of business process representation. The study suggests that, contrary to assumptions likely underlying most of the current business process redesign practice, communication flow-oriented representations of business processes are perceived by those involved in their redesign as significantly more accurate, more useful in the identification of opportunities for process improvement, more useful in the application of process redesign guidelines, more useful in the visualization of process changes, and more useful in the development of generic IT solutions to implement new business processes, than activity flow-oriented representations. The results are consistent with those obtained in similar empirical studies of business process redesign projects involving DoD branches and contractors.

KEYWORDS: Quasi-experimental Action Research, Data Triangulation, Contrast Analysis, Nonparametric Techniques, Process Redesign, Organizational Communication, Electronic Communication

INTRODUCTION

Business process redesign (or, simply, process redesign) approaches have become very popular in organizational circles, particularly since the emergence of the business process reengineering movement in the early 1990s (Hammer, 1996; Hunt, 1996; Reijers et al., 2003). The key assumption underlying the development and use of process redesign approaches is that processes can be understood and modified in such a way as to increase both their efficiency and the quality of their outcomes. In such approaches, processes are seen as the basic units of value-added work in organizations.



In spite of being touted as a new and revolutionary idea, it can be argued that process redesign has a long history, dating back to Taylor's (1911) scientific management movement. The scientific management method was concerned primarily with the improvement of manufacturing processes. It provided an approach through which managers could redesign processes in order to minimize times and motions in them, and subsequently encourage workers to follow the new process designs by means of financial incentives. The approach has worked particularly well in processes that involved the handling of heavy materials, and whose executors were largely uneducated and unskilled workers. In that context, the value of Taylor's (1911) scientific management method is undeniable, making it one of the most enduring and successful organizational development methods ever devised.

The time gap between the emergence of the scientific management method and the emergence of the business process reengineering movement is almost 100 years, and many new organizational development approaches have emerged in the interval. Notably, there was the humanist movement, which shifted the focus of organizational development from "processes" to "people," pioneered by Elton Mayo in the early and mid-1900s (Mayo, 1945), and extended by others such as McGregor, Maslow, and Herzberg (Clutterbuck & Crainer, 1990; Herzberg et al., 1959; Maslow, 1954). There was also the total quality management movement, which reverted to a focus on processes but with an emphasis on process quality rather than productivity, pioneered by Deming, Ishikawa, and Juran (Bergner, 1991; Deming, 1986; Ishikawa, 1986; Juran, 1989; Chapman, 1991; Walton, 1989; 1991).

In spite of the time gap mentioned above, many have argued that reengineering is, in fact, a modernized version of the scientific management method (Earl, 1994; Waring, 1991). When one looks at the original reengineering ideas, and the process redesign approaches that followed, it seems that this argument is generally correct. This seems to be true particularly in connection with operational versions of process redesign (Hammer & Stanton, 1995; Hunt, 1996), which, unlike their more strategic counterparts (Caron et al., 1994; Clemons et al., 1995), place singular emphasis on the modeling and redesign of the inner workings of relatively narrow processes spanning one or few areas of an organization.

Perhaps the similarity between today's process redesign practices and those propounded by the scientific management method has extended to one aspect that, this paper argues, has negative implications for the contemporary practice of process redesign. That aspect is the focus of much of today's process redesign approaches on what seems to be a focus on times-and-motions elements associated with workflows, which is reflected in an emphasis on modeling and understanding processes primarily as chronological sequences of interrelated activities (Kock & McQueen, 1996). It is argued in this paper that such focus, although appropriate for materials-handling processes, is problematic when the targets of process redesign efforts are information-intensive processes. It is also argued in this paper that most processes found in organizations today are information-intensive, and that there is a trend toward information-intensive processes significantly outnumbering materials-handling processes in organizations in general—a trend that is likely to grow in the future.

The main goal of this paper is to compare a communication flow-oriented approach to process redesign (which is arguably well aligned with the information-intensive nature of most modern processes) with an activity flow-oriented approach which reflects much of the current practice in connection with business-process redesign. The comparison is guided by a set of hypotheses which builds on a modern theoretical model of business process redesign, namely the communication-flow optimization model (Kock, 2003; Kock & Murphy, 2001). Based on that comparison, this paper argues that there must be a shift in the emphasis of current process

redesign efforts, from an emphasis on activity flows to an emphasis on the webs of communication interactions that compose most of today's information-intensive processes.

The above shift is particularly important in the redesign of defense acquisition processes. Among the key reasons for this are the large sums involved in defense acquisition, and the knowledge- and information-intensive nature of those processes. In the case of the US Department of Defense and its contractors, the most widely adopted methodology for process redesign is still an activity flow-oriented methodology called IDEF0 (Ang & Gay, 1993; Dean et al., 1995; Kock & Murphy, 2001).

RESEARCH BACKGROUND

Business process redesign has been a fertile area of research, particularly in the last 10 years. Many important research issues have been addressed, and many relevant research questions have been successfully answered. Harmful misconceptions regarding process redesign have been exposed (Davenport & Stoddard, 1994), and the role of information technology as an enabler of new redesigned processes has been identified and explained (Venkatraman, 1994). Key preconditions of process redesign success have been identified (Bashein & Markus, 1994; Clemons et al., 1995; Teng et al., 1998), and related change management techniques have been studied and validated (Kettinger & Grover, 1995; Stoddard & Jarvenpaa, 1995). New methods and automated tools for process redesign have been proposed (Kock, 1999; Nissen, 1998), and successful approaches for implementation of new process designs have been identified (Grover et al., 1995).

In spite of the progress above, some areas of research in connection with process redesign have received relatively little attention. One such area is that of process representation approaches and their impact on process redesign projects (Katzenstein & Lerch, 2000). This area arguably needs its share of research attention since the way processes are looked at is likely to strongly influence the way they are redesigned. This, in turn, should significantly influence the success of process redesign (Biggs, 2000; Hammer & Champy, 1993; Katzenstein & Lerch, 2000). For example, if a contract-preparation process (arguably an information-intensive process) is represented primarily as a web of communication interactions, it is more likely that problems in connection with communication inefficiencies will be identified (e.g., unnecessary forms that are being filled out and exchanged, which may be contributing to a process bottleneck) than if the process is represented primarily as a chronological sequence of activities. While a focus on activity flows is likely to lead to changes in how activities are conducted, particularly in the sequencing of activities (which is an important consideration in materials handling and assembly line processes), a focus on communication interactions is likely to lead to changes in how information flows within a process (Davenport, 1993; Kock, 1999).

A focus on activity flows makes particularly good sense when the processes being redesigned involve the handling of tangible items (such as raw materials and machine parts) and when tangible items substantially outnumber communication interactions in the processes (Kock, 2003). The problem is that, today, very few processes fit that description. The vast majority of processes, even in manufacturing organizations, have substantially more communication interactions than materials flow interactions (Kock & McQueen, 1996). Also, in certain types of non-manufacturing processes, such as processes whose final outcomes are services or information products, it has been shown that an activity-flow focus leads to overly complex and convoluted process representations, and to several related problems in connection with process redesign (Kock, 1999).



In spite of the above, and perhaps due to the fact that most wealth creation in the last 100 years has relied heavily on manufacturing processes, most existing process redesign approaches focus on activity flows, and largely ignore the webs of communication interactions that make up a large component of modern processes (Archer & Bowker, 1995; Kock & McQueen, 1996; Kock, 2003). For example, the US Department of Defense and its contractors, which, combined, possibly form the largest group of employers in the US, have adopted an activity flow-oriented methodology called IDEF0 as their official methodology for process redesign (Ang & Gay, 1993; Dean et al., 1995; Kock & Murphy, 2001).

One widely used approach to process redesign has been proposed by Harrington (1991; see also Harrington et al., 1998), which not only takes a strong activity-flow orientation but also goes as far as stating that: “As a rule [communication flow diagrams] are of more interest to computer programmers and automated systems analysts than to managers and employees charting business activities” (p. 108). This opinion is obviously at odds with the information-intensive orientation that processes have taken since the late 1970s (Galbraith, 1977), and which has arguably reached high levels since the advent of the Internet in the late 1980s and early 1990s (Kock, 1999). Yet, interestingly, Harrington’s (1991) assertion is well aligned with reengineering pioneers Hammer and Champy’s (1993) view of process redesign, which permeates much of today’s practice in organizational settings.

What about systems analysis and design methods? Are not they information-flow oriented? Yes, they are, but those methods (see, e.g., Davis, 1983; Dennis & Wixom, 2000) have traditionally been designed for process modeling and automation, and have rarely been successfully used as a basis for process redesign efforts (Harrington, 1991; Harrington et al., 1998; Kock & McQueen, 1996). There are some reasons for that. For example, systems analysis and design rules for the generation of business process models using data flow diagrams prevent the representation of certain inefficiencies associated with the flow of information in processes, such as a communication interaction between, say, a forklift operator and an inventory manager (represented as “terminators” in the diagrams) that does not use a data repository (e.g., an inbox) to intermediate the interaction. More generally, no two terminators can be represented as communicating with each other without a data repository intermediating the interaction in data flow diagrams (Dennis & Wixom, 2000). The reason why those rules are followed is that they are consistent with the notion, subscribed to by most systems analysis and design practitioners, that the main goal of systems analysis and design is to understand and subsequently automate business processes with the help of information technologies. Although some progress has been made in recent years, as systems analysis and design methodologists incorporate a process-redesign orientation into their approaches, such process redesign-unfriendly rules exist in both structured systems analysis and design methods, as well as in the more recently devised object-oriented systems analysis and design methods (Booch et al., 1998). In contrast with systems analysis and design, the focus of process redesign has traditionally been to understand and change (sometimes significantly) organizational processes, and then implement the new process designs through the use of information technologies (Davenport, 1993; Davenport, 2000; Hammer, 2000; Hammer & Stanton, 1997).

The picture painted above can be summarized as follows. While activity-flow approaches to business process redesign have been by far the most widely adopted, they do not seem to match the information-intensive nature of modern business processes. There have been attempts to understand that picture from a theoretical perspective, and to propose solutions to the many problems associated with it (Keen, 1997; Kock, 2003; Kock & Murphy, 2001; Ould, 1995). One such attempt led to the development of the communication-flow optimization model



(Kock, 2003; Kock & Murphy, 2001). The model, which serves as the theoretical anchor of this paper, is summarized in the next section.

THE COMMUNICATION-FLOW OPTIMIZATION MODEL

The communication-flow optimization model (Kock, 2003; Kock & Murphy, 2001) is concerned with how process redesign practitioners look at organizational processes, and how that perspective affects the efficiency and success of process redesign projects. The model was initially developed based on actual process redesign projects conducted over a period of six years (Kock, 2002), and was later validated through several projects conducted with defense contractors (Kock, 2003). The study described here is one further test of the model, and should be seen as an incremental contribution to the refinement of the model.

Several different lenses can be used to look at and understand organizational processes. Notably, processes can be looked at as sequences of interrelated activities, or as webs of communication interactions (Kock, 1999). One of the core arguments of the communication-flow optimization model is that the webs of communication interactions in a process determine, in a particularly strong way, the quality and productivity of a process. The model argues that much of the variation in the quality and productivity of processes can be explained by the communication-flow structure of those processes, and that a relatively small amount of that variation can be explained through other types of configurations, including activity-flow configurations of the process.

Another key argument made by the communication-flow optimization model, which may seem paradoxical given the above discussion, has been proposed to explain a finding that emerged from the original studies that led to the model. That finding was that, unlike members of traditional systems analysis and design projects (Davis, 1983; Dennis & Wixom, 2000), process redesign project members rarely favored the use of communication-flow representations of processes over activity-flow representations early on in their projects. Moreover, those members consistently perceived communication-flow representations of processes to be more difficult to generate and “less natural” representations of processes than activity-flow representations. The key argument put forth to explain those findings was that activity-flow representations are better aligned with the way in which the human brain has been designed to envision action than communication-flow representations (Kock, 2003). According to the model, the latter representations (communication-flow representations) are subconsciously seen as substantially more abstract, complex, and unnatural than the former.

Nevertheless, since the communication-flow structure of processes is likely to account for a substantial amount of variation in the processes’ quality and productivity, the communication-flow optimization model predicts that process redesign team members will favor communication-flow representations at the redesign stage of their projects. That is, the model predicts that process redesign team members will favor activity-flow representations early on in their projects, when the goal is primarily to analyze the process or processes that are being targeted for redesign. Later, at the redesign stage, though, when process redesign team members try to modify a process or processes with the goal of improving their quality and productivity, the model predicts that those team members will favor communication-flow representations, if any are available. Of course, in many cases those communication-flow representations will not be available, because the initial emphasis would likely have been on activity-flow representations.



Let us assume that a manager of a health insurance underwriting department is asked to come up with a diagrammatic representation of the work performed by the department, which, given the nature of those types of processes, can safely be assumed to be substantially information-intensive. According to the communication-flow optimization model, the manager would most likely draw the different activities conducted by the department, and then connect those activities in a diagram in such a way as to indicate their chronological sequence of execution. While variations could occur, rarely, the model argues, would the manager build the diagram around the communication interactions (e.g., the flow of forms, memos etc.) involved in the underwriting of health insurance. The reason for that, according to the communication-flow optimization model, is that the manager would subconsciously think of activity-flow representations of processes as more natural than communication-flow representations.

In the example above, let us now assume that the manager was asked to propose modifications in the work performed by the health insurance underwriting department, and that he was presented with two different process representations of that work—one depicting the process as a sequence of interrelated activities, and the other as a web of communication interactions. In this instance, the communication-flow optimization model argues that the manager would favor the latter representation in his or her redesign of the process. The reason for that, according to the model, is that most process-related inefficiencies are likely to be caused by underlying communication-flow problems. Moreover, in the implementation of the redesigned process using IT, the model argues that communication-flow representations provide a better visualization tool than activity-flow representations, since there is a clear correspondence between the key elements of communication-flow representations (e.g., data stores) and the key elements of the IT systems used to implement new processes (e.g., databases).

As far as process redesign projects are concerned, the communication-flow optimization model argues that most people will tend to put emphasis on activity flows early on in their process redesign projects, and keep that emphasis throughout their projects, especially if they do not follow a process redesign methodology that somehow “forces” a focus on communication flows. This, in turn, will more often than not lead to sub-optimal process redesign results. That is, the model argues that a somewhat forced focus on communication flows will likely lead to better process redesign results than a natural focus on activity flows.

It is important to note that the communication-flow optimization model is a relatively narrow type of theoretical model, particularly regarding two main aspects. First, the model is concerned with operational-level process redesign projects, which differ substantially from strategic-level projects. In operational-level process redesign projects (see, e.g., Harrington et al., 1998), the main focus is the quality and/or productivity improvement of local processes, which are usually housed in one single department or cut across a few related departments or areas (e.g., warehousing and distribution). Projects involving strategic-level process redesign (see, e.g., Hammer & Champy, 1993), on the other hand, are usually aimed at reengineering broad processes, often processes that cut across an entire company. Second, the model is concerned with process redesign projects in which human beings produce representations of the processes and, based on those representations, come up with new process designs. That is, the model does not address nor dismiss the usefulness of process redesign techniques based on operations research, linear programming, and other traditional assembly-line and factory design techniques that can often be largely automated and that rely to a very little extent on subjective human judgment.

HYPOTHESES

This action research study tested a set of hypotheses derived from the communication-flow optimization model within the context provided by four group-based process redesign projects facilitated in four different organizations. The researcher provided methodological facilitation to the groups. To foster a multiple-perspective view of the target processes, as well as to avoid facilitation-induced bias, the researcher encouraged process-redesign groups to generate both activity-flow as well as communication-flow representations of their target processes, and to consider both types of representations when redesigning the target processes.

The communication-flow optimization model argues that one of the key reasons why individuals prefer activity-flow representations of processes is because those types of representations are better aligned with the way human beings envision “action.” As such, it is reasonable to expect activity-flow representations to be seen, when compared with communication-flow representations, as easier to generate and understand, as well as more accurate and complete representations of processes. These predictions are embodied in hypotheses **H1** to **H4** below.

***H1:** Process redesign group members will perceive communication-flow representations of business processes as more difficult to generate than activity-flow representations.*

***H2:** Process redesign group members will perceive communication-flow representations of business processes as more difficult to understand than activity-flow representations.*

***H3:** Process redesign group members will perceive communication-flow representations of business processes as less accurate than activity-flow representations.*

***H4:** Process redesign group members will perceive communication-flow representations of business processes as less complete than activity-flow representations.*

It is important to test hypotheses **H1** to **H4** to assess the communication-flow optimization model’s claim (Kock & Murphy, 2001) that process redesign group members rarely think of processes in terms of communication interactions at the outset of their process redesign efforts, rather thinking of processes in terms of chronological sequences of interrelated activities, or activity flows, because the latter are better cognitively aligned with the way human beings think of “action.” This claim provides an explanation for what seems to be a generalized preference for activity flow-based process-redesign approaches today (Katzenstein & Lerch, 2000; Kock, 1999) and is, thus, central to the communication-flow optimization model.

Nevertheless, the model also predicts that a communication-flow focus is generally more effective than an activity-flow focus in the context of process redesign projects. In this study, where both communication- and activity-flow representations are used, this would arguably translate into a “change of mind” after the beginning of a process redesign project, reflected in favorable perceptions toward, as well as preferences for, communication-flow representations, as the project moves from process analysis to process redesign. According to the model, this should be particularly noticeable in the redesign phase, where process redesign group members propose changes to a process they already selected and analyzed in some detail. Underlying this predicted preference for communication-flow representations is the heavy role



that information technologies are likely to play on process redesign implementations, and the consequent need to address the flow of communication in the processes targeted for redesign (Kock, 1999). This leads us to hypotheses **H5** to **H8** below.

***H5:** Process-redesign group members will perceive communication-flow representations of business processes as more useful in the identification of opportunities for improvement than activity-flow representations.*

***H6:** Process redesign group members will perceive communication-flow representations of business processes as more useful in the application of process redesign guidelines than activity-flow representations.*

***H7:** Process redesign group members will perceive communication-flow representations of business processes as more useful in the visualization of process changes than activity-flow representations.*

***H8:** Process redesign group members will perceive communication-flow representations of business processes as more useful in the development of generic information technology solutions than activity-flow representations.*

Hypotheses **H5** to **H8** assume that, when employing communication-flow and activity-flow representations during a process-redesign project, the perception of process redesign group members about each type of representation will reflect a rational intention to achieve the best results possible. This can be seen as a reasonable assumption in connection with the group-based projects investigated here because those were real (as opposed to simulated) projects involving individuals who knew they were responsible for the outcomes of their projects, whether those outcomes were “good” or “bad.”

RESEARCH METHOD

Action research: The roots of organizational action research are in studies of social and work life issues (Fox, 1990; Lewin, 1946; Trist et al., 1970). Organizational action research is often uniquely identified by its dual goal of both improving the organization (or organizations) participating in the research study, and at the same time generating knowledge (Elden & Chisholm, 1993; Lau, 1997). A growing body of literature exists on the use of action research in organizational studies in general, as well as in the more specific context of information systems research (Avison et al., 1999; Baskerville, 1997; 1999; Baskerville & Wood-Harper, 1996; 1998; Myers, 1997; Olesen & Myers, 1999), where research on process redesign has flourished since the early 1990s. Due to space limitations, this literature is not reviewed here. The reader is referred to Lau (1997) for a seminal review of action research within the field of information systems research. Peters and Robinson (1984), as well as Elden and Chisholm (1993), provide more general and discipline-independent reviews of action research. For the purposes of this investigation, it suffices to highlight the fact that, in organizational-action research, the action researcher is expected to apply positive intervention on the organization (Jonsson, 1991), which is often realized by the researcher providing some form of service to the organization and its members.

By providing a service to a client organization, the action researcher aims to foster a sense of collaboration with his or her subjects, which characterizes most action research



projects. This sense of collaboration is believed to promote free information exchange and a general commitment, from the researcher as well as the subjects, toward both research quality and organizational development (Argyris & Schon, 1991; Avison et al., 1999; Fox, 1990). One of the key reasons for the emergence and relative success of action research has been the recognition that the behavior of an organization, group, or individual, can be more deeply understood if the researcher collaborates with the subject or subjects being studied. In the case of an organization, this can be achieved when the researcher facilitates improvement-oriented change in the organization, which was the case in the investigation described in this paper.

QUASI-EXPERIMENTAL ACTION RESEARCH

More often than not, action research is used as an approach to collect and analyze qualitative data. Nevertheless, one of action research's pioneers, namely Kurt Lewin, set a precedent for the use of action research in predominantly quantitative studies, in what later became known as the "classical" variety of action research (Elden & Chisholm, 1993). Lewin often saw action research studies as quasi-experiments, with one key characteristic that set those studies apart from traditional field experiments. That characteristic is that the intervention applied by the researcher is aimed at solving a practical problem, rather than generating an experimental control group. This perspective is adopted here, where action research is employed in a quasi-experimental fashion.

The researcher provided process redesign training and facilitation to the members of four process redesign groups involving consultants, employees and management from four different organizations based in the US. The facilitation was solely methodological (e.g., no specific process redesign suggestions were offered), and also "methodologically neutral" so as not to bias the perceptions of the subjects about the redesign approaches used. The process redesign groups conducted their work independently from each other.

THE GROUPS STUDIED AND THEIR STAGES

The research literature suggests successful process-redesign projects are usually conducted by cross-departmental groups that are typically small in size (usually less than 15 members) and that have a short lifetime (from a few days to typically no more than a few months) during which its members define, analyze, and search for alternatives to improve one or a few organizational processes (Caron et al., 1994; Choi, 1995; Choi & Liker, 1995; Hammer & Stanton, 1995). The process-redesign groups studied here presented these same general characteristics. They lasted approximately 3 months each, had a "core" membership of 3 to 5 members (assigned nearly full-time to the process-redesign projects), and had a "peripheral" membership of 5 to 10 members (which involved external advisors, consultants, and administrative support personnel assigned on a part-time basis to the process-redesign projects). All of the groups were cross-departmental (i.e., they involved members from more than one department) and targeted cross-departmental processes (i.e., processes that involved more than one department in their execution). The term "departments" is used here to refer to organizational units that aggregate employees with expertise in related organizational functions, e.g., marketing department, computer support department, and quality control department.

According to the research and business literature, process-redesign groups usually conduct their activities along three main conceptual stages: *definition*, *analysis*, and *redesign* (Davenport, 1993; Davenport & Short, 1990; Dennis et al., 1999; Hammer & Champy, 1993; Hammer & Stanton, 1997; Harrington, 1991; Harrington et al., 1998; Kock, 2001). In the definition stage, the process-redesign group selects a process for redesign. In the analysis



stage, the group studies the process in detail. Finally, in the redesign stage, the group proposes process-design modifications. These stages are followed by the implementation of the modifications. The process-redesign groups studied followed this general structure.

In the analysis stage, each process-redesign group developed both activity-flow and communication-flow representations of their target processes. Activity-flow representations followed the general format proposed by Harrington et al. (1998) for functional timeline flowcharts. While both types of representations contained different types of information, they generally embodied the same “amount” of information (i.e., neither was substantially more “information-rich” than the other). Communication-flow representations were adaptations of data-flow diagrams (Davis, 1983; Dennis & Wixom, 2000), and were generated following the modified format proposed by the researcher (Kock, 1999).

In the redesign stage, each process-redesign group independently proposed several major process changes. Those changes were proposed without interference from the researcher. A list of generic process-redesign guidelines, previously compiled by the researcher (Kock, 1999) based on a survey of the literature on process redesign, were provided to the groups to guide their work. To avoid biasing group-member perceptions in favor of activity- or communication-flow representations, the guidelines were chosen so that: (a) three of the guidelines were more meaningful in the context of activity-flow than communication-flow representations; (b) three of the guidelines were more meaningful in the context of communication-flow than activity-flow representations, and (c) two of the guidelines could be applied in both contexts.

Both activity-flow and communication-flow representations of the new processes, with major changes incorporated into them, were then generated. Following this, each process-redesign group developed a “generic” information technology “solution” to implement the new process. These generic information-technology solutions were essentially product-independent computer-based infrastructure and system specifications, and were illustrated through rich pictorial representations (Checkland, 1981; Checkland & Scholes, 1990; Kock, 1999; Kock & Murphy, 2001). The pictorial representations contained icons representing computers, databases and organizational functions responsible for executing individual activities of the new process.

The above stages were followed by the implementation of the recommended process changes, in most cases leading to changes in process-related procedures, reallocation of human and material resources, and use of new information-technology solutions. Implementations took from four months to eight months. Process performance reviews were conducted approximately six months after the implementation of those changes. Those reviews were based primarily on unstructured interviews with managers and employees and aimed at assessing the bottom-line business impact of the process-redesign projects. All four process-redesign groups studied were generally successful in their projects, as the process changes recommended by them met the following success criteria—they were implemented fully or partially and led to positive observable results. These success criteria are consistent with those proposed in the process-redesign literature (Burke & Peppard, 1995; Davenport, 1993; Hammer & Champy, 1993).

DATA COLLECTION AND ANALYSIS

Three main types of research data were collected and compiled in connection with the process-redesign groups: survey-instrument answers (Drew & Hardman, 1985; Sekaran, 1984),



participant observation notes (Creswell, 1994; 1998; Sommer & Sommer, 1991), and unstructured interview notes (Patton, 1980; 1987). *Survey-instrument answers* were obtained through a survey administered to the “core” members of each process-redesign group (3 to 5 members) at the end of the work of each process-redesign group. In total, 17 sets of answers were obtained based on a questionnaire. *Participant observation notes* were generated based on direct observation of process-redesign group members as well as other employees who were not directly involved in process-redesign groups yet observed or were affected by the work of the groups. *Unstructured interview notes* were obtained through interviews conducted with the “core” members of each process-redesign group, as well as with other employees who were not directly involved in process-redesign groups, yet interacted with group members or were directly affected by the work of the groups. Over forty unstructured interviews were conducted in total.

The data analysis in connection with the hypotheses was focused on the search for “patterns.” The identification of patterns in the survey-instrument answers, which were obtained on a Likert-type scale, was conducted using paired-samples *t* tests (Green et al., 1997; Rosenthal & Rosnow, 1991) comparing the means for answers in connection with communication-flow and activity-flow representations. Patterns in participant observation and unstructured interview notes were identified either based on the observation that they occurred in the majority of the cases (Kock et al., 1997; Miles & Huberman, 1994), or, when the sample size for the unit of analysis under consideration permitted, based on the result of a Chi-square goodness-of-fit test comparing the observed distribution with the expected (or chance) distribution (Siegel & Castellan, 1998).

In order to increase the robustness of the data analysis, the three sources of research data—survey-instrument answers, participant observation notes, and unstructured interview notes—were extensively triangulated (Jick, 1979; Maxwell, 1996; Yin, 1994). As recommended by Maxwell (1996) and Sommer and Sommer (1991), the data set was thoroughly examined for patterns of evidence in support of and against each of the hypotheses, and all the evidence obtained was carefully summarized, compared and double-checked for inconsistencies.

RESULTS

As previously mentioned, unstructured interviews with managers and employees suggested that all of the four process-redesign groups studied were generally successful in their projects. The process changes recommended by them were implemented fully or partially and led to positive observable results, thus meeting general success criteria proposed in the process redesign literature (Burke & Peppard, 1995; Davenport, 1993; Hammer & Champy, 1993).

In this section, hypotheses-relevant results are grouped in three main categories, namely *survey-instrument answers*, *participant observation notes*, and *unstructured interview notes*. Later in the section, the several hypotheses-relevant results, both in support of and against the hypotheses, are summarized in a single table and compared against each other.

SURVEY-INSTRUMENT ANSWERS

Table 1 summarizes the results of a paired-samples *t* test applied on the survey instrument answers. In it, the “core” members of each process-redesign group (3 to 5 members) answered several questions on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The leftmost column of Table 1 lists 8 constructs associated with business-process representations: *ease of generation* (EASYGEN), *ease of understanding* (EASYUND), *accuracy* (ACCUR), *completeness* (COMPLET), *usefulness in the identification of opportunities*

for improvement (OPPORTU), usefulness in the application of process redesign guidelines (APPLIC), usefulness in the visualization of process changes (VISUAL), and usefulness in the development of generic IT solutions (ITSOLUT). The measures for these constructs (one indicator per construct) reflect the constructs identified by Kock (1999) and Kock and Murphy (2001) based on grounded-theory research investigations (Glaser & Strauss, 1967; Strauss & Corbin, 1990; 1998).

	Mean - C	Std. deviation	Mean - A	Std. deviation	<i>t</i>	<i>p</i> (2-tailed)
EASYGEN	2.82	1.29	3.06	1.30	-0.61	0.55
EASYUND	4.18	1.07	3.82	0.81	0.92	0.37
ACCUR	4.18	0.88	3.12	1.50	2.20	< .05
COMPLET	3.35	1.37	2.59	1.23	2.02	0.06
OPPORTU	4.59	0.51	3.76	1.25	2.38	< .05
APPLIC	4.71	0.47	3.82	1.13	2.76	< .05
VISUAL	4.65	0.49	3.47	1.18	3.64	< .01
ITSOLUT	4.24	1.20	3.06	1.30	3.05	< .01

Table 1. Descriptive Statistics and Paired-samples *t* Test Results

(Quantitative data obtained from structured interview transcripts; range: 1 – 5;
Means: C = communication flow; A = activity flow)

Column “Mean – C” in Table 1 shows the means for answers referring to communication-flow representations; column “Mean – A” refers to activity-flow representations. On the right-hand sides of each of these columns are columns showing the standard deviations for each measure. The column “*t*” shows the *t* statistic for each pair of measures. Finally, the column “*p* (2-tailed)” shows the significance level for each *t* statistic based on a 2-tailed test.

The patterns of evidence listed below have been derived from Table 1. They are referred to by “SIA” (survey instrument answers) codes that are later used for data triangulation. The patterns of evidence SIA.H1₀, SIA.H2₀, SIA.H3₀ and SIA.H4₀ do not support hypotheses H1, H2, H3 and H4; that is, they provide support for the null hypotheses H1₀, H2₀, H3₀ and H4₀, respectively. The patterns of evidence SIA.H5, SIA.H6, SIA.H7 and SIA.H8 provide support for the hypotheses H5, H6, H7 and H8, respectively.

SIA.H1₀. On average, group members perceived communication-flow representations as more difficult to generate than activity-flow representations (see EASYGEN row in Table 1). The results of the paired samples *t* test ($t(15)=-.61$, $p=.55$) comparing perceptions for each representation were not statistically significant.

SIA.H2₀. On average, group members perceived communication-flow representations as easier to understand than activity-flow representations (see EASYUND row in Table 1). The

results of the paired samples *t* test ($t(15)=-.92$, $p=.37$) comparing perceptions for each representation were not statistically significant.

SIA.H3₀. On average, group members perceived communication-flow representations as more accurate than activity-flow representations (see ACCUR row in Table 1). The results of the paired samples *t* test ($t(15)=2.2$, $p<.05$) comparing perceptions for each representation were statistically significant.

SIA.H4₀. On average, group members perceived communication-flow representations as more complete than activity-flow representations (see COMPLET row in Table 1). The results of the paired samples *t* test ($t(15)=2.02$, $p=.06$) comparing perceptions for each representation were not statistically significant.

SIA.H5. On average, group members perceived communication-flow representations as more useful in the identification of opportunities for improvement than activity-flow representations (see OPPORTU row in Table 1). The results of the paired samples *t* test ($t(15)=2.38$, $p<.05$) comparing perceptions for each representation were statistically significant.

SIA.H6. On average, group members perceived communication-flow representations as more useful in the application of process redesign guidelines than activity-flow representations (see APLLIC row in Table 1). The results of the paired samples *t* test ($t(15)=2.76$, $p<.05$) comparing perceptions for each representation were statistically significant.

SIA.H7. On average, group members perceived communication-flow representations as more useful in the in the visualization of process changes than activity-flow representations (see VISUAL row in Table 1). The results of the paired samples *t* test ($t(15)=3.64$, $p<.01$) comparing perceptions for each representation were statistically significant.

SIA.H8. On average, group members perceived communication-flow representations as more useful in the development of generic information technology solutions than activity-flow representations (see ITSOLUT row in Table 1). The results of the paired samples *t* test ($t(15)=3.05$, $p<.01$) comparing perceptions for each representation were statistically significant.

PARTICIPANT OBSERVATION NOTES

The patterns of evidence listed below have been derived from the participant observation notes generated based on direct observation of process-redesign groups at work. They are referred to by “PON” (participant observation notes) codes that are later used for data triangulation. The patterns of evidence PON.H1, PON.H6 and PON.H8 provide support for the hypotheses H1, H6, and H8, respectively. These were the only patterns of evidence obtained from the analysis of participant observation notes that were relevant for testing the hypotheses—i.e., other patterns of evidence that emerged from the analysis (but that were unrelated to the hypotheses) are not listed below because they are not relevant for the study reported in this paper.

PON.H1. All groups generated activity-flow representations of their targeted processes before they generated communication-flow representations. This is seen as supporting hypothesis H1 based on the assumption that process redesign groups would generate first the process representation that they perceived as the least difficult to generate.



PON.H6. Of all the 37 process-redesign decisions made by the four groups as a whole, 23 process-redesign decisions (62.16%) were entirely based on communication-flow representations of their target processes. The other 14 process-redesign decisions were distributed as follows: 4 (10.81%) were entirely based on activity-flow representations of their target processes, and 10 (27.03%) were based on both types of representations. This is seen as supporting H6 because a Chi-square goodness-of-fit test of the distribution of process redesign decisions ($\chi^2(2, N=37)=15.3, p<.001$) suggests a statistically significant preference for the use of communication-flow representations when applying process-redesign guidelines.

PON.H8. All groups developed “generic” information technology “solutions” and respective rich pictorial representations entirely based on communication-flow representations of their target processes. This is seen as supporting hypothesis H8 based on the assumption that process-redesign groups would developed their “generic” information technology “solutions” and rich pictorial representations based on the process representation that they perceived as the most useful for those tasks.

UNSTRUCTURED INTERVIEW NOTES

The patterns of evidence listed below have been derived from the notes generated during unstructured interviews. They are referred to by “UIN” (unstructured interview notes) codes that are later used for data triangulation. The patterns of evidence UIN.H1₀, UIN.H2₀, UIN.H3₀, UIN.H4₀ and UIN.H5₀ do not support hypotheses H1, H2, H3, H4 and H5; that is, they provide support for the null hypotheses H1₀, H2₀, H3₀, H4₀ and H5₀ respectively. The patterns of evidence UIN.H6, UIN.H7 and UIN.H8 provide support for the hypotheses H6, H7 and H8, respectively.

UIN.H1₀. There was no clear majority perception as to whether communication-flow representations were easier or more difficult to generate than activity-flow representations.

UIN.H2₀. There was no clear majority perception as to whether communication-flow representations were easier or more difficult to understand than activity-flow representations.

UIN.H3₀. Most group members perceived communication-flow representations as more accurate than activity-flow representations. They generally explained their perception by pointing out that communication-flow representations provided more accurate depictions of the elements that seemed to flow the most in their processes, which they often referred to as “data” or “information.” The following quote illustrates this: *“For certain processes, both the workflow and data-flow representations are accurate. However, they are not accurate for all processes. Our project consisted of movement of both work and data [...] the work flow diagram depicts the movement of material within different functions [...]. They were depicted clearly and in the proper order with correct time frame by the functional time line. Our project also consisted of a variety of data movement[s] like writing the request mutually agreed specification, SOP, and generating the final report [...]. The [communication-] flow diagram by far more accurately depicted these data movement[s] than the functional time line.”*

UIN.H4₀. There was no clear majority perception as to whether communication-flow representations were more or less complete than activity-flow representations.

UIN.H5. Most group members perceived communication-flow representations as more useful in the identification of opportunities for improvement than activity-flow representations. They generally explained their perception by pointing out that communication-flow

representations had not “caged” them into thinking in an “artificially sequential” manner, which was necessary for the redesign of the flow of “data” or “information” within a process. The following quote provides an illustration of this perception: *“The [activity-flow] diagram does not visibly show any wasted effort [...] because the [communication-flow diagram] does not show actual tasks[;] it allows one to be more creative than being limited by a particular sequence. In the [communication-flow diagram] sequences aren’t greatly represented [...] so you do not get in the mindset of following a specific sequence. We can see what is needed, where to get information from, and it’s up to us to define the sequence later.”*

UIN.H6. Most group members perceived communication-flow representations as more useful in the application of process redesign guidelines than activity-flow representations. They generally explained their perception by pointing out that communication-flow representations were better visual aids in the identification of problems in connection with the flow of “data” or “information,” which were more frequently observed, and where process-redesign guidelines could be easily applied. This is illustrated by the following quote: *“The workflow representation shows a chronological view. Thus, it is easier to conceptualize the process at first. This will give a quick picture in order to understand the process [...] [However,] by utilizing the [communication-] flow [representation], it was [easier] to see the excessive data flowing between the customer and the employees of ACD.”*

UIN.H7. Most group members perceived communication-flow representations as more useful in the in the visualization of process changes than activity-flow representations. They generally explained their perception in the same way as they explained their perception that communication-flow representations were more useful in the application of process-redesign guidelines, as the following quote suggests: *“It is easier to visualize the process changes using the data-flow representations than the workflow representations. With the data flow, you see that different data stores are receiving data from the same functional unit and sending data to the same or different functions. Based upon the data flow representation, it is easy to determine that all of the data stores are not needed.”*

UIN.H8. Most group members perceived communication-flow representations as more useful in the development of generic information technology solutions than activity-flow representations. They generally explained their perception by pointing out that, since the generic information-technology solution automated the flow of communication within a process, the communication-flow representation was particularly suited for its development. The following quote illustrates this: *“[Communication-flow representations give] a much better guideline for development of generic IT solutions than workflow representations. In our case, we used the new [communication-flow representation] and easily converted it to a generic IT solution. We had three main data stores. The first one was used for interaction between customer and ACD employees (in creation of RFS, MAS, SOP). This was easily changed to an asynchronous Web-based communication that was connected to a database management system. The second data store was used by the product technician for performing the test. This was replaced by the Automation system. The last data store stored manual results of lab which was replaced by the Lab Information Management System. This also provided the data needed for the Vice President to finalize the report for the customer and adhere to the ISO 9002 standard.”*

SUMMARY OF EVIDENCE IN SUPPORT AND AGAINST THE HYPOTHESES

Table 2 summarizes evidence in connection with the hypotheses, showing individual patterns of evidence in support of and against the hypotheses. Evidenced against the hypotheses H1, H2... is defined as evidence in support of the respective null hypotheses H1₀, H2₀...



	Survey instrument answers	Participant observation notes	Unstructured interview notes
H1		PON.H1	
H1 ₀	SIA.H1 ₀		UIN.H1 ₀
H2			
H2 ₀	SIA.H3 ₀		UIN.H3 ₀
H3			
H3 ₀	SIA.H2 ₀		UIN.H2 ₀
H4			
H4 ₀	SIA.H4 ₀		UIN.H4 ₀
H5	SIA.H5		UIN.H5
H5 ₀			
H6	SIA.H6	PON.H6	UIN.H6
H6 ₀			
H7	SIA.H7		UIN.H7
H7 ₀			
H8	SIA.H8	PON.H8	UIN.H8
H8 ₀			

Table 2. Individual Patterns of Evidence in Support of and against the Hypotheses

(Evidence against H1, H2... = Evidence in support of the null hypotheses H1₀, H2₀...)

The evidence presented in Table 2 is grouped based on its source and indicated by specific acronyms that indicate the source of each piece of evidence—survey instrument answers (SIA), participant observation notes (PON), and unstructured interview notes (UIN). Empty cells indicate that a thorough search revealed the absence of patterns of evidence from a particular source in connection with the respective hypotheses.

DISCUSSION

The patterns of evidence summarized in the previous section provide weak support for hypothesis H1, no support for hypotheses H2, H3 and H4, and general support for hypotheses H5, H6, H7 and H8. This is summarized in Table 3 for convenience. Since the hypotheses were developed based on the communication-flow optimization model, it can be concluded that the

patterns of evidence also provide moderate support for the model, reinforcing some elements the model but not others.

Hypothesis	Assessment
H1: Process-redesign group members will perceive communication-flow representations of business processes as more difficult to generate than activity-flow representations.	Weak support
H2: Process-redesign group members will perceive communication-flow representations of business processes as more difficult to understand than activity-flow representations.	Not supported
H3: Process-redesign group members will perceive communication-flow representations of business processes as less accurate than activity-flow representations.	Not supported
H4: Process-redesign group members will perceive communication flow representations of business processes as less complete than activity flow representations.	Not supported
H5: Process-redesign group members will perceive communication-flow representations of business processes as more useful in the identification of opportunities for improvement than activity-flow representations.	Supported
H6: Process-redesign group members will perceive communication-flow representations of business processes as more useful in the application of process redesign guidelines than activity-flow representations.	Supported
H7: Process-redesign group members will perceive communication-flow representations of business processes as more useful in the visualization of process changes than activity-flow representations.	Supported
H8: Process-redesign group members will perceive communication-flow representations of business processes as more useful in the development of generic information technology solutions than activity-flow representations.	Supported

Table 3. Assessment of the Hypotheses

Inconsistent with the model's predictions, process-redesign group members did not seem to perceive communication-flow representations of processes as less accurate, more difficult to understand, and less complete than activity-flow representations. In fact, evidence from both survey-instrument answers (SIA.H2₀) and unstructured interview notes (UIN.H2₀) suggest that communication-flow representations were perceived as significantly more accurate than activity-flow representations.

Also inconsistently with the model's predictions, process-redesign group members did not seem to perceive communication-flow representations of processes as more difficult to generate than activity-flow representations. Nevertheless, all groups spontaneously generated activity-flow representations of their targeted processes before they generated communication-flow representations (PON.H1).

The above findings put into question the communication-flow optimization model's assertion that activity-flow representations are better aligned with the way humans are cognitively programmed to envision "action" in the physical sense, and its claim that such cognitive alignment is one of the reasons why activity-flow representations and related process-redesign guidelines are so widely used today.

On the other hand, consistent with the communication-flow optimization model's predictions, process-redesign group members perceived communication-flow representations of business processes as more useful than activity-flow representations in the following aspects: identification of opportunities for improvement, application of process-redesign guidelines, visualization of process changes, and development of generic information-technology solutions (SIA.H5, SIA.H6, SIA.H7, SIA.H8, UIN.H5, UIN.H6, UIN.H7, UIN.H8). Also consistent with the communication-flow optimization model's predictions, the distribution of process-redesign decisions suggested a statistically significant preference for the use of communication-flow representations when applying process-redesign guidelines (PON.H6), and all groups developed "generic" information-technology "solutions" and respective rich pictorial representations entirely based on communication-flow representations of their target processes (PON.H8).

The above findings support the communication-flow optimization model's predictions that process redesign group members will prefer communication-flow representations particularly as the project moves from process analysis to process redesign, arguably due to the heavy role that information technologies are likely to play on process-redesign implementations, and the consequent need to address the flow of communication in the processes targeted for redesign.

It is clear that much more research is needed to further test and refine the communication-flow optimization model. Notably, this study suggests that the widespread use of activity-flow representations may be more due to current habits reinforced by consulting companies and management gurus, as argued by Kock and McQueen (1996), than to a cognitive predisposition toward those types of representations, as argued by the communication-flow optimization model. This issue is addressed below in our discussion of implications for future research and practice.

CONCLUSION

This study builds on the communication-flow optimization model and compares two key types of business process representations in the context of actual process-redesign projects. Empirical evidence collected and analyzed through a quasi-experimental action research project suggests that perceived accuracy is approximately 34% higher in communication-flow representations of processes in contrast to activity-flow representations. That empirical evidence also suggests that perceived usefulness in the identification of opportunities for improvement is about 22% higher in communication-flow representations; perceived usefulness in the application of process redesign guidelines is about 23% higher; perceived usefulness in the visualization of process changes is about 34% higher; and perceived usefulness in the



development of generic IT solutions is about 38% higher in communication-flow representations in contrast to activity-flow representations.

While the above findings are consistent with the communication-flow optimization model and provide general support for the model, some other findings were not. Contrary to what is predicted based on the model, process-redesign group members did not perceive communication-flow representations as more difficult to generate than activity-flow representations, nor did they perceive communication-flow representations to be less accurate, more difficult to understand, or less complete than activity-flow representations. Interestingly, these findings suggest that communication-flow representations may be even more desirable than predicted by the model, since some of the disadvantages associated with them do not seem to be as significant as initially predicted.

As previously mentioned, the above findings may be seen as putting into question the model's claim that activity-flow representations are better aligned with the way humans are cognitively programmed to envision "action" in the physical sense than communication-flow representations. However, another explanation could be invoked—one that would not require substantial revisions of the key underlying assumptions of the model. That explanation is that even though activity-flow representations are indeed seen as more natural than their activity-oriented counterparts, the information-intensive nature of most processes today (Drucker, 1993; Kock & McQueen, 1996; Kock et al., 1997; Kock & Murphy, 2001) forces individuals into adapting their way of thinking about processes—toward thinking of processes as webs of communication interactions—and thus counterbalances that naturalness effect. This explanation is consistent with the perception by process-redesign group members in this study that communication-flow representations are approximately 8% more difficult to generate than activity-flow representations. Such difference, while statistically insignificant given the sample size, has a noteworthy effect size of about .31. One possible way in which this alternative explanation can be tested is by assessing whether workers involved in less information-intensive processes perceive communication-flow representations to be more difficult to generate than activity-flow representations to a larger extent than workers in more information-intensive processes. That is, in the test of the alternative explanation, information-intensiveness in the processes targeted for redesign would have to be measured and tested for moderating effects on other variables.

This study suggests one key area of future research in connection with the communication-flow optimization model the investigation of the impact of using either communication-flow or activity-flow representations in process redesign projects, but not both (as in this study). This would provide the basis on which researchers could more clearly assess the advantages and disadvantages of one type of representation over and against the other, as this research design would be less likely to be influenced by interaction effects in connection with repeated-measures research designs (Drew & Hardman, 1985; Rosenthal & Rosnow, 1991) such as the one employed in this study. It seems, from the findings of this study, that communication-flow representations may provide a complete and advantageous alternative to activity-flow representations.

Another area of future research relates to the development, refinement and investigation (based on the findings of this study) of methods and techniques that are related to but go beyond the scope of business process redesign. One area in which this line of inquiry may be fruitful is systems analysis and design (Dennis & Wixom, 2000), as there have been research studies in that past (see, e.g., Chuang & Yadav, 2000) suggesting that some new and increasingly popular systems-analysis and design methods and techniques may suffer from the



same problems associated with methods and techniques used in process redesign that rely too heavily on activity-flow representations (and too lightly on communication-flow representations).

One example of the above situation is the recent success of object-oriented programming, which has led to the emergence and increasing use of object-oriented methods and techniques for systems analysis and design. In spite of much industry support, the scope of use of object-oriented methods and techniques in systems analysis and design is still not very significant when compared with that of object-oriented methods and techniques in programming. Chuang & Yadav (2000) argue that this is due to object-oriented analysis' excessive activity orientation, which they addressed by developing and validating, with positive conceptual results, a new methodology that applies modified object-oriented methods and techniques to the solution of systems analysis and design problems. This new methodology shifts the emphasis away from activities, as defined in this paper, and onto how communication takes place in processes.

This research has key implications for managers involved in operational-level process-redesign projects. One key implication is that those managers should carefully analyze the focus of their projects, especially when the goal is to obtain quality and productivity improvements through the redesign of individual processes. While a focus on activities and their flow may be advocated by proponents of popular activity flow-based methods such as large consulting companies and recognized management "gurus" such as Hammer (1996) and Harrington et al. (1998), this study suggests that such focus is likely to contribute to less-than-optimal outcomes. Managers should strongly consider moving away from that focus and toward a focus on communication flows and process redesign-related techniques. This is particularly important in broad projects that target primarily service processes, where the flow of materials is minimal, such as the recent organization-wide initiatives by large corporations and government branches to improve acquisition practices (Graves, 2001). In projects of such breadth and magnitude, even single-digit success rate increases can lead to savings in the range of millions of dollars.

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Determining the Best Loci of Knowledge, Responsibilities and Decision Rights in Major Acquisition Organizations

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ABSTRACT

The DoD is a large, bureaucratic, rule-intensive organization that may not be suited well for its environment. Building upon prior research of acquisition centralization and knowledge dynamics, we employ computational methods to assess the behavior and performance of different organizational designs in varying environments. Our results reinforce Contingency Theory and suggest particular characteristics of different acquisition environments make one organizational form relatively more or less appropriate than another. Practically, answers to our research questions have direct and immediate application to acquisition leaders and policy makers. Theoretically, we generalize to broad classes of organizations and prescribe a novel set of organizational design guides.

INTRODUCTION

Acquisition is big business. The US Department of Defense (DoD) alone executes routinely eleven-figure budgets for research, development, procurement and support of weapon systems, for instance. Acquisition is also a rule-intensive business. In addition to myriad laws governing federal acquisition in the US, a plethora of regulations specify—in great detail often—how to accomplish the planning, review, execution and oversight of Government acquisition programs, large and small, sole-source and competitive, military and commercial (Dillard, 2003). Due in great part to the large size and many rules associated with Defense acquisition in particular, the organizations responsible for DoD acquisition activities tend to be large and rule-intensive themselves, reflecting the kinds of centralized, formalized, specialized and oversight-intensive forms corresponding to the classic Machine Bureaucracy from Organization Theory (e.g., see Mintzberg, 1979). The problem is this classic organizational structure is known well to be exceptionally poor at responding to change. In the context of military transformation, such a problem should be clear and compelling. Arguably, one or more, superior, organizational approaches must be available to replace the current acquisition organization. But which, if any, is most appropriate? On what basis should acquisition leaders and policy makers choose between such competing organizational forms? What evidence supports claims of superiority for one organizational approach versus another? Questions such as these are difficult to answer through most research methods employed today to study acquisition organizations (e.g., case study, survey, action).

The bureaucratic nature of the DoD Acquisition Organization did not emerge recently, nor did it materialize by design. Rather, it reflects the cumulative accretion of laws, regulations, rules and hierarchical levels over considerable time. If only the organization could be changed and evaluated—say through assessment of four alternate organizational structures—then one could assess the relative performance of the new organizational designs versus the current form and recommend transformation toward the best performer. But, clearly the set of problems and actors in the changed organizations would differ from those associated with the original and with one another; that is, there is no way to impose controls over such a study (e.g., internal validity is compromised). This is one reason why so many acquisition research projects produce so little new knowledge. Alternatively, such controls can be imposed easily through laboratory experimentation. Yet, the simplified nature and laboratory context of experiments fail to capture the size, scope and complexity of the acquisition organization (e.g., external validity is compromised). This is another reason why so many acquisition research projects produce so little new knowledge. However, by combining the best features of laboratory experimentation (e.g., experimental controls) with field methods (e.g., large-scale and complex behaviors), one can design and conduct a study of acquisition organizations that reflects both internal and external validity.



This is the approach of computational experimentation: using sophisticated and validated computer models of organizations to assess the behavior and performance of different organizational designs. Computational Organization Theory (COT; see Carley & Prietula, 1994) provides a set of methods and tools to enable this approach. In particular, using the methods and tools associated with the Virtual Design Team (VDT) Research Group at Stanford, computational models of organizations are driven by well-accepted organization theory and are validated by extensive and repeated field studies. This validation provides considerable confidence that computational results reflect the likely behaviors and performance of the acquisition organizations they model and emulate.

The research described in this article involves the application of VDT methods and tools to study acquisition organizations. In particular, we model and simulate the behavior of organizations associated with major defense acquisition programs in the DoD. We provide both answers to and insights into how such organizations can be changed to improve performance. Some of the key organizational design variables of interest pertain to the bureaucratic nature of the organization and follow from recent research to investigate centralization (Dillard, 2003). For instance, factors such as *centralization*, *formalization*, *specialization*, *hierarchical layers* and the like can be manipulated—individually as well as in combination—under controlled and replicated conditions to assess the performance of acquisition organizations in different forms. This follows recent, complementary research using computational organization theory in the domain of military command and control (Nissen & Buettner, 2004; Nissen, 2005a, b). Considerations such as the number, frequency and level of acquisition reviews, adaptability and flexibility of acquisition organizations, and risk-versus-project-duration of acquisition programs are primary in this study. The key research question is: How can organizations responsible for major acquisition programs be redesigned to improve performance?

The significance of this approach is twofold. First, answers to the research question have direct and immediate application to acquisition leaders and policy makers. Such answers address a serious and immediate problem, revealing insights into the behaviors of major acquisition organizations that are too complex and dynamic to be understood well or directly. They illuminate the kinds of changes acquisition organizations can make to balance competing performance measures (e.g., adaptability & flexibility vs. project risk & duration). They can explain—in a theoretically grounded manner—many different cases of acquisition success as well as failure. They can also provide overarching theory to help promote the former and obviate the latter in future acquisition programs.

Second, this research project demonstrates the efficacy of a new approach to studying acquisition organizations. It enables leaders, policy makers and analysts to answer “how much” questions such as: How much centralization, formalization and specialization is best? What fraction of commercial off-the-shelf equipment would be ideal? What level of concurrency between development and production provides the best combination of cost, schedule, performance and risk? Such questions are not answered well today in terms of acquisition organizations. This leaves acquisition decision makers today with no reliable means to address such questions.

The balance of the article begins with a focused review of the literature relevant to this study. We follow with discussion of our research design and description of the computation model developed to represent and emulate the acquisition organization. The article turns then to discuss results of our computational experiments. Conclusions, implications and recommendations for future research close the article, along with a rich set of references for



deeper exploration into the research on which this article builds and contributes. We also include two appendices to provide details of our computational models.

BACKGROUND

This focused review of the literature relevant to our study is organized into three parts: 1) the acquisition organization, 2) organization theory, and 3) computational experimentation.

The Acquisition Organization

Of particular interest to the authors is the realm of DoD program management, where research and development dollars are expended to invent or advance warfighting capability. While US weaponry is considered some of the best in the world, the major acquisition projects to acquire them are often fraught with cost and schedule growth. They even fail at times to meet specifications or to provide the capabilities desired. Since implementation of the Goldwater-Nichols Act legislation in the late 1980s, major defense acquisition organizations (e.g., program management offices) have operated under a four-tiered decision structure.

For major acquisitions, the current policy makes clear that the Under Secretary of Defense for Acquisition, Technology and Logistics is the Milestone Decision Authority responsible for the overall program: Described in the DODI 5000.1:

3.4 The Milestone Decision Authority (MDA) is the designated individual with overall responsibility for a program. The MDA shall have the authority to approve entry of an acquisition program into the next phase of the acquisition process and shall be accountable for cost, schedule, and performance reporting to higher authority, including Congressional reporting. (USD(AT&L), 2003)

And three levels down the hierarchy, Program Managers (PMs) are described as:

3.5.1 the designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the MDA. (USD(AT&L), 2003)

Thus, the Program Manager and Milestone Decision Authority share responsibility for development and oversight of a program. Further guidance under the DoD Instruction 5000.1 provides:

4.3.1.1 There is no one best way to structure an acquisition program to accomplish the objective of the Defense Acquisition System. MDAs and PMs shall tailor program strategies and oversight, including documentation of program information, acquisition phases, the timing and scope of decision reviews and decision levels to fit the particular conditions of that program, consistent with applicable laws and regulations and the time-sensitivity of the capability need. (USD(AT&L), 2003)

However, while the wording above might indicate that the MDA and PM plan jointly or collaborate in some way on program strategy, there are, in fact, both a Component Acquisition Executive and Program Executive Officer in the hierarchy between them, and direct communication between MDA and PM is infrequent. The four tiers of major program command and control and typical grade/ranks of positions are shown in Figure 1.





Figure 1. DoD Decision Hierarchy for Major Defense Acquisition Programs
 (adapted from DAU, 2004)

MDA PMs lead Program Management Offices (PMOs). PMOs vary greatly in size. A typical range of government-assigned workers is generally between 50 and 100 individuals dedicated to the day-to-day efforts. An expanding network of other government agency players, multi-tier industry contractors, and other participants can multiply this figure many times (Dillard, 2004). While all stakeholders represent different parts of the enterprise, here we refer to this central government organizational entity—the government PMO—as the *acquisition organization*.

At the PMO level, several alternatives for the organization exist. In most cases, the offices are comprised of permanently assigned “core” personnel, and temporarily assigned co-located “matrix” personnel on loan from commodity systems commands. These are personnel typically arrayed by functional area within the PMO (as shown in Figure 2). A significant number of on-site support contract personnel may be present as well.

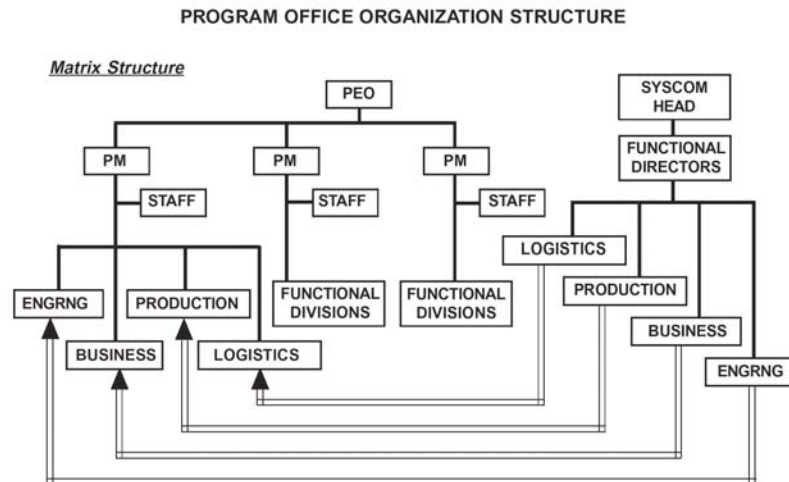


Figure 2. Typical, Matrixed Program Management Office Structure (adapted from DAU, 2004)

Somewhat less formally, programs also organize internally in ad hoc teams oriented on specific areas of each project. This stems largely from DoD initiatives over the last 10 years to implement Integrated Product and Process Development (IPPD) using Integrated Product Teams (IPT). This management philosophy emphasizes the potential of collective knowledge via small organizations with cross-functional or multi-disciplinary members (OUSD, 1998). Interestingly, the ideas in this IPPD/IPT philosophy of work implementation and problem solving are also embodied and magnified in emerging thought regarding command and control (C2) in tactical military organizations. The text *Power to the Edge* recognizes the benefit of using information-age technology to transfer knowledge and power to the point of an organization's interaction with its environment (Alberts & Hayes, 2003).

INTEGRATED PRODUCT TEAMS

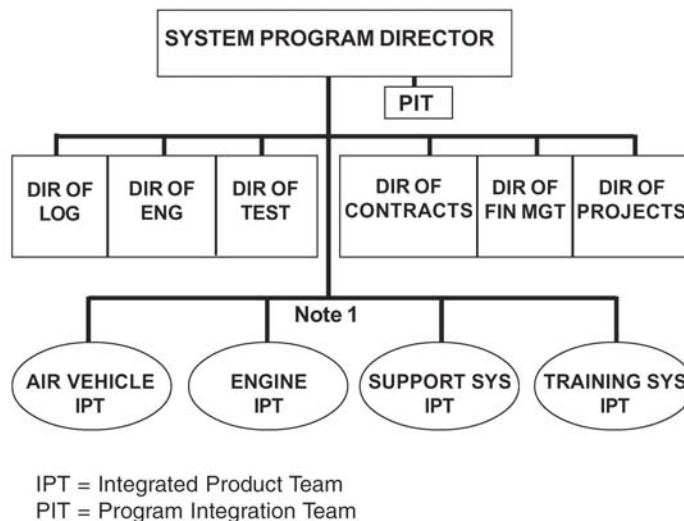


Figure 3. Example (Aircraft) PMO IPT Structure (adapted from DAU, 2004)

Another concept pertinent to our introduction is that of work and organizational hierarchy. Nobel Prize winner Herbert Simon argues, from his observation of complexity in things both natural and artificial, that complex systems evolve from simple systems. And they do so more rapidly when there are stable, intermediate forms or sub-systems (like modules or “units of action”). Moreover, he argues the resulting evolution into the complex system will be hierarchic, including systems such as organizations (Simon, 1981). But an important observation is also made by Koestler, who studies hierarchies in social organizations. He notes that sub-systems exist only as entities relative to their positions in the hierarchy. He proposes the word “holon” to describe the hybrid nature of individual organizations within larger organizations/systems. Holons are unique and self-contained wholes to their subordinated parts. But at the same time, they are also dependent parts of the larger hierarchy (or “holarchy,” as Koestler termed structures consisting of them). He views holons as autonomous, self-reliant units which have their own independence, and which cope with contingencies without asking higher authorities for instructions. Yet, they remain subordinate ultimately, subject to control from higher authorities. The term seems somewhat analogous to *edge* in the conceptualization of Edge organizations (Alberts & Hayes, 2003). Such concepts of unit knowledge, empowerment and relative autonomy within organizational structures are key to our design of various organizations for experimentation.

Organization Theory

Classic organization theory holds that organizational structures must change in response to contingencies of size, technology, environment and other factors. Indeed, it is accepted widely that, when faced with uncertainty (a situation with less information than is needed), the appropriate management response should be either to redesign the organization for the task at hand or to improve information flows and processing (Galbraith, 1973). Van Creveld (1985) applies this same principle to command and control of combat elements in war. He argues that the command structure must either create a greater demand for information (vertically, horizontally, or both) and increase the size and complexity of the directing organization, or it must enable the local forces to deal semi-independently with the situation. His central theme is that decentralized control is the superior method of dealing with uncertainty, whether with the task at hand or with transformation of the organization itself. Research by Van de Ven and Delbecq (1986) has shown further that as complexity and uncertainty increase, hierarchical management control and vertical communication strategies are considered inferior to less formal organizations with horizontal communication channels.

Another classical concept of organizational theory is Ashby’s Law of Requisite Variety (Ashby, 1960). This states loosely that, in order to cope with the variety of challenges imposed by it, the internal capabilities of a system must be as diverse as those required by its environment. Organizational evolution and survival are dependent upon requisite variety, particularly in environmental contexts that are dynamic and unpredictable. This suggests, too, that the organization’s structure and control strategy must be matched to its environment to enhance performance. Open and flexible management styles and processes are required often for dynamic market and technological conditions. Further, research by Burrell and Morgan (Morgan, 1997) indicates that any incongruence among management processes and the organization’s environment tend to reduce organizational effectiveness.

What the cumulative research appears to support is that, for large, complex hierarchies such as the Department of Defense—which operate in today’s environment of program complexity, evolving requirements, and rapidly changing technology—decentralized control and empowerment should be an organizational strength. Notwithstanding such cumulative research,



however, organizational hierarchies persist (Leavitt, 2004). Indeed, for DoD acquisition in particular, the command structure has remained relatively stable since the late 1980s. Although the current command structure is arguably flatter and more streamlined now than it was in the Seventies and before, it remains fundamentally hierarchical, centralized and rule-driven. Only through the major reform initiatives of the 1980s and 1990s did the acquisition organization's "chain of command" become as streamlined as it now is (Packard Commission, 1986).

Computational Experimentation

Drawing heavily from Nissen and Buettner (2004), we assert that throughout the era of modern science, a chasm has persisted between laboratory and field research. On one side, the laboratory provides unparalleled opportunity for controlled experimentation. Through experimentation, the researcher can manipulate only a few variables of interest at a time and can minimize the confounding associated with the myriad factors affecting complex systems and processes in the field (Box et al., 1978; Johnson & Wichern, 1992). However, limitations of laboratory experimentation are known well (Campbell & Stanley, 1973) and are particularly severe in the domain of acquisition. In acquisition experimentation, such limitations center on problems with external validity. Laboratory conditions can seldom replicate the complexity, scope and scale of the physical organizations and systems of interest for research. Experiments also include problems with generalizability. Many experiments utilize samples of convenience (esp. university students) instead of working professionals. This practice calls into question how closely the associated experimental results are representative of acquisition behavior in operational organizations. These same concerns pertain also to analytical methods (e.g., mathematical analysis, optimization; see Chiang, 1984; Lapin, 1985). Most such methods use theoretical concepts as variables, not operationalized constructs. And, of course, analytical models do not involve real people, systems and organizations.

On the other side, field research provides unparalleled opportunity for realism (Denzin & Lincoln, 1994). The researcher in the field can study full-scale artifacts in operational environments (Yin, 1994) and can minimize the abstraction away from working people, systems and organizations (Glaser & Strauss, 1967). However, limitations of field research are also known well (Campbell & Stanley, 1973) and are particularly severe in the acquisition domain. In acquisition field research, such limitations center on problems with internal validity. Field research affords little opportunity for controlled experimentation (cf. Cook & Campbell, 1979). Also, confounding data often results from the myriad influences on complex systems and organizations that cannot be isolated in the field. This diversity makes it difficult to identify and trace the causes of differential behaviors—better as well as worse—in acquisition.

As implied by the name, computational experiments are conducted via computer simulation. As such, they offer all of the cost and time advantages of computational analysis. But, computational experiments go beyond most simulations. Rigorous experimental designs are employed to capture the benefits of laboratory experimentation. The variables affecting physical systems and organizations in the field can be isolated and examined under controlled conditions. This type of analysis also addresses the internal validity and confounding limitations of field research. Yet, computational experiments can be conducted at a fraction of the cost and time required to set up and run experiments with human subjects in the laboratory. Further, through external validation, computational models can demonstrate fidelity emulation of the key qualitative and quantitative behaviors of the physical systems and organizations they represent. This ability addresses the problems with external validity and generalizability noted above.



It is important to note: computational modeling and simulation are not new techniques for the study of acquisition. For instance, a major DoD initiative called simulation-based acquisition has sought to educate the workforce about modeling and simulation (DSMC, 1998). And DoD policy has called for extensive use of modeling and simulation techniques in program planning and execution (Gansler, 1998). But, simulation-based acquisition has suffered to date from problems with internal and external validity alike. Such problems are not inherent to simulation methods or tools per se. Rather, they stem from models lacking theoretically rooted behaviors, externally validated results, and experimental controls. Our approach to computational experimentation obviates such problems deliberately.

Figure 4 illustrates the essential elements of computational experimentation as a research method. The top of the figure includes a shape to depict the bridge metaphor associated with this method, as it spans a wide gap between laboratory and field methods. From the left side of this “bridge,” two arrows represent inputs to describe the behaviors of computational models. Organization theory, which is predicated upon many thousands of studies over the last half century, provides the basis for most such behaviors. Behaviors pertaining to organizational factors such as centralization, division of labor, task interdependence, function, coordination, formalization, technology and information processing from organization theory are captured well. Where extant theory does not address well a behavior of interest (e.g., knowledge flows), ethnographic and like immersive field studies (Bernard, 1998) are conducted to understand the associated organizational behaviors. Because organization theory is general and not based on any single organization, the associated behaviors have broad applicability across organizations in practice. This provides for the generalizability attainable through the method of computational experimentation.

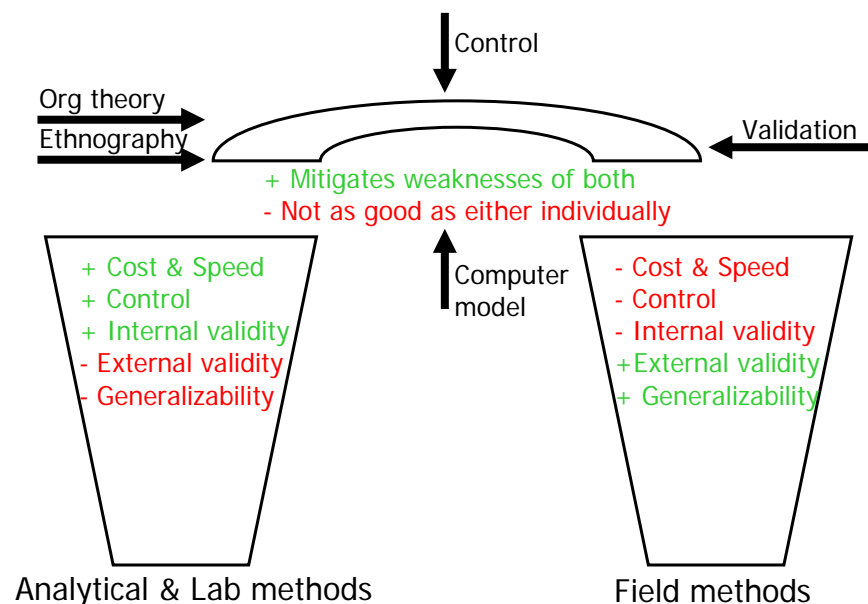


Figure 4. Bridge Method (adapted from Nissen & Buettner, 2004)

From the bottom of the “bridge,” an arrow represents the use of computer models to represent organizations and to emulate their key behaviors. Some variety exists in terms of specific implementations, but most computer models adhere to standards, norms and conventions associated with the COT field. The central goal is to develop computer models that emulate the key behaviors of organizations and to use such models to examine alternate methods of organization and coordination. As such, COT shares with acquisition a focus on many factors of importance.

From the right side of the “bridge” in the figure, one arrow represents a requirement in our approach for model validation. Through validation, the organizational behaviors emulated by computer models are examined and compared with those of operational organizations in the field. We view this comparison as essential, for it provides confidence that the behaviors emulated by the computer model have sufficient fidelity to mirror faithfully the behaviors of the operational organizations they represent. This provides for the external validity attainable through computational experimentation. It is important to note, not all COT models are subjected to such validation. Many researchers use computational models to conduct theorem-proving studies, which are valuable in their own right to demonstrate various aspects of organization theory. But without validation, researchers have difficulty making claims that such theory mirrors the behavior of organizations in the field. Hence, validation represents an important characteristic of distinguishing computational experimentation (as the research method described specifically in this article) from COT in general.

Finally, from the top of the “bridge,” an arrow represents the use of experimental controls in research. Following the same, rich set of experimental designs available to laboratory researchers (e.g., full-factorial, Latin Squares, blocking with replication), computational experimentation as a research method can be used to control myriad factors and to manipulate just one or a few variables at a time (e.g., searching for causality relations). Further, the same experimental design and setup can be replicated any number of times—for instance, using Monte Carlo techniques or other computational approaches to introduce variation. This provides for the internal validity attainable through computational experimentation. The combination of these “bridge” inputs—organization theory and ethnography, computer models, validation and control—allows the method of computational experimentation to be understood in terms of, and to indeed inherit, the various properties of its constituent elements.

Figure 4 illustrates also the bridging nature of computational experimentation as a research method. On the left side, we depict analytical and laboratory methods and we summarize their key advantages (e.g., low-cost & fast studies, good experimental control & internal validity) and disadvantages (e.g., poor external validity & generalizability). On the right side, we depict field methods in similar fashion to summarize their key advantages (e.g., good external validity and generalizability) and disadvantages (e.g., high cost & time consuming, poor experimental control & internal validity). Notice from their relative advantages and disadvantages how the two classes of research methods complement one another. Field methods are strong in the areas where analytical and laboratory methods are weak, and vice versa. As an alternate research method, computational experimentation mitigates weakness of both classes. For instance, it enables good experimental control and internal validity as in laboratory methods. It also promotes good generalizability and external validity as in field methods.

Nonetheless, every research method is flawed in some respects. In our present case, when used in isolation, computational experimentation is not as good as either method at its best. For instance, because computational experimentation uses computer models of people in



organizations instead of real people, it is weaker in this respect than laboratory experimentation is. This same use of computer models instead of real people also makes computational experimentation weaker than field methods are. This is why we describe computational experimentation as a *bridge method*: it bridges the chasm between experimental and field research methods; yet, it serves best to complement, not to replace, such methods.

RESEARCH DESIGN

This discussion of the research design is organized into three parts: 1) agent-based modeling environment, 2) computational acquisition organization model, and 3) experimental design.

Agent-Based Modeling Environment

In this section, we build upon current advances in VDT research to describe the agent-based modeling environment used here for computational experimentation. Drawing heavily from Nissen and Levitt (2004), we first summarize the stream of research associated with VDT and then describe its modeling environment.

Virtual Design Team Research

The VDT Research Program (VDT, 2004) reflects the planned accumulation of collaborative research over two decades to develop rich theory-based models of organizational processes. Using an agent-based representation (Cohen, 1992; Kunz et al., 1998), micro-level organizational behaviors have been researched and formalized to reflect well-accepted organization theory (Levitt et al., 1999). Extensive empirical validation projects (e.g., Christiansen, 1993; Thomsen, 1998) have demonstrated representational fidelity and have shown how the emulated behaviors of VDT computational models correspond closely with a diversity of enterprise processes in practice.

The VDT research program continues with the goal of developing new micro-organization theory and of embedding it in software tools that can be used to design organizations in the same way that engineers design bridges, semiconductors or airplanes: through computational modeling, analysis and evaluation of multiple, alternate prototype systems. Clearly, this represents a significant challenge in the domain of organizations. Micro-theory and analysis tools for designing bridges and airplanes rest on well-understood principles of physics (e.g., involving continuous numerical variables, describing materials whose properties are relatively easy to measure and calibrate), and analysis of such physical systems yields easily to differential equations and precise numerical computing.

In contrast, theories describing the behavior of organizations are characterized by nominal and ordinal variables, with poor measurement reproducibility, and verbal descriptions reflecting significant ambiguity. Unlike the mathematically representable and analyzable micro-behaviors of physical systems, the dynamics of organizations are influenced by a variety of social, technical and cultural factors, are difficult to verify experimentally, and are not as amenable to numerical representation, mathematical analysis or precise measurement. Moreover, quite distinct from physical systems, people and social interactions—not molecules and physical forces—drive the behavior of organizations. Hence, such behaviors are fundamentally non-deterministic and difficult to predict at the individual level. Thus, people, organizations and business processes are qualitatively different from bridges, semiconductors and airplanes. And it is irrational to expect the former to ever be as understandable, analyzable or predictable as the latter. This represents a fundamental limitation of the approach.



Within the constraints of this limitation, however, we can still take great strides beyond relying upon informal and ambiguous, natural-language textual description of organizational behavior (e.g., the bulk of extant theory). For instance, the domain of organization theory is imbued with a rich, time-tested collection of micro-theories that lend themselves to qualitative representation and analysis. Examples include Galbraith's (1977) information-processing abstraction, March and Simon's (1958) bounded rationality assumption, and Thompson's (1967) task-interdependence contingencies. Drawing from this theory base, we employ symbolic (i.e., non-numeric) representation and reasoning techniques from established research on artificial intelligence to develop computational models of theoretical phenomena. Once formalized through a computational model, the symbolic representation is "executable," meaning it can emulate the dynamics of organizational behaviors.

Even though the representation is qualitative (e.g., lacking the precision offered by numerical models), through commitment to computational modeling, it becomes semi-formal (e.g., different people viewing the model can agree on what it describes), reliable (e.g., the same sets of organizational conditions and environmental factors generate the same sets of behaviors), and explicit (e.g., much ambiguity inherent in natural language is obviated). Particularly when used *in conjunction with* the descriptive natural language theory of our extant literature, this represents a substantial advance. Further, once a model has been validated to emulate accurately the qualitative behaviors of the field organization it represents, it can be used to examine a multitude of cases (e.g., many more and diverse than observable in practice) under controlled conditions (e.g., repeating the same events multiple times, manipulating only one or a few variables at a time through repeated trials, stopping the action for interpretation). These features alone offer great promise in terms of theory development and testing.

Additionally, although organizations are inherently less understandable, analyzable and predictable than physical systems are, and the behavior of people is non-deterministic and difficult to model at the individual level, it is known well that individual differences tend to average out when aggregated cross-sectionally and/or longitudinally. Thus, when modeling aggregations of people in the organizational context (e.g., work groups, departments, firms), one can augment, with certain aspects of numerical representation, the kind of symbolic model from above. For instance, the distribution of skill levels in an organization can be approximated—in aggregate—by a Bell Curve; the probability of a given task incurring exceptions and requiring rework can be specified—organization wide—by a distribution; and the unpredictable attention of a worker to any particular activity or event (e.g., new work task, communication, request for assistance) can be modeled—stochastically—to approximate collective behavior. As another instance, specific organizational behaviors can be simulated hundreds of times—such as through Monte Carlo techniques—to gain insight into which results are common and expected versus those that are rare and exceptional.

Of course, applying numerical simulation techniques to organizations is nothing new (e.g., see Law & Kelton, 1991). But this approach enables us to *integrate* the kinds of dynamic, qualitative behaviors emulated by symbolic models with quantitative aggregate dynamics generated through discrete-event simulation. It is through such integration of qualitative and quantitative models—bolstered by strong reliance upon well-established theory and commitment to empirical validation—that our approach diverges most from extant research methods and offers new insight into the dynamics of organizational behavior.



VDT Modeling Environment

Here we provide a brief overview of the VDT modeling environment. The development and evolution of VDT has been described in considerable detail elsewhere (e.g., Cohen, 1992; Christiansen, 1993; Jin & Levitt, 1996; Thomsen, 1998; Kunz et al., 1998; Levitt et al., 1999; Nogueira, 2000; VDT, 2004), so we do not repeat such discussion here. The VDT modeling environment has been developed directly from Galbraith's information-processing view of organizations. This information-processing view has two key implications (Jin & Levitt, 1996). The first is ontological: we model knowledge work through interactions of *tasks* to be performed, *actors* communicating with one another and performing tasks, and an *organization structure* that defines actors' roles and that constrains their behaviors. In essence, this amounts to overlaying the task structure on the organization structure and to developing computational agents with various capabilities to emulate the behaviors of organizational actors performing work.

Figure 5 illustrates this view of tasks, actors and organization structure. As suggested by the figure, we model the organization structure as a network of reporting relations which can capture micro-behaviors such as managerial attention, span of control and empowerment. We represent the task structure as a separate network of activities, which can capture organizational attributes such as expected duration, complexity and required skills. Within the organization structure, we further model various *roles* (e.g., marketing analyst, design engineer, manager), which can capture organizational attributes such as skills possessed, level of experience and task familiarity. Within the task structure, we further model various sequencing constraints, interdependencies and quality/rework loops—which can capture considerable variety in terms of how knowledge work is organized and performed.

As suggested also by the figure, each actor within the intertwined organization and task structures has a queue of information tasks to be performed (e.g., assigned work activities, messages from other actors, meetings to attend) and a queue of information outputs (e.g., completed work products, communications to other actors, requests for assistance). Each actor also processes such tasks according to how well the actor's skill set matches those required for a given activity, the relative priority of the task, the actor's work backlog (i.e., queue length), and how many interruptions divert the actor's attention from the task at hand. Collective task performance is constrained further by the number of individual actors assigned to each task, the magnitude of the task, and both scheduled (e.g., work breaks, ends of shifts, weekends and holidays) and unscheduled (e.g., awaiting managerial decisions, awaiting work or information inputs from others, performing rework) downtime.

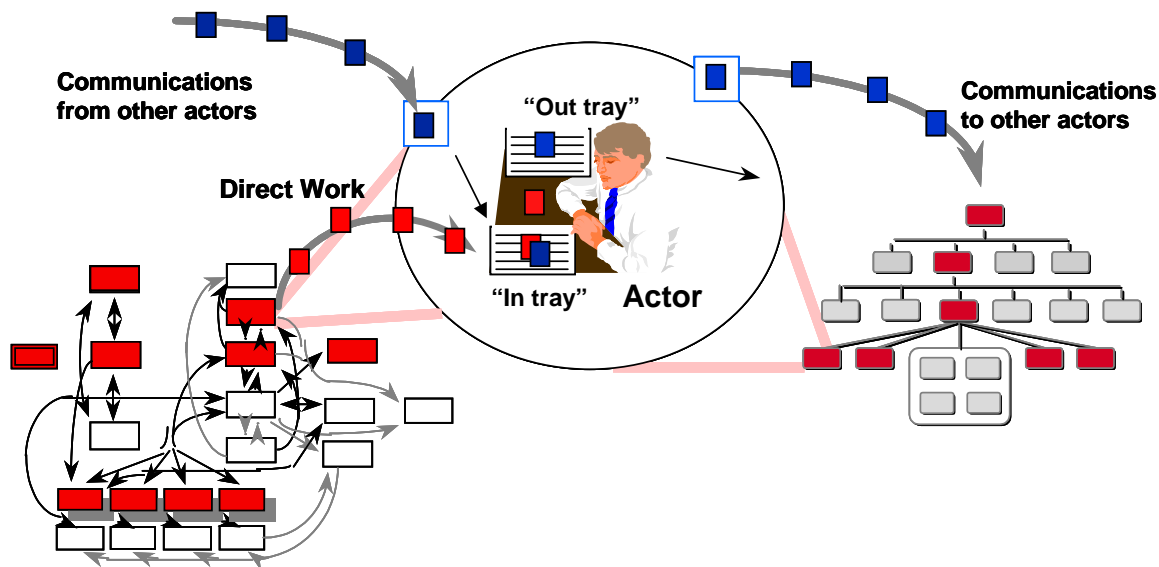


Figure 5. VDT Information Processing View of Knowledge Work (adapted from Nissen & Levitt, 2004)

The second implication is computational: both primary work (e.g., planning, design, management) and coordination work (e.g., group tasks, meetings, joint problem solving) are modeled in terms of *work volume*. This construct is used to represent a unit of work (e.g., associated with a task, a meeting, a communication) within the task structure. In addition to symbolic execution of VDT models (e.g., qualitatively assessing skill mismatches, task-concurrency difficulties, decentralization effects) through micro-behaviors derived from organization theory, the discrete-event simulation engine enables (virtual) process performance to be assessed (e.g., quantitatively projecting task duration, cost, rework, process quality).

Clearly, quantitative simulation places additional burden on the modeler in terms of validating the representation of a knowledge-work process, which generally requires fieldwork to study an organization in action. The VDT modeling environment benefits from extensive fieldwork in many diverse enterprise domains (e.g., power-plant construction and offshore drilling, see Christiansen, 1993; aerospace, see Thomsen, 1998; software development, see Nogueira, 2000; healthcare, see Cheng & Levitt, 2001; others). Through the process of “backcasting”—predicting known organizational outcomes using only information that was available at the beginning of a project—VDT models of operational enterprises in practice have demonstrated dozens of times that emulated organizational behaviors and results correspond qualitatively and quantitatively to their actual counterparts in the field (Kunz et al., 1998).

Viewing VDT as a validated model of project-oriented knowledge work, researchers have begun to use this dynamic modeling environment as a “virtual organizational testbench” to explore a variety of organizational questions, such as effects of distance on performance (Wong & Burton, 2000) or to replicate classic empirical findings (Carroll & Burton, 2000). Thus, the VDT modeling environment has been validated repeatedly and longitudinally as representative of both organization theory and enterprises in practice. This gives us considerable confidence in its results. Moreover, VDT is designed specifically to model the kinds of knowledge work and information-processing tasks that comprise the bulk of acquisition processes.

Computational Acquisition Organizational Model

In our experimental efforts, we use the VDT modeling environment to represent work associated with a three-tier acquisition organization. This follows our discussion above, and it is representative of many DoD service-level environments today (e.g., where several project offices report into one program executive “Portfolio Manager” and then up to a Component Acquisition Executive, and often into yet another level of decision-making). VDT is capable of modeling large, complex, operational organizations in great detail; it has been demonstrated repeatedly to emulate well the associated behaviors of organizations in the field. But, using a high-level model as such helps us to maintain the focus of this expository article on techniques of VDT modeling and computational experimentation (which represents one of our primary contributions), and not to get lost in the details of the organization itself. We first describe the VDT representation and then illustrate how a full-factorial computational experiment can be performed upon it.

VDT Acquisition Model

Figure 6 presents a screenshot of the VDT acquisition program model. The model is comprised of five developmental system acquisition projects (i.e., denoted as lightly colored boxes). Both concurrent and sequential projects/tasks are depicted in the model, and interdependencies are represented among them. The model depicts a simple and abbreviated series of coordinated research and development efforts which are aligned to deliver an Advanced Strike capability integrated into a mobile platform and, subsequently, are enhanced with an evolutionary block of capability. It is but a representative subset of what could be a larger, more complex, and more detailed representation of such a program.

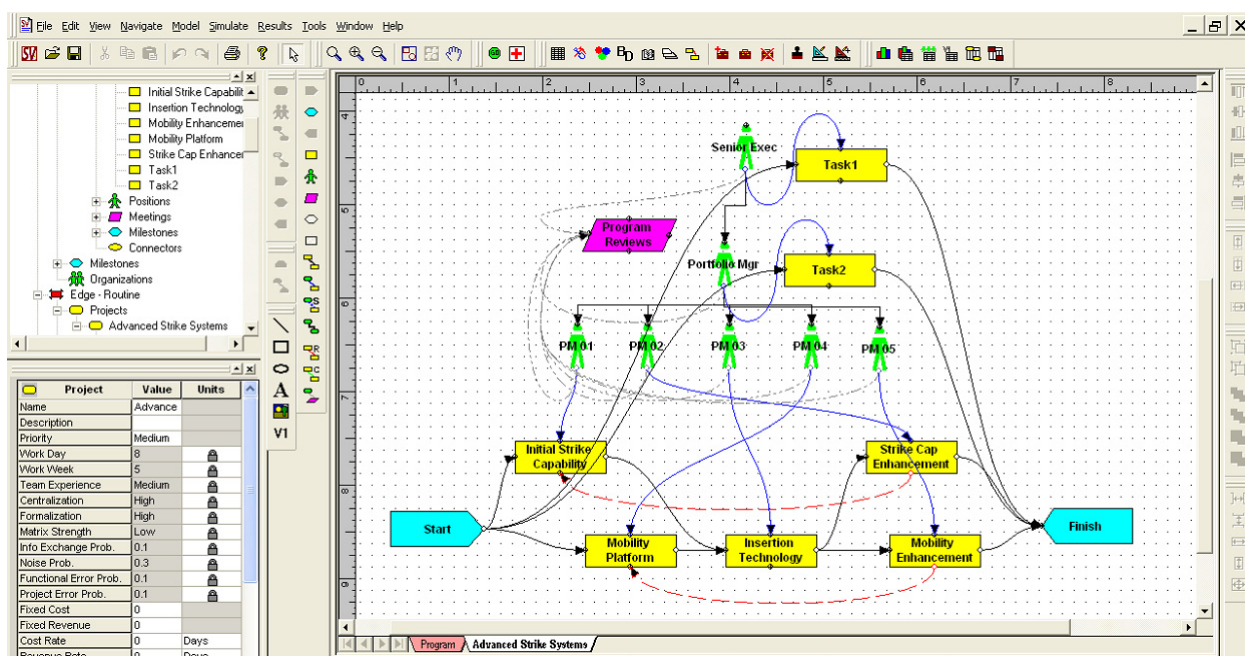


Figure 6. VDT Acquisition Model Screenshot

The coordination links (i.e., denoted by light dashed lines) connecting the coordinated tasks or projects denote reciprocal task interdependencies (Thompson, 1967), which suggest they must be coordinated closely in both planning and execution. For example, integration of

strike capabilities into a mobile platform requires coordination among engineers for interface and configuration control of hardware, software, and other factors. VDT emulates the added coordination effort associated with such reciprocal task interdependencies. The rework links (i.e., denoted by dark dashed lines) connecting tasks from different mission phases denote sequential task dependencies, which suggest the predecessor activities must be accomplished effectively in order for the successors to perform well. Strike and Mobility Enhancements, for instance, depend heavily upon success of the Initial Strike and Mobility Platform efforts. To the extent that such predecessor work is not completed or not accomplished effectively, certain aspects may have to be reanalyzed to correct any major deficiencies.

The people icons depict organizations and are arranged in terms of the command-and-control, or decision-making, hierarchy. People icons represent one or more human resources, specified in Full Time Equivalents (FTEs), which have particular capabilities, skill levels and roles. Where a skilled actor's capability matches that required for an acquisition task, the resource is likely to perform it competently and within the time required. If the actor has greater or lesser skill, the time required to perform the task can be appreciably shorter or longer, and the competency of performance can be notably better or worse, respectively. Where an actor does not possess the required capability at all, the task will be in jeopardy. Such relationships are appealing intuitively and reflect well many organizational behaviors.

A Senior Executive actor sits atop the acquisition organization model and has a Portfolio Manager reporting to it. Reporting to the Portfolio Manager are five individual PMOs (01 through 05) with different roles and capabilities within them. For example, the icon labeled "PM 02" is responsible for the technological enhancement of the initial Strike Capability. Notice the VDT representation includes a work task structure and an organization structure. The assignment links (i.e., delineated by solid lines) denote which organizational actors are responsible for the various work tasks. Finally, a dark trapezoid box is used to depict recurring meetings (e.g., coordination meetings, technical reviews, milestone reviews) that must be attended by the actors connected by links. Meetings consume actors' resources, but they also contribute toward coordination.

All of the structural elements (e.g., work tasks, requirements and interdependencies, actor capabilities, skill levels and roles, organization structure, task structure and meeting requirements) of this VDT model are developed by the authors. Such structural elements would clearly be different for each unique organization and process model. VDT also includes several dozen environmental variables with "normal" values determined empirically by prior field research. These include factors such as the level of uncertainty and noise associated with a project, the inherent propensity of an organization to make errors, and relative concern for performance quality associated with actors at different levels of organizational hierarchy. These and other environmental variables can be changed where appropriate to reflect a wide variety of different organizations and contexts. Other factors can be changed to reflect different organizational designs. For instance, the level of centralization and formalization can be varied by changing design variables. The corresponding VDT model behaviors have been developed empirically. We capitalize upon such empirically developed behaviors to design and compare new acquisition organization models and subject them to changing environments.

VDT also includes several performance variables for comparison. In addition to standard simulation measures such as project duration and cost, VDT also includes measures such as levels of rework, coordination and delay, in addition to risk measures keyed to various attributes of importance (e.g., tasks left undone, missed communications, project-level errors). Some of these performance variables are correlated often with one another, whereas others highlight

tradeoffs that must be made. In other words, where a project is running behind schedule but on budget, a leader or manager can decide to employ more resources. This often has the effect of increasing the rate of progress while also increasing the rate of expenditure. Other tradeoffs such as those between cost and risk or schedule and coordination require balance in a similar fashion. It is important to note again the extensive and longitudinal validation of VDT provides considerable confidence that the organizational behaviors emulated by our computational model will reflect well those of operational organizations in the field.

Experimental Design

As is appropriate for the cumulative accretion of knowledge through research, this study builds upon prior work using VDT methods and tools to examine alternate organizational designs and environmental conditions. For instance, Kim and Burton (2002) use VDT to model projects with varying levels of task uncertainty and centralization, measuring the effects on cost, schedule and risk as dependent performance variables. They find a relationship between organizational structure and performance. And they examine project risk, measuring the likelihood that outputs from a project will not be integrated at completion, or that the integration will have defects. The study calls attention to the impact of centralized control on organizational performance in light of task uncertainty. It also suggests that managers should pay attention to such aspects of organizational structure and should consider the importance of project quality in addition to profitability alone. In another instance, Nissen and Buettner (2004) use VDT to model command and control in military missions. They model organizations having varying levels of bureaucracy, coordination and knowledge, measuring the effects on mission duration and risk as dependent, performance variables. They find a similar relationship between organizational structure and task performance and overall risk, and they suggest that organizational leaders must choose and balance the performance measures that are most relevant to the project's environment and desired outcomes.

In this study, we emulate the behaviors of three different modeled organizations which vary in degrees of hierarchy, centralization and formalization, and which are subjected to different levels of environmental stress. Briefly, our three designs of organizations have the same amount of work volume to perform, with the same level of team experience and individual skills involved. What differs among them is their degree of autonomy and empowerment, specified by several VDT constructs. Therefore, we build upon the kinds of prior research noted above, and we extend such prior research to address the acquisition domain. We also extend prior research through the greater number and variety of organizational design changes and degrees of environmental stress examined in this study.

Figure 7 reflects today's acquisition organization (labeled "Typical") with high centralization, formalization and three layers of decision hierarchy, somewhat like an ACAT II program or set of projects within the DoD.



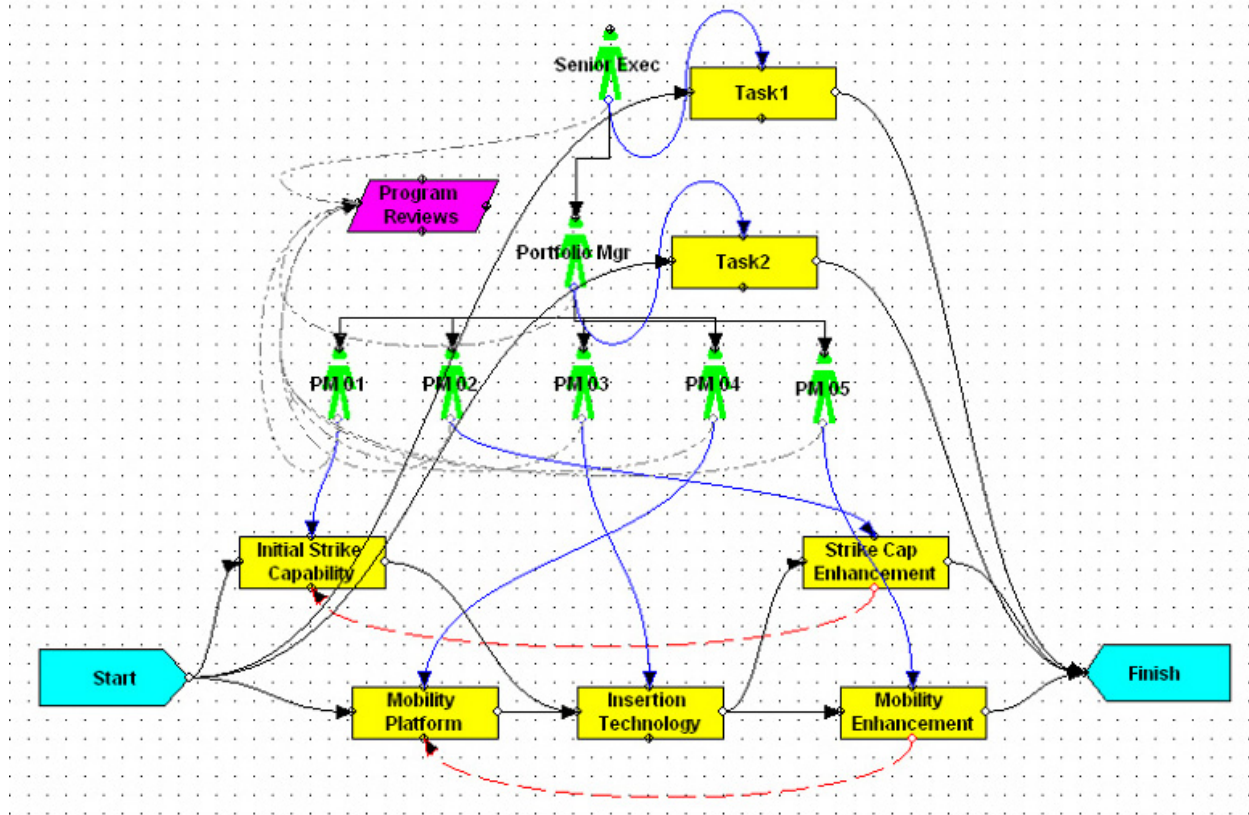


Figure 7. Typical Acquisition Organization Design and Project Work

In contrast to the typical organization, Figures 8 and 9 depict two alternate organizations with fewer layers of decision hierarchy and lower centralization and formalization. The first organization (labeled “Decentralized”) has less hierarchy and control overhead in its management structure. Note the removal of the “Senior Executive” position in the representation, whose VDT role of PM has been delegated lower to the Portfolio Manager, now labeled as “Leader.” As in reality, the supervision structure in the VDT model is an exception-handling hierarchy. It is the chain of command for information and decision about problems discovered in the course of a project. Positions of PM 01, 02, and others still act within the VDT simulation as Subteam Leaders who handle some exceptions and pass others up the hierarchy for resolution.

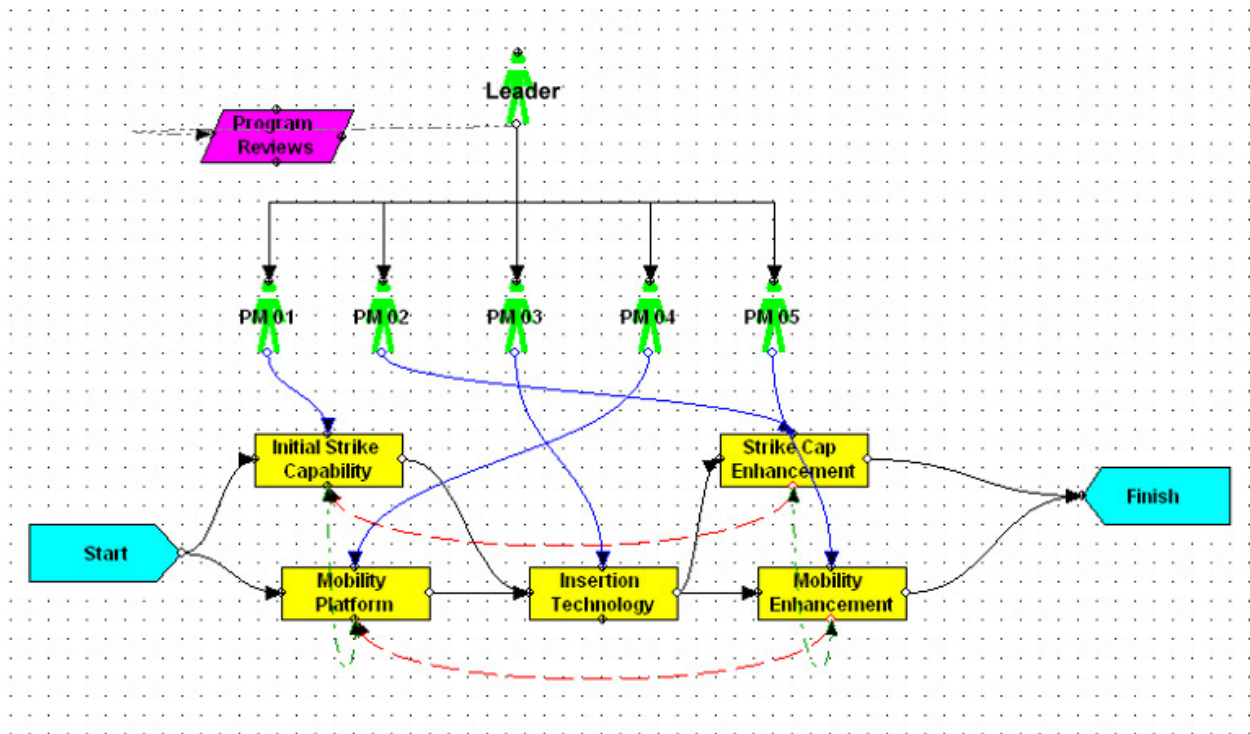


Figure 8. Decentralized Organizational Design and Project Work

The second organization, depicted in Figure 9 (labeled “Holonistic”) has no overhead management structure at all. Here, each PM position in the figure remains designated a Subteam Leader within the VDT tool. The various PMs communicate with one another directly. Table 1 shows the VDT settings for organizational parameters to be tested. Additional modeling detail on organizational design parameters is found in Appendix A.

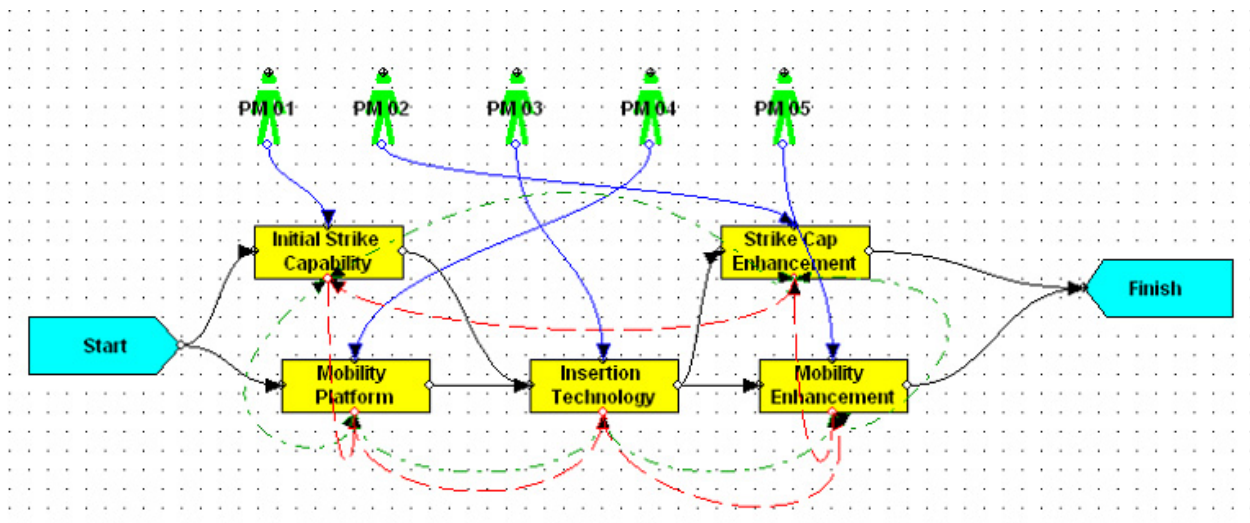


Figure 9 . Holonistic Organizational Design and Project Work

Table 1. Organizational Design Parameters

Organizational Parameter	Typical	Decentralized	Holonistic
Centralization	High	Low	Low
Formalization	High	Low	Low
Matrix Strength	Low	High	High
Hierarchy	3 layers	2 layers	1 layers
Sr-Cmd (Sr Exec PM):	1 FTE	0	0
Mid-Cmd (Port Mgr SL):	1 FTE	1	0
Operations (PMOs):	50 FTE	50	50
Communication Links	0	2	5
Info Exchange Prob	0.1	0.9	0.9
Application Exp.	Low	Medium	Medium
Meetings	More	Less	None
Functional Error Prob	0.1	0.2	0.2
Project Error Prob	0.1	0.2	0.2
Rework Links Str	30	10	10
Team Experience	Medium	Medium	Medium
Skill Level/Matched	Medium	Medium	Medium

Environmental stress is applied to our three organizational designs via the VDT constructs *requirement complexity*, *solution complexity*, and *task uncertainty* (appropriate to environments that project offices often face with technology maturity, interoperability requirements, etc.) as well as higher noise (distractions) and increasing functional- and project-error probabilities. For the experiment, each of these three factors is specified at two levels: routine and stressed, shown in Table 2 below. Hence, a full-factorial design consists of six trials (i.e., three alternate organizational designs x 2 different environmental conditions), which we designate according to the levels corresponding to a set of environmental factors. Additional modeling detail on environmental parameters is presented in Appendix B.

Table 2. Environmental Parameters

Environmental Parameter	Routine	Stressed
Requirement Complexity	Medium	High
Solution Complexity	Medium	High
Uncertainty	Medium	High
Noise	0.3	0.4
Functional Error Probability	0.1 & 0.2	0.3 & 0.4
Project Error Probability	0.1 & 0.2	0.3 & 0.4

We examine the dependent variables of particular interest in the acquisition domain: *cost*, *schedule duration* and *project risk*. We also make note of the maximum position backlog, rework volume, coordination volume, and decision wait time, as these have implications for managers to consider. Schedule is important to project managers, and time is often viewed as money because of the staff that must be paid as long as they are retained—whether productive to the project or not. Project cost is measured in \$K, and pertains to staffing costs only, as no material costs are modeled in our experiment. Project risk, as mentioned above, is represented as the likelihood of an incomplete project outcome, which relates directly to project quality. While every task within a project may not be critical to project quality, more tasks incomplete or defective place the overall project at risk for failure. Where lives are at stake, such as in new pharmaceutical compounds, new passenger aircraft, or defense weapon systems involving lethality and survivability, overall project risk may be a difficult trade for managers also concerned with project cost and schedule.

EXPERIMENTAL RESULTS

In this section, we report on the results of our computational experiment. Summarized in Table 3 is each of the six trials in this full-factorial experiment. The table includes measures for project cost, schedule and risk, in addition to other metrics that can provide insight into organizational dynamics (rework volume, coordination volume and decision wait).

Table 3. Experimental Results

Measure	Typical Organization in Routine	Decentralized Organization in Routine	Holonistic Organization in Routine	Typical Organization Under Stress	Decentralized Organization Under Stress	Holonistic Organization Under Stress
Duration (dys)	556	428	407	580	604	458
Cost \$K	\$8,085	\$4,674	\$4,565	\$8,561	\$6,708	\$4,973
Project Risk	0.41	0.54	0.76	0.37	0.55	0.76
Max Backlog (dys)	26	12	12	30	27	19
Work Volume (dys)	4800	4500	4500	4800	4500	4500
Rework Volume (dys)	124	866	465	401	2747	740
Coordination Volume (dys)	3051	423	742	3205	952	976
Decision Wait	20	54	0	67	186	0

Examining these results, we see that the baseline organization—the Typical Organization in Routine environment—completes the series of projects in 556 days, at a cost of \$8,085(K), with a project risk index of 0.41. While these are the three primary success measures of any project, the VDT simulation provides more insight in terms of position backlog (e.g., one actor got 26 days behind in work at one point during the project). The tool can also identify when this occurs so that planners can split tasks or assign more resources for specific tasks. Work volume refers to the amount of effort expected to complete all project tasks under ideal conditions (e.g., no noise, errors or miscommunications). Rework Volume refers to the simulated time needed for all positions on a project to perform required rework. Coordination volume is the cumulative time positions spend during a project processing information requests from each other, attending meetings, and other coordinative tasks. Decision Wait measures the cumulative time spent by positions waiting for decisions to be made in a project. These values for our baseline case provide a basis for comparison with results for alternate organizational designs and environmental conditions.

Comparing these results with those obtained by the Decentralized and Holonistic Organizations in the Routine environment, key differences are apparent. Decentralized and holonistic organizations fare considerably better (in terms of both cost and schedule) in the routine environment than their more typical counterpart organizational design does. Program schedule or duration is reduced some 23% (from 556 to 428 days) with the Decentralized Organization and 27% (from 556 to 407 days) by changing organizational structure toward more Holonistic. Program cost is reduced similarly by 42% (from \$8085 (K) to \$4674 (K)) with Decentralized and 44% (from \$8085 (K) to \$4565 (K)) with Holonistic in the successive design iterations. However, project risk increases appreciably in both alternate organizations, going up to 54% and then to 76%, respectively, in decentralized and holonistic designs. Here, we find that Decentralized and Holonistic organizational forms offer a combination of advantages (e.g., shorter schedule duration, lower cost) and disadvantages (e.g., higher risk) with respect to the Typical acquisition organization in a routine environment.

Upon examination of these organizational designs under stress environments, we find the Typical Organization suffers cost and schedule growth in the 4-5% range (i.e., 580 days, \$8561K), with a slight decline in project risk (0.37). Decentralized and Holonistic organizations under stress perform better in the cost realm with 22% (\$6708K) and 42% (\$4973K) reductions compared with the Typical. The Decentralized design reveals longer schedule duration (604 vs. 580 days), but the Holonistic organization shows a 21% decrease (458 vs. 580 days). Again, project risk climbs in stress environments to 55% for Decentralized and to 76% for the Holonistic.

Figure 10 illustrates graphically the dynamic relationship we find between cost and organizational design. Notice, in the routine environment, project cost decreases abruptly with a shift from a Typical to a Decentralized organizational form. But, negligible additional improvement accrues to the Holonistic design. Alternatively, in the stressed environment, the Decentralized organization performs better than the Typical does, and the Holonistic organization performs better still. Notice also how costs are higher for every organizational form in the stressed environment than they are in the routine one.

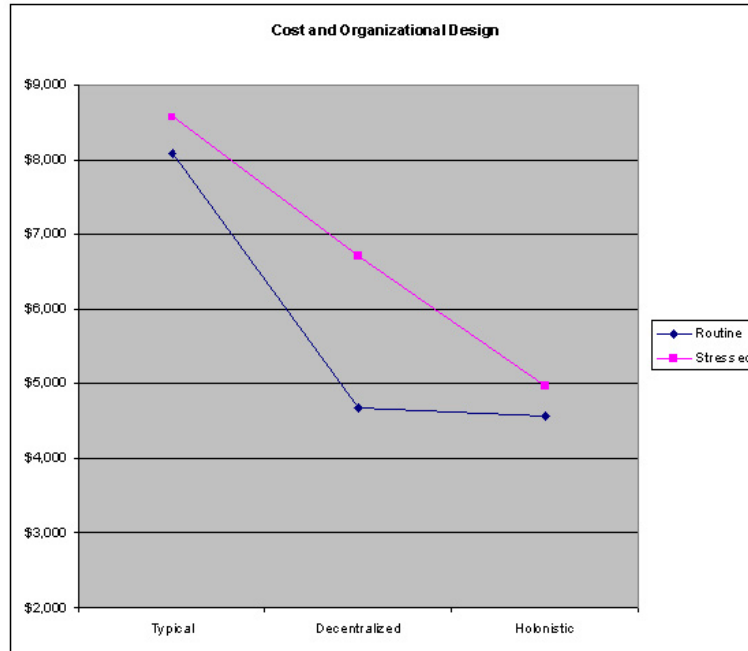


Figure 10. Relationship between Cost and Organizational Design

Figure 11 illustrates the relationship between risk and organizational design. Here, we observe a monotonic increase in risk corresponding to progression in organizational form from Typical, through Decentralized, to Holonistic. As costs decrease across these alternate organizational forms, risk increases in lock step. Unlike the cost results, however, the stressed environment appears to exert little influence in terms of risk.

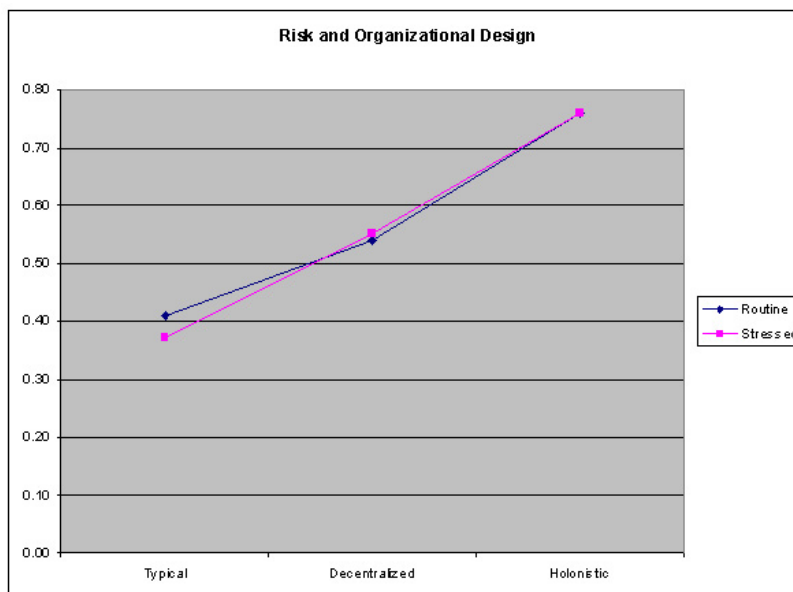


Figure 11. Relationship between Risk and Organizational Design

Interpreting these results, the researchers found that the less centralized, formalized and hierarchical organizational designs perform better in terms of cost and schedule than other designs, but with accompanying project-quality risk. Interpreting these results further, in which

schedule and cost are of primary concern to all project managers, decentralized control (especially in stressed environments) may provide a more cost-effective approach. Alternatively, where project risk or quality is paramount, formalized procedures, vertical information flows, and centralized decision-making typical of bureaucratic organizational forms can be seen as superior. This reflects a fundamental tradeoff between performance measures and organizational design, as conceptualized generally in terms of Contingency Theory (Lawrence & Lorsch, 1967). And as Kim and Burton (2002) noted, the theory is actually extended by the evidence of risk coming into play with a more rapid and inexpensive project solution afforded by empowered actors with relevant information at their organizational edge.

The DoD, like sponsors of projects in the FDA's pharmaceutical arena and in the FAA's commercial aviation arena, is averse generally to risk due to the safety and survivability aspects of many of its developmental systems. Indeed, the modeling here can be viewed as confirmation of the DoD's varying levels of decision hierarchy correlating to estimated program dollar thresholds (stratification of acquisition categories I through IV) as a means of addressing cost risk. However, and just as important to illustrate, high levels of bureaucracy place considerable stress on acquisition organizations and come at their own cost. Are 40% program cost growth and 25% schedule growth commensurate with 20 – 50% program risk reduction? Might a commensurate amount of risk be alleviated through a less-expensive means? Clearly, tools such as VDT provide a new way of gaining insights into these important program considerations, particularly when forming organizations for the management of weapon system developments.

CONCLUSION

The DoD is a large, bureaucratic, rule-intensive organization that may not be suited well for its environment. Building upon prior research on acquisition centralization and knowledge dynamics, we employ computational methods to assess the behavior and performance of different organizational designs in varying environments. Our results reinforce Contingency Theory and suggest particular characteristics of different acquisition environments that make one form relatively more or less appropriate than another. Practically, answers to our research questions have direct and immediate application to acquisition leaders and policy makers. Theoretically, we generalize to broad classes of organizations and prescribe a novel set of organizational design guides.

In this study, we use the VDT modeling environment to represent and emulate the behavior of an acquisition organization. Although the Typical acquisition organization modeled in this study is representative of such organizations in practice, we do not claim to have experimented—even computationally—with an operational organization. Rather, we experiment computationally with a high-level organizational model, illustrating the method, use and utility of our approach for exposition. We then conceptualize and model two alternate acquisition organizations, manipulating key factors of their organizational designs. We subject them to two environmental contexts, routine and stressed, comparing their performance in terms of cost, schedule and risk.

In routine circumstances, our experimental decentralized and holon-type organizations out-perform typical hierarchies in measures of cost and schedule. Under high stress from task uncertainty, noise, and error probability, our decentralized and holon-type organizations completed their same project work volume as well, faster, and for less cost than their centralized counterpart. In both environments, however, our less formal organization structures yield a higher project-quality risk.



Our findings are similar to those of other VDT researchers who find the relationship between organizational performance improvements and increasing project risk from decentralization in environments of uncertainty (Kim & Burton, 2002) and worker knowledge (Nissen & Buettner, 2004). They offer an extension of contingency theory to include risk as a dependent variable for organizational structures and project outcomes. Our results reveal the same relational patterns of performance capabilities among the three organizational designs and across differing stress environments. They underscore complex interactions between organizational design factors, and suggest fundamental tension and decision tradeoffs between important performance measures such as project cost, schedule and quality/risk.

The results provide several implications for managerial practices and application of organization theory regarding the relationships between organizational structure and performance. Understanding when the bureaucracy is relatively beneficial and how this rigid organizational form can negatively influence project cost (and positively impact project risk) is important for acquisition practitioners today. The apparent implications are that adopting a decentralized structure in accordance with contingency theory may not lead to higher unit performance, since it might instead produce poorer project quality. But, we suspect it is insufficient to only assume that more bureaucracy alleviates risk with attendant costs, or that managers must simply choose either fast and cheap, or better quality results.

In the early 1990's, with a goal of shortening development times, reducing cost, and increasing numbers of scientific missions flown, NASA adopted a "Faster, Better, Cheaper" approach to project management. This management philosophy was implemented in spite of an old project management adage that project managers could have any two of these performance outcomes, but not all three (Spear, 2000). This maxim is supported somewhat by the findings of Lin and Carley (1997) regarding decision accuracy in organizations under time pressure. After the several unmanned mission failures, and ultimately the February 2003 Columbia disaster that claimed the lives of seven astronauts, an analysis of NASA failures blamed a more risk-tolerant culture as an organizational cause of the accident.

The DoD, having large complex systems with inherent risk of their own, is particularly averse to risk in its decision structure and perhaps even its organizational culture. With growing federal budget deficits and base re-alignments, it is also particularly cost-constrained. And with accelerating obsolescence rates of weapon system technology, the DoD remains under considerable pressure to reduce project schedules as well. Even with simple models, we show that project performance can be examined with various organizational designs and under differing environments. Perhaps for the first time—or at least to an extent unachievable heretofore—we show how managers can gain fundamental insights into the inherent project tradeoffs *in advance of making project decisions*. The practical significance should be apparent immediately.

These experiments support propositions that information processing is a primary organizational activity and is associated with project cost and duration (i.e. the more information processing a project requires, the more costly and lengthy the project becomes). Certainly, there is attendant benefit to the information processed as well. However, the additional measure of project-quality risk is critical for many types of projects, and its emerging relationship from these studies and our most recent work begin to shape a new hypothesis: that perhaps there is an optimal organizational design solution, relative to cost, duration *and* risk. If managers can ascertain early on the criticality (and tolerable level) of project-quality risk, they can perhaps select along a continuum the level of organizational hierarchy and centralization needed to control project outcomes. Or, reframing the question, how much will added



bureaucracy cost to alleviate risk? The key point is: the answer will differ—necessarily—for every project. A one-size-fits-all acquisition policy is naïve given such knowledge and our ability to emulate organizational performance as illustrated in this article.

Building upon the VDT constructs introduced in this article, one day researchers may even develop techniques for design optimization based on project objectives (e.g., speed vs. risk) and environment. Leaders, managers and researchers may develop the capability to design organizations, work processes and technologies using computational techniques comparable to those employed for designing airplanes, bridges and computers. That day is not yet here. But, through research along these lines, we can both foresee and accelerate its arrival. Meanwhile, the centralized control that dominates current acquisition thinking and policy merits re-examination in light of this study. Such control imposes costs as well as accrues benefits. We know now how to measure and compare them: via computational experimentation.

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APPENDIX A: DESIGN OF ORGANIZATION MODELS

This appendix provides additional detail about the design of our experimental acquisition organization models. Table 1 above specifies design parameters and VDT simulation settings for all three of our organizational designs: Typical, Decentralized and Holonistic. We reproduce the information below as Table 4 and discuss the various design parameters.

Table 4. Organizational Design Parameters

Organizational Parameter	Typical	Decentralized	Holonistic
Centralization	High	Low	Low
Formalization	High	Low	Low
Matrix Strength	Low	High	High
Hierarchy	3 layers	2 layers	1 layers
Sr-Cmd (Sr Exec PM):	1 FTE	0	0
Mid-Cmd (Port Mgr SL):	1 FTE	1	0
Operations (PMOs):	50 FTE	50	50
Communication Links	0	2	5
Info Exchange Prob	0.1	0.9	0.9
Application Exp.	Low	Medium	Medium
Meetings	More	Less	None
Functional Error Prob	0.1	0.2	0.2
Project Error Prob	0.1	0.2	0.2
Rework Links Str	30	10	10
Team Experience	Medium	Medium	Medium
Skill Level/Matched	Medium	Medium	Medium

Our experiments simulate the acquisition efforts of five small project-management offices oriented on an initial strike capability (such as one provided by a missile or direct-fire weapon), integration into a mobile platform (such as a ground or air vehicle), and followed by block enhancements to both sets of capability from insertion of technology. These types of effort are common within program executive office portfolios across the military services. To simulate the completion of these projects, we design three different organizations with similar resources, but varying parameters of organizational control.

Centralization, Formalization and Matrix Strength comprise a group of variables that work together in our modeling tool to characterize levels of bureaucratic organizational control. Low Centralization settings in the Decentralized and Holonistic models mean decisions are made by the individual responsible positions. Centralization reflects decision-making in the organization—either by senior project positions or by “decentralized” individuals. With high Centralization, there is more communication required. Formalization measures how formal the communication is in an organization, with high Formalization meaning that communication tends to occur in formal meetings (despite the many informal communication occurring in any typical project office), and low settings reflecting informal communication among positions. Matrix strength characterizes the probability that workers will attend to exchanges of information—



whether via meetings, communications about tasks, or noise. It conveys “connectedness” and can correspond to geographical collocation of workers. Typical major program acquisition organizations have workers and decision makers distributed across the country, and there is a greater need for meetings. The low setting for Typical acquisition organizations, however, reflects high meeting quality and complements high Formalization. Conversely, high Matrix Strength, which complements low Formalization, characterizes our flatter, more Decentralized or Holonistic organizations. In the “Typical” model, we use a three-level management hierarchy with two different full-time equivalents (FTE) in two management positions, acting as portfolio manager and senior executive. We reduce to two, and then one in the other derivations. The PM and SL designations beside their positions are VDT designations, which connote decision-making. The 50 FTEs aside—Operations represent project management office personnel in five distinct project work areas that are interdependent, and become more strengthened with communication links, used as such by the VDT. In the Typical DoD acquisition organization, we have observed it is common for individual project offices within a PEO to communicate infrequently, though there is a great deal of vertical communication within the hierarchy, evidenced in the model with Meetings. We also reduce the number of meetings in the successively flatter organizational designs.

Correspondingly, hierarchical communication is also depicted via a low setting (0.1) of Information Exchange Probability for the Typical Organization and growing much higher (0.9) in the flatter designs. This is characteristic for a project involving mostly routine daily jobs performed by skilled workers (Typical design). A higher value is given the designs with more highly interdependent tasks that are being performed by very busy workers. A low setting of Application Experience for the Typical organization, and set at the entire program level, describes how many new R&D projects the positions may have worked on before, in spite of relative individual skill levels (which are all presumed as Medium and Matched to the work tasks assigned across all three designs). The Decentralized and Holonistic learning organizations are envisioned as learning organizations, with the benefit of some Application Experience (set at medium), from less complicated information processing and learning.

Five Rework links connect all tasks in the Holonistic design, given the lack of an overhead hierarchy as an integrative function. This is opposed to two links in the Decentralized and Typical designs. Likewise, Rework Strength designations shift to reflect success/failure dependency as higher in the Decentralized and Holonistic, and lower in the Typical hierarchy, commensurate with associated task interdependency. In much the same way, the stove-piped, independent efforts within the Typical organization hierarchy are represented in lower Functional and Project Error Probability settings. Higher settings for the flatter organizational designs convey the challenge of integration and alignment they must face without an overarching control entity.

The total simulated work task effort of all organizational designs is the same, except that layers of management in the Typical configuration have their own management tasks that run about 25% of the duration of the project’s planned timeline. The team experience value in the VDT tool affects the amount of information exchange on the project and the way a position’s information processing speed is calculated. Team Experience for the work effort is set to medium for all organizations, representing a measure of how successfully the team has performed related projects.



APPENDIX B: ENVIRONMENTAL PARAMETERS

This appendix provides additional detail about the environmental scenarios that our experimental acquisition organization models were subjected to. Table 2 above specifies environmental parameters and VDT simulation settings for both of our environmental conditions: Routine and Stressed. We reproduce the information below as Table 5 and discuss the various parameters.

Table 5. Environmental Parameters

Environmental Parameter	Routine	Stressed
Requirement Complexity	Medium	High
Solution Complexity	Medium	High
Uncertainty	Medium	High
Noise	0.3	0.4
Functional Error Probability	0.1 & 0.2	0.3 & 0.4
Project Error Probability	0.1 & 0.2	0.3 & 0.4

Requirement Complexity describes the degree of task complexity, which is relative to the total number of project requirements that the task must satisfy. Representative of current DoD acquisition environments are state-of-the-art technologies and interoperability requirements. As such, there is a common environment of at least a medium setting within our VDT tool for organizations under even routine circumstances. An even more highly optimized design could have many tasks with a high requirement complexity, and is appropriate for our “stressed” settings.

Solution Complexity represents the number of solutions to which a task contributes. The degree of complexity reflects the effect a task has on the tasks that depend on it. Thus, for routine circumstances, we use “medium” and “high” for stressed scenarios.

Uncertainty is a setting regarding the amount of communication across links needed for a task’s (and its dependent tasks’) completion. Task uncertainty reflects the effect that other tasks can have on each other within the project. Task Coordination volume and the number of communications increase with higher uncertainty, so we selected “medium” for routine and “high” for stressed environments.

Noise Probability describes the interruptions or distractions that detract from work on project tasks. The probability of noise is set at 0.3 for our routine scenarios and 0.4 for stressed.

Functional error probability is the probability that a task will fail and require rework. Functional errors are localized to an individual task and, thus, only cause rework in that task. Functional errors could be discovered via self-check, a project-review meeting, or a supervisory review. Depending on the level of centralization and hierarchy in the project, an exception can be handled by the responsible position or someone up the hierarchy. When a functional error is detected, an exception is sent to the responsible position or to a supervisor, generating either



rework of the task, a quick fix, or feigned ignorance of the problem. Project error probability is the probability that a task will fail and generate rework for all dependent tasks connected to it by rework links. The more rework links there are in a project, the more rework is generated by the exceptions that occur. We select 0.1 as our routine setting for the Typical organization and 0.2 for our Decentralized and Holonistic designs, reflecting their decreasing management potential for intervention. For stressed scenarios, we use 0.3 for our Typical organization and 0.4 for our Decentralized and Holonistic designs.



From Market to Clan: How Organizational Control Affects Trust In Defense Acquisition

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ABSTRACT

Military acquisition relies upon industry for new product development, but market organizational control is not recommended for knowledge-intensive work. Unfortunately, increasing hierarchy-control mechanisms, such as formalization, could reduce trust. What is the appropriate balance of control mechanisms and trust for an IPT in the DoD acquisition realm? We conducted interviews and surveys in a major military acquisition program office employing IPTs, Alpha Contracting and collocation. We found that the relationship between formalization and trust was different between government and contractor team members. Acquisition managers must understand the relationships between control mechanisms and trust within and between organizations to increase collaboration between government and contract personnel.

Key words: Trust, Organizational control, Transaction-cost Economics

INTRODUCTION

The government and industry partnership is central in the military acquisition domain—with both parties pursuing both common and separate goals based upon their buyer and seller roles. Organizational control theory holds that in such environments of differing goals, managers can use three types of control systems: the market, the bureaucratic, and the clan (Ouchi, 1980). In *market organizational control systems*, managers contract with and then monitor their suppliers. In *bureaucratic (hierarchical) organizational control systems*, formal control mechanisms (such as rules and regulations) are enforced through hierarchies. Workers within *clan organizational control systems* self-manage using common values, traditions and beliefs. Acquisition of new weapon systems has traditionally employed the *market* form of organizational control with the industry side of the partnership, and *bureaucratic* organizational control within the Department of Defense (DoD).

Given the nature of new product development, DoD Program Management Offices typically operate in the context of relatively high asset specificity, risk aversion and uncertainty. Although these variables have been shown by research to encourage the switchover from *market* to *hierarchy* control, the government/industry buyer/seller relationship precludes the adoption of hierarchical organizational control or even quasi-vertical integration.

However, over the last 10 years, defense acquisition has adopted Integrated Product and Process Development (IPPD), using Integrated Product Teams (IPT) to encourage government and contractor personnel to work more closely together to design and build new products (OUSD, 1998). IPTs, Alpha Contracting, management councils and other organization-oriented changes (such as collocation of government and contractor personnel) have extended the *market* form of organizational control; yet, each of these must stop short of switching over to the *hierarchical* or *bureaucratic* organizational control form given the separation of public and private enterprise.

The government's goal orientation in its procurement pursuits is provided in the guiding principles of FAR Part 1.102:

The Federal Acquisition System will—(1) Satisfy the customer in terms of cost, quality, and timeliness of the delivered product or service by, for example—(i) Maximizing the use of commercial products and services; (ii) Using contractors who have a track record of successful past performance or who demonstrate a current superior ability to perform; and (iii) Promoting



competition; (2) Minimize administrative operating costs; (3) Conduct business with integrity, fairness, and openness; and (4) Fulfill public policy objectives. (FAR, 2004)

In short, the government seeks the best possible value of goods and services for the least cost to the taxpayer, while industry seeks to maximize profit while avoiding competition. Fundamental goal differences notwithstanding, this partnership has historically yielded unmatched military capability, as well as profit for shareholders.

Trust has also been recognized as a critical ingredient in modern defense acquisition (Siemsen, 2002). Although *trust* is considered to be the basis of the *clan* form of organizational control, scholars recently have observed that *trust* can be used to extend *market* control and to avoid switching over to *hierarchical* control.

This research study asks: What is the appropriate balance of hierarchy-control mechanisms and trust for an IPT in the DoD acquisition realm?

In this paper we describe the changes in work structure in major military acquisition programs employing the IPPD and Alpha Contracting approaches. We analyze the risks for client and supplier representatives in new product development teamwork and develop hypotheses about the effect of control mechanisms—such as formalization—on interpersonal trust. We conducted eighteen interviews and a survey in a major weapon system program office employing IPTs, Alpha Contracting and collocation to test our hypotheses. We analyze and report the results and describe the implications for managers of IPTs.

THE EVOLVING GOVERNMENT/INDUSTRY RELATIONSHIP

New product development is increasingly undertaken in the context of inter-firm collaboration, in which a client firm engages an outside supplier to design and/or engineer a component, subsystem or process (Carson, Madhok, Vasrman & John, 2003). Likewise, in defense acquisition the government engages industry suppliers with contracts to develop their new products. Because the US government is often the sole purchaser of newly developed weapon systems, something of a monopsony exists in which the supplier cannot sell the product to another purchaser without the government's consent. Similarly, once the government selects a single supplier to develop a new technology, the supplier gains a competitive advantage over other suppliers, creating a monopoly supply situation for follow-on procurement contracts. Therefore, the power of buyer and seller are somewhat balanced in a situation in which asset specificity develops and partners change to entail extremely high transaction costs. In such a situation, exit costs are high for both parties: the cost to the government of nonperformance by the contractor is high, and the cost to the contractor of finding another partner is very high as well.

Alpha Contracting

The government's traditional contracting approach (before acquisition reforms of the last decade) required successive iterations between the client and the supplier—to discover the client's requirements and the applicable supplier technologies—until a relatively complete contract could be written. This traditional sequential interdependency relationship has changed to a closer reciprocal interdependency relationship with Alpha Contracting, in which the client and supplier work together to define the requirements and discover solutions. Again, the Federal Acquisition Regulation gives guidelines for this dialogue:



The Government must not hesitate to communicate with the commercial sector as early as possible in the acquisition cycle to help the Government determine the capabilities available in the commercial marketplace. The Government will maximize its use of commercial products and services in meeting Government requirements. (FAR Part 1.102-2)

Alpha Contracting has evolved from a 1990s-era reform initiative aimed at improving government and contractor communications in order to increase efficiency and effectiveness. At its very foundation is a need for increased trust and teaming toward common government/industry objectives, within the paradigm of their buyer/seller relationship. By encouraging more collaboration early in the contracting negotiations phase, Alpha Contracting reduces procurement costs and cycle time via joint and concurrent processes and information flows. Key activities in the process are: specification of requirements, preparation of the statement of work, negotiations and executive review. Even though direct savings may be hard to quantify, most agree the savings derived from Alpha Contracting are substantial, even if the only savings counted is the increase in the program office staff's time free to solve other problems (Nissen, 1997). As Siemsen (2002) explained, the indirect benefits extend to both government and contractor as monitoring costs of other agencies like Defense Contract Audit Agency (DCAA) and Defense Contract Management Agency (DCMA) are precluded. This initiative actually seeks and obtains the information that enables a trust-based partnership. The shift from sequential to concurrent requirements definition and design is happening in many industries, not only the DoD. For example, the construction industry has adopted the design/build approach.

In addition to collaborating on the requirements definition and contracting phase of new product development, the interpersonal closeness developed in the Alpha Contracting approach can be carried over to the development stage. The use of Integrated Product Teams (IPT) encourages the government's user representatives and the contracting supplier's engineers to work together as the new product is designed and the initial prototypes are built. In some instances, the government's representatives and the contractor's engineers are collocated in the same building. The potential advantages of this increasingly close interdependency between client and supplier are to shorten the design process, reduce development costs and, hopefully, to increase the quality of the resulting product. These advantages mainly apply to the government, but the advantage to the contractor in such closer interaction might be a perceived increase in the likelihood of winning a future competitive bid. The potential disadvantages of this trend towards more concurrent engineering include the difficulties of achieving higher interdependencies between everyone involved in the project, including the government representatives and the contractor's engineers, designers and developers.

ORGANIZATIONAL CONTROL MECHANISMS: MARKET, HIERARCHY AND CLAN

Transaction-cost economics proposes that when the specific identity of the parties has an important cost-bearing significance, the transaction becomes idiosyncratic, rather than unspecialized (Williamson, 1979). Cost economies in production occur if the supplier develops a special-purpose plant or the labor force develops special-purpose skills in the course of contract execution. Special-purpose skills, which can reduce transaction costs, include institutional and personal trust.

Although both buyer and supplier have long-term interests in implementing changes through a strategy of joint-profit maximizing (meaning value to each partner), each also has an interest in appropriating as much of the gain as possible (Williamson, 1979). Productivity



benefits can result in excessive haggling, which could dissipate the benefit of the changes to both parties. Alternatively, those changes could go unrealized for fear of initiating an expensive conflict. The government buyer has to trust the contractor supplier will take advantage of all potential productivity-improvement opportunities. The contractor supplier has to trust the government client will share the benefits from productivity improvements fairly.

Ouchi proposes three fundamentally different forms of organizational control for dealing with the problem of obtaining cooperation among individuals or collectives—like government buyers and contracting suppliers—who share only partially congruent objectives. These are market organizational control, hierarchy organizational control and clan organizational control (1979).

Market Organizational Control and Price

Market organizational control is based upon price (Adler, 2001), which can be a very efficient control mechanism, but the conditions for an efficient market do not always exist. In new product development, exactly how long it will take to develop a new technology or how much it will cost is difficult to predict; these unknowns make writing a fixed-price contract impractical. In the uncertain conditions provided within research and development (R&D), the government has adopted the practice of awarding cost-reimbursable contracts. This means that suppliers won't compete on price alone, but on more intangible aspects, such as their demonstrated skills, abilities and facilities; this increased range of competition reduces the strength of the market form of organizational control. In new product development, the client wants the supplier to develop extensive knowledge about the technology and users—making market-organizational control less attractive. Notwithstanding the U.S. government's sovereign right to terminate contracts for cause or convenience, the government's ability to wield market organizational control can become limited over time by the difficulty of exiting the relationship to buy from another supplier due to the asset specificity the new supplier has developed. Switching suppliers will incur huge costs and considerable time due to getting a new supplier "up to speed" on the new technology.

Hierarchy Control and Authority

When asset specificity and governance costs are high, hierarchical organizational control, based upon the exercise of authority (Adler, 2001), has advantages over market control (Chiles & McMakin, 1996). Hierarchical organizational control involves control mechanisms largely based upon formalization, which is establishing rules and monitoring behavior to ensure compliance with the rules. Unfortunately, formalization has a large administrative overhead in writing and enforcing rules. Also, in new product development, writing rules that cover all conditions when the transformation process is unknown is difficult; likewise, in knowledge work such as R&D, monitoring adherence to rules is difficult.

Clan Organizational Control and Trust

Ouchi suggests people must be able to either trust each other (i.e. have congruent goals) or to monitor performance (1979). Since monitoring performance is difficult in new product development, the situation calls for the clan form of control, which is based upon trust (Adler, 2001). Clan control relies on a "deep level of common agreement between members on what constitutes proper behavior, and it requires a high level of commitment on the part of each individual to those socially prescribed behaviors" (Ouchi, 1979). IPTs, Alpha Contracting and collocation can be seen as a move away from market and hierarchical control in the direction of



clan form of organizational control. In order for clan control to be effective, the organization must have or develop an appropriate organizational culture involving higher levels of trust. Unfortunately, many managerial strategies fail due to incompatibility with the organizational culture (Schneider, 2000).

PRICE, AUTHORITY AND TRUST IN NEW PRODUCT DEVELOPMENT

Military acquisition of new products involves all three organizational control systems described by Ouchi (1979). The formal relationship between the government and the contractor is a market-based control mechanism using contracts and market power. Once the contractual relationship is established, an IPT organization is set up and the government implements formal control mechanisms. When the work starts, informal social mechanisms develop. Through the life of the project, at different levels of organization (from the top level of contact between the government and contractor, through the IPT structure to the individual team members), the three forms of organizational control operate in various combinations (Ouchi, 1979).

Several studies have looked at the conditions under which each control mechanism will be used. Some researchers propose that most organizations use some combination of all three control mechanisms of price, authority and trust (Bradach & Eccles, 1989; Adler, 2001). Adler proposes that, particularly for knowledge-based assets which form the basis for new product development, price and authority are relatively ineffective control mechanisms compared to trust.

Gunnarson and Levitt propose that when the reduction in production savings achieved through economies of scale in outsourcing is less than the increases in transaction costs due to asset specificity, the firm will switchover from market to hierarchy control (1982). New product development has two out of three of the sources of asset specificity found in idiosyncratic transactions, including technology specificity and knowledge specificity, but not typically location specificity. With high asset specificity and low economies of scale, the product development organization is likely to switchover from a market to hierarchy form of organizational control. Zaheer and Venkatraman (1995) found that asset specificity is positively and significantly related to greater degrees of quasi-integration. This means that new product development is more likely to be vertically integrated than other activities.

The US military predominately out-sources its research and development of new weapon systems; thus, it does not have complete hierarchical control over its selected industry providers. Zaheer and Venkatraman (1995) found that trust was positively and significantly related to greater degrees of quasi-integration. This means that the closer the organization was to a hierarchy, the more trust developed. But Chiles and McMackin propose that when there are higher levels of trust, the switchover from market to hierarchy will occur later (1996). Therefore, the effects of trust can be to extend the range of market control and delay the switchover from market to hierarchy.

This study asks: when the client organization extends the range of the market form of organizational control in new product development, what effect will this have on interpersonal trust between IPT members?

Trust in New Product Development

In this research, trust is defined as the trustor's willingness to accept the risk of relying on a trustee, even when the trustor is unable to monitor or control the trustee (Rousseau, Sitkin,



Burt & Camerer, 1998; see also Mayer, Davis & Schoorman, 1995). In the trust equation (Hardin, 2000), “Person A trusts Person B about X,” which is the object of trust. Zolin and Hinds (2004) extended the equation to say “when Z,” where Z is the context of trust.

Trust is considered to be essential to cooperation (Kollock, 1994) and expected to have an impact on performance (Dirks, 1999), particularly in knowledge-intensive work (Lane, 1998) such as new product development.

Trust is highly influenced by the perceived trustworthiness of the trustee, the context (Rousseau, Sitkin & Camerer, 1998; McEvily, Perrone & Zaheer, 2003, Zolin, Hinds, Fruchter & Levitt, 2004) and the history of the relationship. Perceived trustworthiness is the trustor’s assessment of the trustee. This multidimensional construct is proposed to contain the dimensions of ability, benevolence and integrity. Ability reflects the trustee’s skills and resources required for the necessary performance. Benevolence represents the extent that two parties share the same objectives; the trustor can trust the trustee to make decisions and act as the trustor would in the situation. Hardin calls this “encapsulated interests” (1998). Integrity is the trustee’s honesty in not misrepresenting the situation.

There are many dynamics involving risk (vulnerability) and trust from the organizational to the interpersonal levels within the Program Management Office in the IPT structure. As mentioned before, the two parent organizations may have different economic objectives, but they agree to work together to achieve the project goals of designing and developing the desired product within time, cost and quality constraints.

Individual team members also have different objectives depending upon their role in the design process. For example, a design engineer could have different (and sometimes conflicting) objectives from the government’s user representative. In the ITP, the government personnel represent the user and have extensive knowledge of how the product will be used in the field or what the logistical or maintenance issues will be. The government representative’s function is to give the contractor engineer advice on how to design the component to maximize the value to the user. The engineer’s job is to solve the engineering problems involved in the design of a new component or in integration of the new component into the system. To do so, the engineer has to understand the many constraints imposed by the function of the component and its interaction with other components in the system. The government representative’s suggestions could remove some constraints, making the component easier to design. Or he/she could add new requirements, making the component more difficult to design. The engineer has to trust the government representative in order to accept the advice. If the government representative is wrong, the contractor’s engineer could have to do a lot of additional work redesigning or reintegrating the component. Therefore, the engineer must trust that the government’s representative knows the user’s requirements (ability), has concern for the engineer’s work, won’t change the requirements without good reason (benevolence) and will be honest about what happens (integrity). Similarly, the government representative has to trust the engineer to listen to the advice, to accept or reject the advice based upon a sound knowledge of the constraints (ability), to not take the easy way out to reduce work (benevolence) and to be honest about the situation (integrity).

Risk, Trust and Control Mechanisms

Trust is only relevant when there is risk in the relationship. In addition to the usual risks of collaborative work—such as the free rider problem, in which an individual shirks his or her duties knowing that others in the group will perform them (Hardin, 1971)—new product



development entails additional uncertainty regarding the ability of the design engineers to develop the new product to the client's specifications within the scheduled time and budget.

Trust and control mechanisms are strategies for dealing with the freedom of the other party to take actions that may disadvantage the trustor. Because the trustee has freedom to act, the trustor wants to reduce the amount of risk he/she is exposed to. While a trustor may use control mechanisms, such as formalization of contracts, to limit the size of risk or the likelihood of failure by the trustee, ultimately collaboration requires some risk and, consequently, requires some trust.

Das and Teng propose that trust and control mechanisms work as supplements, rather than alternatives, to create cooperation and reduce opportunistic behavior in inter-firm alliances (1998). Leifer & Mills define control as a "regulatory process by which the elements of a system are made more predictive through the establishment of standards in the pursuit of some desired objective or state" (1996, p. 117). Das and Teng also use the concept of control mechanisms, which are organizational arrangements designed to determine and influence what organization members will do. If trust and control mechanisms are supplementary, they will have a positive relationship, such that the more control mechanisms there are, the more trust will develop.

Alternatively, some theorists propose that trust and control are complimentary. In other words: the more trust there is, the less control mechanisms are needed, or the more control mechanisms are used, the less trust develops. Sitkin and Roth propose that legalistic remedies—i.e., "mechanisms that are institutionalized, mimic legal forms, and exceed legal regulatory requirements" (1993, p. 367)—will fail to restore trust and could lead to an "inflationary spiral" of increasingly formalized relations. They distinguish between trust based upon ability and distrust based upon generalized value incongruence. They propose that legalistic mechanisms are more effective in addressing reliability issues than value incongruence. Researchers have found that highly formalized management-control systems lead to escalating distrust when they are mismatched to the task at hand, such as the use of precise and deterministic measurement and monitoring in conditions characterized by high levels of uncertainty (Sitkin & Stickler, 1996).

Organizational boundaries could influence the relationship between trust and control. Dyads operating within the same organization could have a supplementary relationship between trust and control because controls provide protection and reduce the risk needed for trust. In contrast, when dyads operate across organizational boundaries, there could be more value incongruence. We propose that dyads operating across organizational boundaries will have a negative relationship between trust and control mechanisms, while those operating within the same organization will have a positive relationship.

Hypothesis 1: When the trustor and trustee belong to the same organization, there will be a positive relationship between control mechanisms such as formalization and trust.

Hypothesis 2: When the trustor and trustee belong to different organizations, there will be a negative relationship between control mechanisms such as formalization and trust.

METHODOLOGY

This research project studied a target population composed of all twenty-eight IPT teams in an Acquisition Category (ACAT) 1D major defense acquisition development program. Those IPT teams contained 368 members consisting of government, civilian, military and contractor



employees. The research consisted of two elements: qualitative interviews and a quantitative survey.

Eighteen semi-structured interviews were conducted onsite with 12 government personnel and 6 contractor personnel. Interviews were voluntary and individuals self-selected to be interviewed. The growing size of the project IPT was mentioned by the Project Manager prior to the study as a potential problem. Questions were asked about collocation, team size and Alpha Contracting, but respondents were also encouraged to raise their own issues and discuss what problems and solutions they perceived.

Team members were asked to complete an online survey. A non-probability convenience sampling method was used. Team members were invited to respond on a voluntary basis.

Respondents were asked to answer questions about their demographics as well as questions about their relationship with the trustee. The respondents were asked to provide information on their work relationship with four other employees chosen at random. This design created pairs of trustor (respondent)/trustee called “directional dyads.” The directional dyad is the unit of analysis. The sample size was 370 directional dyads.

Except for questions about the frequency of communication, all variables were measured using a 7-point Likert scale from “Strongly disagree” (1 point) to “Strongly agree” (7 points). Where a question was reversed in the meaning from the overall direction of other questions, the result for that question was reversed (i.e., a 1 was converted to a 7).

Trust ($\alpha = .72$) and perceived trustworthiness ($\alpha = .96$) were measured using scales developed by Mayer and Davis (1999). Zolin, Fruchter, Hinds and Leavitt (2004) proposed the questions for risk and reward, and a scale for perceived follow-through ($\alpha = .88$). Formalism ($\alpha = .80$) was measured on a scale developed by Hanks and Chandler (1995). Project communication, coordination communication and personal communication were measured by the number of times the topic was discussed per week.

Analysis

For the 370 directional dyads, t-tests for differences in means for government versus contractor personnel were conducted. To test for interrelationships between the variables, we computed Pearson correlation coefficients with respective p-values. Linear regression was used to model the relationship between the trust as the dependent variable and the various independent variables.

QUALITATIVE RESULTS

Collocation, Alpha Contracting and Team Size

Most individuals interviewed reported being collocated with their team members. The general consensus was that collocation was better, making communication easier. The positive attitude towards collocation was shared by both government and contractor personnel, but the government personnel appeared to appreciate collocation more. Government personnel reported that before collocation they had to make formal appointments to meet with contractors, journey from one building to the other (several miles) and waste the trip if the other party became unavailable. Collocation provided the opportunity to meet informally.



The few individuals whose teams were divided between two buildings reported that geographic distribution made communication difficult and slowed the process. Sometimes, although the team was collocated, the respondent had to work with other teams that were geographically distant, which caused problems. For example, a contract team member reported that difficulties arose from not being close to the Configuration Management team. Geographic separation was reported to increase “stove piping,” although even those who were collocated reported this issue.

Alpha Contracting was positively received, although some contractor personnel were not familiar with the term. Alpha Contracting was mainly associated with collocation of government and contractor personnel.

Although several respondents mentioned they had never worked in such a large project team, the overall size of the project was not mentioned as a problem. A problem which was mentioned more than once was the ineffectiveness of large meetings (described as consisting of 30 to 80-plus people). The difficulty of making decisions in such a large meeting was mentioned by four government personnel.

Another problem related to team size was the difficulty created by team growth. The addition of new team members was reported to slow things down because each addition had to be briefed on what was happening.

Problems and solutions

The onsite interviews had a higher response rate from government (11) than contractor (6) personnel. As would be expected, the individuals who volunteered to be interviewed had strong opinions (usually negative) about the project. Only one respondent mentioned no problems. Respondents mentioned many of the problems that IPTs and Alpha Contracting are designed to overcome, including lack of communication, stove piping, and lack of integration. Problems mentioned included:

1. Stove piping, conflict, personalities, career-agenda people
2. Disrespect for top management
3. Lack of communication, coordination, cooperation
4. Schedule-driven, overly ambitious schedule
5. Micro-management
6. Lack of integration
7. Lack of discipline, lack of control and lack of strong leadership
8. Large meetings
9. Lack of training

Complaints were more often directed toward the system than individuals. Government and contractor personnel were just as likely to criticize their own organization’s performance as that of the other organization. Despite this, there was a general feeling of frustration by government personnel who felt they had no control and no way to make the contractors heed their advice, despite sometimes feeling like they had superior training and experience to that of

the contractors. Some contractor personnel also felt the government should take more control of the situation and give more direction.

Many respondents complained about the IPT team structure. There appeared to be two groups: those who preferred the “traditional” structure in which the “government told the contractors what to do” and those who preferred the IPT approach, but thought it wasn’t being followed. The Traditionalists were the larger group and represented both government and contractor personnel. Typical complaints by the Traditionalists were lack of discipline, lack of control and lack of strong leadership. Typical complaints by the IPT supporters were lack of adequate training. One government IPT supporter said:

There is no such thing as a Government IPT. The Government IPT was created by those who refuse to break with tradition. Folks in a Government IPT do their own thing and then talk to the contractor when they’ve made up their minds. In a real IPT, the government is a representative, not a lead. -Government representative

The difficulty of integration was mentioned by both government and contractor personnel. Integration includes the need for coordination of design changes across the IPT. One Contractor mentioned, “people don’t want to make changes, it takes more work.”

Many of the individuals who volunteered for interviews belong to IPTs that have to integrate across the existing IPT structure; for example, some teams were described as Interface IPTs creating components (such as cabling) to connect system parts. If a part changes, the cables connecting to it have to change. Besides being made to work extra if a part changes, these individuals are not always told when something upstream changes. Two IPTs were created by the government to represent the two prototypes under construction and to integrate across the functional IPTs; yet, these two government IPTs weren’t reflected in the contractor structure at the time of the interviews.

QUANTITATIVE RESULTS

The descriptive statistics are reported in Table 1, which shows the means, standard deviations and F-statistic for the comparison of government and contractor personnel (See Table 1). Both government and contractor trustors had high levels of trust, between which there was no significant difference (F-statistic = 2.19, n.s.). When we distinguish dyads by both trustor and trustee (e.g., government trustor and government trustee—G to G), the dyad type with the highest trust was government to contractor. The lowest was contractor to government.

Government trustors reported significantly higher levels of project communication (F-statistic = 13.87, $P < .001$), coordination communication (F-statistic = 7.40, $P < .01$), and perceived follow-through (F-statistic = 6.46, $p < .05$) than contractors.

Table 1. Descriptive Statistics

Variable	All		Government		Contractor		F-statistic	Gov to Gov	Gov to Con	Con to Con	Con to Gov
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.		Mean	Mean	Mean	Mean
1. Trust	4.97	1.36	5.21	1.34	4.92	1.35	2.19	5.2	5.3	5.0	4.6
2. Trust propensity	3.81	0.80	3.71	0.52	3.84	.84	1.51	3.6	3.9	3.8	3.9
3. Formalization	4.26	1.07	4.70	0.87	4.15	1.07	15.39***	4.6	4.8	4.0	4.7
4. Risk	3.96	1.17	3.79	1.08	3.99	1.17	1.51	3.9	3.6	3.9	4.3
5. Reward	5.77	1.04	5.38	0.93	5.86	1.04	11.72***	5.3	5.5	5.8	5.9
6. Project comms.	4.39	5.62	6.85	8.37	3.76	4.44	13.87***	7.8	5.2	4.1	2.1
7. Coordination comms.	3.11	4.10	4.46	4.92	2.68	3.72	7.40**	5.2	3.2	2.8	2.0
8. Personal comms.	2.27	2.58	2.81	2.79	2.11	2.52	2.69	3.4	1.6	2.2	1.6
9. Hours F2F	4.50	6.74	5.38	5.79	4.32	6.97	1.37	5.5	5.2	4.8	2.6
10. Perceived trustworthiness	5.60	1.17	5.77	1.05	5.57	1.19	1.56	5.7	5.9	5.6	5.3
11. Perceived follow-through	5.43	1.29	5.81	1.18	5.35	1.30	6.46*	5.9	5.7	5.4	5.2

*** p<.001, ** p<.01, * p<.05, + p<.10

Correlations between variables are reported in Table 2. Trust was significantly related to formalization ($r = .14$, $p < .05$) and personal communications ($r = .17$, $p < .05$), but there was no significant relationship to risk ($r = -.08$, n.s.) or reward ($r = -.04$, n.s.).

Table 2. Correlations

	1	2	3	4	5	6	7	8	9
1. Trust									
2. Formalization	.14*								
3. Risk	-.08	-.23***							
4. Reward	-.04	.12*	.18***						
5. Project comms.	.18**	-.05	.05	-.09					
6. Coordination comms.	.14*	.02	-.05	.01	.75***				
7. Personal comms.	.17*	.00	.01	-.18	.64***	.56***			
8. Hours F2F	.24***	.00	.03	-.16**	.42***	.31***	.44***		
9. Perceived trustworthiness	.80***	.13*	-.06	-.04	.12+	.07	.17*	.24***	
10. Perceived follow-through	.60***	.05	.05	-.06	.17**	.08	.22**	.30***	.68***

*** p<.001, ** p<.01, * p<.05, + p<.10

Hypothesis 1 proposed that when the trustor and trustee belong to the same organization there will be a positive relationship between trust and formalization. Both government and contractor trustors had high levels of trust, between which there was no significant difference (F-statistic = 2.19, n.s.) (See Table 1). When we distinguish dyads by both trustor and trustee (e.g., government trustor and government trustee—G to G), the dyads with

the highest trust were government to contractor (M = 5.3) and government to government (M = 5.2). The lowest was contractor to government (4.6). Government trustors reported significantly higher levels of formalization (F-statistic = 15.39, $p < .001$) than contractor trustors.

To test the hypothesis, we conducted regression models for each of the different dyad types (see Table 3). In model 2, there was a significant positive relationship between formalization and trust among government trustors and government trustees ($\beta = .31$, $p < .05$). Yet, no significant relationship existed for contractor-to-contractor dyads ($\beta = -.06$, n.s.). This data provides partial support for hypothesis 1.

Hypothesis 2 proposed that in dyads when trustor and trustee belong to the different organizations there will be a negative relationship between trust and formalization. In model 2, there was a negative relationship between formalization and trust in government-to-contractor dyads ($\beta = -1.02$, $p < .01$) and a barely significant negative relationship for contractor-to-government dyads ($\beta = -.36$, $p < .10$). This data supports hypothesis 2.

Table 3. Comparison of OLS Estimates (Standardized beta Values) of Trust

	Gov to Gov		Gov to Con		Con to Con		Con to Gov	
	M1	M2	M1	M2	M1	M2	M1	M2
Intercept	+		***		***			
Formalization	.44*	.31*	-1.02**	-.69	.05	-.06	-.13	-.36+
Risk	-.61*	-.08	.45+	.46	-.02	-.29***	-.36	-.57*
Reward	.14	-.06	.17	.14	.02	.32***	.52+	.07
Project communication	-.14	-.01	.14	-.06	.11	-.00	.11	.83+
Coordination communication	-.56	-.15	.19	.23	.00	.06	.05	-.36
Personal communication	.87**	.38*	.20	.20	.07	-.04	.41	-.47
Perceived trustworthiness		.71***		.35		.56***		.72**
Perceived follow-through		.04		.70		.35***		.40+
Adj. R-squared	.37	.71	0.71	0.71	-.02	.63	-.09	0.73
Model F	3.60*	13.11***	5.82*	4.44	0.65	22.78***	0.77	6.73**
Degrees of freedom	6, 21	8, 19	6, 6	8, 3	6, 10	8, 93	6, 11	8, 9

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$ (C = Contractor, G = Government)

DISCUSSION

Our results support our theories, which propose there is a positive relationship between trust and formalization in dyads within organizations, but a negative relationship between trust and formalization in dyads that span organizational boundaries.



Likewise, market control mechanisms operating at the firm level may be ineffective in regulating behavior at the interpersonal level.

In our qualitative results, both the government and contractors asked for more controls, although the level of formalization in both organizations was moderate, with government personnel rating formalization slightly higher than the contractors (Government 4.7 and Contractor 4.15 out of 7).

In our quantitative results, formalization increased trust for government trustors, but was not significant for contractors. In contrast, contractors' trust was associated with lower risks and higher rewards. These differences between government and contractor organizations could indicate differences in organizational context or organizational culture. More research is needed to determine the source of this difference.

The relationships between trust and formalization that applied within the government and contractor organizations did not apply across organizational boundaries. Although formalization increased trust of Government trustors for government trustees, formalization was negatively related to trust when the trustee was a contractor. Similarly, although trust was not significant for contractors within their organization, contractor trustors also had a negative relationship between formalization and trust when the trustee was a government representative. This confirms that there is a negative relationship between formalization and trust when the dyad spans organizational boundaries.

Given the market relationship between the government and contracting organizations, it is possible that their formal rules only applied within each organization, and that there were few, if any, rules that applied across organizations. For example, the government's rules applied to government personnel; yet, those same rules might not apply to the contractor's personnel. Similarly, the contractor's rules may not apply to government personnel.

When the organizational control is a market relationship at the organizational level; highly interdependent work seems to be difficult at the interpersonal level. In this context, we found individuals experienced difficulties which they felt could be alleviated by greater hierarchical control.

Although trust can be an alternative to hierarchical control, that trust must be built through shared norms and values; these may not exist between different organizations such as government and contractors.

Implications for Managers

This research does not question the basis for the government's decision to rely upon industry for its research and development; there are obviously good and enduring reasons for that policy. Given that the government and an increasing number of other organizations manage R&D through the market form of organizational control, what more can be done to facilitate the development of quality products developed within time and budget constraints?

1. Foremost in such contractual relationships is the realization on the part of organizational leaders that a substantial structural difference exists, especially in the case of government-industry (buyer/seller) partnerships. These structural differences create different risks and rewards for team members representing buyer-organizations compared to seller organizations.



2. Equally important is the need to develop trust without relying upon formalization, because formal rules could reduce trust. Alternative trust-building methods should be used, such as emphasizing shared goals and values by top management and enculturation of new team members.
3. Managers of outsourced new product development should be aware of the symbolic impact of their actions and consider how those actions will be interpreted by both buyer and seller representatives.
4. The client and contractor organizations should consider how inter-organizational rules could be instituted in ways that would facilitate, rather than erode, trust. For example, Positive Organizational Change initiatives (such as Appreciative Inquiry) could identify changes in ways that avoid the downward spiral of formalization. Likewise, an innovative approach toward trans-organizational individual (not just enterprise) rewards might be considered for improved motivation.
5. Program Managers should consider what teambuilding activities can be used to facilitate the development of trust and collective identity. Although the government has rules against the provision of benefits such as food and entertainment, opportunities may be created for government and contractor personnel to interact in social contexts.
6. Program Managers should bring the risks associated with lack of trust into explicit and conscious awareness. They can ensure the government personnel understand the problems they can cause by suggesting changes which would be overruled at a later date. They can also ensure the contractor engineers understand the loss they can create by ignoring valid suggestions from government personnel.
7. Program Managers should ensure team members understand their roles. Of particular importance is that the government representative understands the facilitation role—as opposed to a line-management role. Likewise, members of interfacing teams should be trained to understand project interdependencies and how to achieve component integration.
8. Finally, management should measure achievement in areas highly influenced by trust, such as government-to-contractor knowledge transfer and system integration.

This study was limited by the small number of respondents. Division of the dyads by both trustor and trustee yielded very small samples, but some statistically significant results were obtained. Our study is also a snapshot of the situation at a point in time, while trust is dynamic and varies over time. Therefore, we could learn more with a longitudinal study.

CONCLUSION

Trust is proposed as a way to extend market control of R&D and new product development.

We found that team members representing buyers had different relationships between control mechanisms, such as formalization and trust, than those representing sellers. Within their organizations, buyer's representatives had a positive relationship between formalization and trust, but that relationship did not exist for the seller's representatives. When



representatives operated across organizational boundaries, the relationship between formalization and trust was negative, indicating that greater formalization could lead to less trust.

We encourage managers of outsourced new-product development to be aware of differences in trust and control between buyer and seller representatives in such teams.

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Panel—Market-Based Acquisition

Wednesday, May 18, 2005	Outsourcing, Employment and Public Policy: Who are the Winners and Losers?
2:45 p.m. – 4:15 p.m.	Chair: Daljit Singh , California State University at Fresno Discussant: Davinder Singh , California State University at Long Beach Papers: <i>"Military Out-sourcing: Observations, Opportunities, Conflicts and Recommendations"</i> Olin O. Oedekoven, Northcentral University <i>"Out-sourcing as an Engine of Growth for the United States"</i> Craig Martin, Northcentral University <i>"Out-sourcing and Privatization" Creating Value at What Cost?"</i> Dwight A. Sheldon, Northcentral University

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Dr. Singh has served as Dean and Professor of Public Management, College of Business and Public Management, University of the District of Columbia, Washington, DC (1989-91), Dean and Professor of Public Administration, College of Business and Public Administration, University of Guam (1984-89 and 1996). In 1996, he was confirmed as Professor Emeritus of Public Administration at the University of Guam. During the same year, Dr. Singh was awarded by the Government of Guam the highest civilian award for community service, The Ancient Order of the Chammori. Additionally, he is a recipient of Official Commendations from the US Department of the Army and a Certificate of Recognition from the Department of Justice, Federal Bureau of Investigation.

Currently, Dr. Singh is serving as Lecturer in the Graduate Program in Public Administration at California State University at Fresno. He has authored or edited: *Small Business and Public Policy in America* (1981), *Government of Guam: A Reference Guide* (1981), and "Quarantine Laws and Small Business Development on Guam," *The Pacific Rim Journal of Small Business* (1996). He has co-authored with Dwight Sheldon, "The Digital Revolution and Investment Opportunities in Micronesia," a chapter in the forthcoming textbook: *Foreign Direct Investments in Developing Countries* (2005).

Discussant: Davinder Singh—California State University at Long Beach



Military Out-sourcing: Observations, Opportunities, Conflicts and Recommendations

Presenter: Olin O. Oedekoven is an Assistant Professor of Business Management and Public Administration at Northcentral University located in Prescott, Arizona. Dr. Oedekoven is also President of the Peregrine Leadership Institute headquartered in Gillette, Wyoming, where his Company provides leadership development, human resource management training, and business consulting. Oedekoven is a 26-year service member and currently commands the 115th Field Artillery Brigade of the Wyoming Army National Guard. He has been selected to become the Assistant Adjutant General for the Wyoming Army Guard in January 2006. Dr. Oedekoven is a graduate of South Dakota State University, the University of Wyoming, the US Army War College, and Northcentral University.

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ABSTRACT

Observations, opportunities, and potential conflict areas concerning both defense out-sourcing and out-sourcing of the military for homeland security agencies are discussed. Observations include the impact of transformation and network-centric operations on defense out-sourcing within a volatile and uncertain national security environment. Opportunities for out-sourcing include retention of institutional knowledge, assistance with generating a network-centric force, and cost savings. Potential areas of conflict include the domestic use of the military to fight terrorism and the asymmetric nature of warfare. Recommendations are offered that suggest areas for defense outsourcing and concern the domestic employment of the National Guard.

INTRODUCTION

The US military has long relied upon a critical relationship with the industrial community to maintain and enhance readiness (Michaels, 1999). Defense contractors research, test, and develop virtually all of the military's equipment, transports, armaments, and personal gear. The military-industrial relationship is absolutely critical if the services are to meet their constitutional mission to fight and win the Nation's wars. As the services, in particular the Army, move forward to rapidly modernize and transform for the 21st Century, the industrial relationship the military has relied upon for over 200 years will become even more vital because the Defense Department cannot conceivably move forward in any reasonable fashion without its private-sector partners.

The nature of warfare and defense readiness is, however, changing. New roles, responsibilities, and requirements within the military-industrial relationship are emerging. Today's battlespace is characterized by nonlinear battlefields, asymmetric threats, global engagement, and interagency dependence (Bush, 2002). A capabilities-based military must be agile, flexible, and rapidly deployable if it is to successfully fulfill its mission (Rumsfeld, 2001). The recently published National Defense Strategy states, "We will conduct network-centric operations with compatible information and communications systems, usable data, and flexible operational constructs" (Rumsfeld, 2005). As in the past, the industrial partners of the Defense Department are essential to provide the necessary capabilities for the Armed Services. It is,



therefore, important to critically examine the military-industrial relationship in light of recent trends, observations, and strategic defense guidance concerning defense out-sourcing to ensure that it is headed in the right direction.

The purpose of this essay is, therefore, to describe recent trends and observations regarding military out-sourcing, suggest opportunities for the future, discuss potential issues concerning Defense out-sourcing, and offer recommendations so the military-industrial-societal relationship can best meet the Nation's requirements. Out-sourcing is defined as the transfer of a function typically performed "in-house" by the organization to an outside or third-party vendor (Cardinali, 2001). Out-sourcing involves the movement of the work to the provider, but the responsibilities, accountability, and oversight for the services are retained by the owner. This paper focuses on the evolving nature of military out-sourcing within the last few years in terms of trends, opportunities, and potential concerns.

TRENDS AND OBSERVATIONS

Although there are numerous observations that could be discussed relative to the current and evolving nature of the military-industrial-societal relationship, a few noteworthy observations include force/structure changes, unprecedented deployments of both active and reserve forces, less distinct lines between "traditional military" and "traditional contractor support," the asymmetric nature of the conflict, the use of the military in a less traditional security role, and the recent trends regarding the use of the military as an out-source for homeland security agencies. Each of these trends and observations has had, and will continue to have, a unique bearing on defense contracting and military out-sourcing.

Current US military initiatives include modernization, transformation, re-stationing, network-centric operations, effect-based warfighting, and force rebalancing between the reserve and active components (Rumsfeld, 2005). Modernization efforts include precision munitions, lighter forces, and digital architectures for the command and control of deployed forces. Transformation measures include joint-interdependence of the services and creating capabilities-based forces. Effects-based planning and network-centric operations have replaced conventional warfighting paradigms of the last Century. Re-stationing for the military includes returning forces from Europe to create more continental US (CONUS) basing of forces (Noonan, 2005). Force rebalancing ensures that the military has the active-duty force structure needed for at least the first 30 days of the fight (Noonan, 2005). Collectively, the defense initiatives will result in an unprecedented change for the military in terms of its deterrence and warfighting postures. The Department of Defense has resisted changing end-strength, which is resulting in a need to outsource many logistical functions of the military as forces are re-designated from combat service support to either combat or combat-support organizations.

The second observation is that there is a much higher operations tempo (OPTEMPO) for the military services over the past 3 years than what has been seen in the US since World War II. The services are currently stretched between multiple theaters of operations and homeland security for the Global War on Terrorism (GWOT). Active forces are rotating between home station and deployed location every 6 to 24 months. Reserve Component (RC) forces are being activated at an unprecedented rate. Currently, over 60 percent of the RC has been mobilized at least once since the GWOT began in 2001 (Noonan, 2005). Defense contractors are used to backfill critical capabilities left vacant with the high OPTEMPO. Military out-sourcing is used to train, equip, and prepare units for their deployment.



A third observation worth noting for its impact on military out-sourcing is that there appears to be a less distinct line between what has been considered a “traditional military” role versus what is deemed “traditional contractor support” functions to the armed services (Cardinali, 2001). For example, home-station base security was typically handled by military security forces stationed at the base; however, most bases have out-sourced this function due in part to the rapidity of the security force deployments. Similarly, the security function for forward-operating bases is also being shared with military contractors. Deployed combat units have imbedded contractor support to assist with maintenance, transportation, logistical, electronic, and intelligence operations (Scharnberg, 2005). While out-sourcing the military’s logistical functions is not new, the pace of out-sourcing in recent years has clearly increased (Cardinali, 2001). The Department of Defense has been using private sources to train and equip US and foreign militaries for peace and stability operations for several years because of cost considerations, as opposed to using uniformed members for the duty (Burton-Rose & Madsen, 1999).

Blurred lines between civilian-military roles and responsibilities over the past 3 years lead to a fourth noteworthy observation: the asymmetric nature of the threat results in casualties for both military personnel and the contractors within the theater of operations (Scharnberg, 2005). The death toll of service personnel is regularly tracked and reported by the media; however, civilian casualties directly related to acts of war seldom receive similar media attention; they are barely acknowledged. Scharnberg (2005), for example, reported that since the Iraq war began, at least 232 civilians working on US military and reconstruction contracts have been killed as a direct result of combat operations. The actual death toll is probably much higher. Because contractors are deployed right along side of fighting forces and embedded within nearly every operational aspect of the military, contractors are also suffering casualties—but without the deserved attention. Of concern is that the true cost of the GWOT in terms of human lives lost may not be fully realized nor appreciated by the general public (Scharnberg, 2005). Additionally, it is worth questioning if the nation is putting civilian contractors in harm’s way without proper training, support, or appreciation for the job they are tasked to perform.

The GWOT is also resulting in an unprecedented use of the military for security and stability operations, both domestically and internationally (Noonan, 2005). The core competency for the armed services has always been to fight and win the Nation’s wars. The GWOT environment is such that the fighting and winning requires a dramatic shift away from the core competency into an area not traditionally viewed as a high priority for training and readiness. Security and stability operations require unique skills and capabilities compared to traditional warfighting. Out-sourcing has been used to create supplemental capabilities, augment the skills needed, and free-up uniformed forces for combat roles within the emerging national security environment.

The sixth noteworthy observation is the evolving use of the military, particularly the National Guard, as an out-source to the civil community. The Guard was used for airport security following 9/11, side-by-side with local police (Piatt, 2004). The Guard has been and is still being used to protect critical infrastructure in certain parts of the country in addition to its combatant roles overseas (Abshire, 2004). The Guard’s Civil Support Teams (CST) are tasked solely to provide a chemical-biological-radiological (CBR) response capability to state and federal homeland security agencies (“Plans Announced,” 2004). Although the Guard has a constitutionally defined dual-mission responsibility for both federal and state missions, recent trends in the domestic deployment of the Guard suggest that the organization may not be structured for all potential domestic missions. Moreover, one could legitimately question the appropriateness of using the Guard as an out-source for the civil homeland security community



and, instead, suggest that resources being used to create the capability for the Guard should be redirected to the civil agencies to create a civilian homeland security capability.

Again, while there are many trends and observations which could be discussed relative to military out-sourcing, ones presented here provide a basis to discuss emerging opportunities and potential conflicts regarding out-sourcing, defense contracting, and the military-industrial-public relationship.

OPPORTUNITIES

Some of the opportunities for military out-sourcing include the retention of institutional knowledge, cost savings over the long-term, adjusting the end-strength mandates for the services, creating more flexible capabilities, improving domestic preparedness, providing short-term fixes to critical problems, and accelerating military modernization and transformation. Clearly the opportunities for expanding and improving the military-industrial relationship are many; the ones presented in this paper are offered to initiate the discussions on defining new roles and opportunities for the defense community.

The military rank structure is one designed purposefully to create an “up or out” culture. Warfighting is clearly a young person’s profession given the physical challenges on today’s modern battlefield. Service members are generally promoted at specific intervals based on their years of service in their current grade and military education level. Most career service personnel retire at 20 years, which for most personnel, means retiring at age 38 to 45. Senior leaders are vulnerable to retention boards that force involuntary separation (unless they are regularly promoted to the next higher grade). The basic concept behind the military system is to create a balanced age and rank structure within the confines of end-strength mandates defined by Congress. At issue, however, is that the services lose institutional knowledge and experience as service members leave the military. An important opportunity for military out-sourcing is to view the relationship as one that can retain institutional knowledge within the defense community long after service members retire from uniformed service. For example, Military Professional Resources, Inc. (MPRI) and DynCorp are private defense contractors that employ many retired military professionals, much to the advantage of both the defense community and the Nation in terms of knowledge retention, information transfer, and cost savings (Burton-Rose & Madsen, 1999).

Certainly one of the key benefits to out-sourcing is cost savings to the Federal government over the long term (Michaels, 1999). Changes in the military’s end-strength would mean more retirees and entitlements for the future. Already federal entitlement programs constitute a significant portion of the federal budget. Adding to the military’s end-strength would increase Federal entitlements. Out-sourcing, however, can create an immediate military capability without the long-term costs of entitlements. An opportunity for military out-sourcing created by an end-strength adjustment would be in terms of developing infrastructure (training bases, schools, etc.) to support a higher end-strength. As defense planners consider out-sourcing versus force structure, a consideration that should be carefully weighted is the long-term cost of an end-strength increase.

Conversely, however, Congress does appear receptive to making an adjustment in the military’s end-strength, particularly for the Army (Schmitt & Shanker, 2005). Because the Army is stretched both globally and domestically and will continue to have a high OPTEMPO for the foreseeable future, an increase in the Army’s end-strength appears warranted. As the Army rebalances, re-stations, and transforms, consideration should be made to adjust force structure



to more closely align end-strength with the requirements. Currently, the Army is exceeding its end-strength cap because of the deployments and mobilizations (Schmitt & Shanker, 2005). It seems only prudent to consider making the change permanent so the Army can maintain the needed readiness levels long into the future by creating the support architecture needed to sustain the force.

Another opportunity for military out-sourcing is that out-sourcing creates greater flexibility and agility for the Department of Defense in terms of generating deployable capabilities that are military-civilian interdependent, as opposed to pure military forces (Cardinali, 2001). Just as the military is striving to achieve military joint-ness as a key tenet of readiness in order to maximize service capabilities, a military-civilian expeditionary force would have inherit strength in terms of institutional knowledge, flexibility, capability, sustainability, and deployment agility. Direct warfighting roles should remain in the uniformed services. Out-sourcing support functions of the expeditionary force would free-up resources needed for direct combat operations (Cardinali, 2001).

Out-sourcing may also improve domestic preparedness of the homeland security agencies at both the Federal and State levels. Contractors already provide resources in the event of a domestic natural or human-caused disaster. The Guard may be prepared to assist, but only if the units are not deployed and if they are trained properly for domestic employment (Oedekoven, 2003). A more enduring solution would be to create a permanent, and perhaps more reliable, domestic capability through out-sourcing and civil-agency expansion. Although the National Guard is certainly committed to fulfilling its domestic responsibilities, overseas deployments may trump readiness and availability for local and state emergencies. Although Weiss (2001) argued that the consequence-management requirements for Weapons of Mass Destruction (WMD) incidents should be in the National Guard and civilian agencies, the post-9/11 realities suggest that perhaps the response should be weighted more heavily in the civil community given the current availability, or lack thereof, of the Guard.

Out-sourcing can provide the much-needed help with military educational requirements while the military creates the educational infrastructure to support programmed schooling. The military's training base is currently stretched to the breaking point, and contractors currently provide military educational opportunities that the military otherwise would not be able to provide (e. g., distance education by the Senior Service Schools, the Army's Force Management School, the Reserve Officers Training Course, etc.). The rapid pace of technological change is also such that the military cannot be as responsive as it should be to the change. Out-sourcing allows the military to keep pace with technological improvements via equipment acquisition, training, and maintenance. An additional benefit of educational out-sourcing is that institutional knowledge can be retained and shared—provided that the contractors employ retired service personnel to instruct the programs.

Out-sourcing is critically important if the military is to successfully transform and modernize within the timelines established by the Department of Defense. It only makes sense that contractors be used to conduct the training for new equipment fielding in order to free up billets for combat and combat-support personnel scheduled for deployments. Out-sourcing is a proven method for helping the Army transition; it improves combat effectiveness at a faster rate than would otherwise be possible without the participation of the private sector (Harvey, 1996). Out-sourcing will be needed to create the training platforms, simulators, and facilities for the Army's modular force. If more resources were directed to military out-sourcing, it would be possible to accelerate the transformation/modernization program which is currently scheduled well into the next decade and possibly beyond.



Many other opportunities for military out-sourcing certainly exist given the nature of the national security environment. What is needed is greater imagination and creativity to better create and leverage the industrial capabilities that could support national defense.

POTENTIAL CONFLICTS

Out-sourcing is certainly not free of risk and conflict, both perceived and actual. It is important to recognize and mitigate risks associated with out-sourcing to create the defense posture the GWOT demands. Some of the potential trouble spots include: the domestic use of the military, long- and short-term costs, theater of operations casualties, and understanding and appreciating the asymmetric nature of warfare. Potential trouble areas can be divided into two areas: the use of the military as an out-source and the use of civilian organizations as an out-source for the military.

The nature of military training is that forces are used to “fight the enemy.” The domestic use of the military relative to acts of terrorism (both foreign and domestic) could lead to a potential conflict: the domestically deployed force could view US citizens as “the enemy.” The domestic employment of military forces must be such as not to create a value-conflict within the service membership. If the military, in particular the National Guard, is deployed as an out-sourced resource for civil homeland security agencies, the civil and military leadership must recognize and effectively mitigate the potential problem of “enemy recognition.” One need only look back to the Los Angeles riots in 1992 (Schnaubelt, 1997) and the riots and protests of the late 1960’s and early 1970’s to see the potential risks associated with the domestic employment of the military.

Federal law limits the domestic use of the military to conduct traditional law-enforcement duties (Schnaubelt, 1997). The Posse Comitatus Act prohibits Title 10 (Federal Active Duty) service members from a number of domestic law-enforcement roles. The military can work around this restriction by employing Air and Army Guard service members in a State Active Duty status. Funding for the deployment is the issue with this solution, however, because Title 10 service is paid for by the Federal government, whereas State Active Duty service is paid for by the States. It is important to learn from both the successes and shortcomings during the 1992 Los Angeles riots and the post 9/11 domestic deployments if we are to use the nation’s military as a security out-source for civil authorities.

A third potential trouble spot regarding military out-sourcing is within the area of cost and bureaucracy creation. There is certainly a strategic desire by the Defense Department to keep costs down by not changing end-strength. At the same time, however, the Department appears to be creating a much larger defense-contractor bureaucracy to address the short-term needs for out-sourcing. Recent media attention on the possible misuse of government funds regarding Halliburton in Iraq is due in part to the seemingly complex bureaucracy created to support the multi-billion dollar contracting program. The Department of Defense does not appear to be organizationally structured to best administer its huge defense contracting program. Media attention on the issue creates public perceptions of trust issues and support for the defense effort.

Another area of concern regarding military out-sourcing in light of recent trends and observations is the rising number of non-military casualties within the theater of operations from direct combat actions (Scharnberg, 2005). The public appears to not focus on the number of contractor casualties, only on the daily troop casualty figures. As such, the public might not be seeing an accurate picture regarding the strategic situation and the cost of the GWOT. The



potential conflict in this perception is that the nation appears to place a higher value on a service member's life than it does on a civilian defense contractor's life (Zucchini, 2005). The Nation must not travel down this very slippery moral slope of making a value judgment regarding the loss of a combatant versus a noncombatant American.

A fifth potential area of conflict concerns an appreciation for the asymmetric nature of war. Clearly, asymmetric warfare will now be the norm rather than the exception. No military in the world can go toe-to-toe with the US military and expect to win a protracted fight unless the enemy conducts asymmetric operations (Rumsfeld, 2005). An asymmetric battlefield means blurred lines between the locations of friendly and enemy troops. Historically, civilian contractors tended to operate within the theater or corps support areas, usually well away from the front-line battle. Today and for the foreseeable future, contractors, even those in support roles, will be operating throughout the asymmetric battle space (Zamparelli, 1999). The asymmetric nature of the threat may be relatively clear within the Defense community; however, the general public may still not fully appreciate the combat environment for the GWOT. Potential concerns regarding military out-sourcing within the asymmetric environment include a public that does not understand defense requirements nor appreciate the true costs of the campaign.

No doubt there are other areas of potential conflict and concern regarding military out-sourcing. As a nation and a defense community, civilian and military leaders should be forward thinking regarding potential conflicts and take the needed measures to more effectively manage the risks involved.

RECOMMENDATIONS

The following recommendations are offered to improve both the out-sourcing for the military and regarding the use of the military as an out-source.

1. Transformation and modernization of the military to create a network-centric-based force will require an integrated command and control architecture that includes all of the services and leverages both existing, as well as emerging, capabilities to create joint synergy. Specific opportunities for out-sourcing and acquisition include secure wireless technologies operating in remote and urban environments over long distances.
2. A network-centric force needs more effective tools to better measure the sociological effects of its operations. Much depends on the force achieving strategic and operational effects outlined in the theater and campaign plans; yet, few resources and specific tools exist to qualify and quantify the effects of the operations.
3. The Department of Defense should critically examine the employment of the National Guard's Civil Support Teams to ensure that they are fully integrated into the civilian emergency response network. It may also be prudent to examine if the CST should be a pure civilian organization that can tap into military resources but remains under a state homeland security agency rather than the military departments of the Guard.
4. The Nation should focus on building up the capabilities of the civilian emergency response communities and security agencies instead of being dependent upon the military, in particular the National Guard. The nature of



the National Security environment is such that the Guard will be regularly deployed and may not be available as originally planned.

5. The Country needs to recognize the true cost of war in terms of both military and contractor deployments and casualties. Perhaps the Department of Defense could re-examine the historical lessons learned during World War II concerning the Merchant Marines and develop a new defense organization that would more formally recognize and acknowledge the heroic efforts of defense contractors within the Theater of Operations.

Military out-sourcing has been and will continue to be absolutely essential for national defense. Like any program or business, continuous improvement is needed in the system to better realize potentials and reduce risks. Just as the military is transforming to meet 21st-Century defense challenges, so too should the military-industrial-public partnership adapt to meet changing out-sourcing needs.

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Out-sourcing as an Engine of Growth for the United States

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While pursuing his PhD, Craig has been teaching graduate business courses, primarily in the University of Phoenix Online and FlexNet modalities. His teaching experience includes instructing for two years at University of the Ozarks.

Prior to entering the academic world, Craig was an executive and CEO with several corporations for 25 years. As publisher and president of four daily newspapers in the Midwest and California, Craig enjoyed professional relationships with DoD units of the Air Force. He also held several positions in the healthcare industry, including marketing director of Latin American operations for Baxter, Inc.

Craig served as a Supply Corp Officer in the US Navy in the 1960s, and was stationed in Rota, Spain, and Jacksonville, Florida. He was selected to attend the civilian program of the United States Air Force Air War College in 1993.

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ABSTRACT

Proponents of out-sourcing cite numerous benefits accruing to those organizations pursuing out-sourcing. Yet, opponents decry the practice as the primary cause of job loss in the United States. This paper will demonstrate that the critics' perceptions are not supported by the actual experiences of organizations. Research has found, instead, that out-sourcing leads to the creation of more jobs (due to capital flows resulting from the beneficial impacts of out-sourcing) than are eliminated due to the process.

The discussion concludes with a proposal for creation of partnerships between the Federal government, state governments and non-governmental entities to advance the skills and knowledge of those persons unemployed due to out-sourcing to prepare them to reenter the workforce in newly created future positions.

OUT-SOURCING AS AN ENGINE OF GROWTH FOR THE UNITED STATES

The recent 2004 presidential campaign highlighted the ongoing debate over out-sourcing and whether it is beneficial or detrimental to the American workforce. Business executives, laborers, economists and scholars are all voicing their opinions in the continuing discussion, arguing the benefits of out-sourcing activities versus the costs and adverse consequences. While recognizing the negative outcomes of out-sourcing, this paper will focus on the many benefits derived from out-sourcing acquisitions of products and services.

Benefits of out-sourcing take the form of enhancing innovation, producing value-added outcomes, advancing technology and providing additional funds for reinvestment. Trade among



organizations and countries results in economic growth, and it will be demonstrated in this study that such activity leads to positive growth in employment at the macroeconomic level in the United States.

Perceived detrimental consequences of out-sourcing are usually limited to arguments regarding job loss and the loss of control by the organization participating in out-sourcing. Other research has shown that the latter is effectively addressed by employing modern management techniques to measure performance against desired outcomes. In the case of the former, this researcher has concluded that, while some job loss does occur within organizations or industry segments due to out-sourcing, the activity at the macroeconomic level can be shown to drive positive employment growth in the United States. Further, with the introduction of innovative and/or governmental programs to motivate the use of educational resources to assist in the transition of workers adversely impacted by out-sourcing, various case studies have indicated that most adverse impacts of out-sourcing relative to employment can be mitigated at the microeconomic, or organizational, level.

GLOBAL OUT-SOURCING BENEFITS AT THE MACROECONOMIC LEVEL

Out-sourcing—acquiring products or services from an entity independent of the organization—is not a new concept. Even when families and clans were the largest form of organized government, it made sense to out-source in order to take advantage of the skills of others outside the family unit (division of labor) and to employ outside labor to assist the family unit in the production of all the necessities for survival (labor saving).

On a larger scale, the Scottish economist David Ricardo advanced the theory of comparative advantage of production between countries as a reason to out-source. Ricardo's theory holds that greater growth in the Gross National Product (GNP) occurs if each country produces and trades those products for which it holds the comparative advantage of adding value to than if each country produces all products and does not trade (Ricardo, 1817, 163-164).

That Ricardo's theory is valid can be seen in research that illustrates that countries participating in trade in the 20 years prior to 1997 experienced GNP growth of 4.9% on average, while those that did not participate grew at a rate of less than 0.7% (Hill, 2003, 145-152).

Researchers logically ask: Did capital flows lead to similar beneficial results? Again, research shows that the flow of capital, or Foreign Direct Investment (FDI), *from* the United States results in positive flow of capital *to* the U.S. in the forms of profits, component products, services and investment.

The inflow of products and services to the U.S. directly related to FDI rose to 34% of total imports by 1993, and this percentage has remained fairly constant ever since (Aguilar, 1996). Profits and cash flow returning to the U.S. from subsidiaries of U.S. multinationals have grown substantially since the 1970s, as measured by Bureau of Economic Analysis (BEA) annual data (BEA, 2004).

Positive investment flow as a direct result of trade and FDI has also come in the form of FDI from foreign investors. Entities that are at least 50% owned by non-U.S. citizens contributed about 10% of all investment capital in the U.S. in 2003, enabled 5.1% of all U.S. employment in that year, purchased over \$1.0 trillion in goods and services from U.S. entities and made major contributions to American research and development (Slaughter, 2004).



Out-sourcing in the form of capital also has been shown to lead to intellectual benefits. By out-sourcing software development to India, among other countries, U. S. developers have been able to allocate an additional \$30 billion since 2003 to other research and development projects that will drive innovation and productivity (www.amrresearch.com).

In-sourcing of FDI, which has been positively correlated to the out-flow of FDI in the US, has resulted in over 14% of the annual US research and development expenditures flowing from foreign subsidiaries located within this country (Slaughter, 2004, 6-7).

While our primary purpose in this study is to explore the benefits of outsourcing for the US, it is interesting to note that research confirms similar benefits to other countries from similar flows of capital. This research demonstrates the positive contributions of trade and capital flows between Japan and the US, between the EU (European Union) and the US, between the three North American Free Trade Union (NAFTA) countries, and between Mexico and Malaysia.

ORGANIZATIONS BENEFITING FROM GLOBAL OUT-SOURCING

The macroeconomic benefits discussed above can be apportioned, on a microeconomic basis, to individual organizations, including private and public entities. For example, profits and cash flows from subsidiaries flow to the US parent, as do components for insertion into products in the US and finished goods ready for resale. While research confirms this on a case-by-case basis, this writer has not identified a comprehensive study demonstrating the anticipated conclusion.

Initially, a primary benefit of out-sourcing from the US, especially to developing countries, was the growth in profits from reduction in labor costs. Though these savings were partially offset by increased transportation costs, wage differentials were substantial enough to justify FDI. However, with the average life of a labor-rate-advantage study now being less than five years, a more recent study has found that adequate Return on Investment (ROI) cannot be earned based on labor-cost savings alone (Bartlett, 2004, 7-13).

In 2003, McKinsey & Company, a global consulting firm, found that shifting jobs off-shore was driven more by technological advancements in telecommunications and productivity enhancements than by efforts to shift to lower wage areas. The research found benefits to the US economy from cost reductions, the creation of new revenues as a result of new services offered at lower prices, and increased value added to firms as a result of US workers shifting positions, all of which led to increased profits (Geewax, 2004).

Foreign capital invested in plants and equipment and to procure inventory from US companies will naturally benefit the American entities, and technology advancements and innovation flowing to US entities are an immediate and direct contribution to the increased value of those entities, public and private. Moreover, FDI into the US resulted directly in the growth of the workforce by 5.1% in 2003. Two subsidiaries of foreign investors experiencing such job growth were GKN Aerospace, located in St. Louis, Missouri, and Saint-Gobain, located in the suburbs of Atlanta, Georgia (Slaughter, 2004, 4-5).

Similarly, Federal and state governments accrue benefits in the form of taxes resulting from positive investments and profit flow. In particular, the Department of Defense (DoD) has benefited directly from foreign capital flow in the past. Surplus equipment is sold to entities overseas, and services in the form of training are provided within the US to members of foreign military.



Just as private firms realize benefits from the procurement of services from foreign firms, cost savings and value-added activities are likely to be realized by the DoD when non-strategic services are procured off-shore. For example, in the DoD's competitive sourcing program, research shows savings of 44% in labor costs while the DoD still effectively improves quality of services added (Gansler, 2004). There is no reason to suspect that similar outcomes cannot be realized whenever bidding is employed.

In summary, there are multiple benefits emanating from out-sourcing goods, services and capital from the US to overseas locations. Though the above discussion is not comprehensive, it is an overview of the kinds of benefits that can be reasonably expected by those who participate in outsourcing.

DETRIMENTAL CONSEQUENCES OF OUT-SOURCING

The perception that out-sourcing leads to the loss of jobs is long-standing. Governmental bodies around the globe have long cited this argument to justify the enactment of trade barriers against imports or against the in-flow of investment capital (Hill, 2004, 181). Labor unions have routinely bargained job retention when companies have introduced out-sourcing as a means of acquiring new technology or knowledge. And the continuing political and economic debate is centered on the conviction that out-sourcing does indeed lead to job loss. But is this a valid perception? And, if it is shown to be valid, to what extent are the consequences detrimental? Do detrimental outcomes in fact outweigh the benefits enumerated above?

At the macroeconomic or national level in the US, evidence does not support the contention that out-sourcing is basically detrimental. Careful review of the two employment series maintained by the Bureau of Labor Statistics (BLS) since their inception suggests a different conclusion. As we shall see, each of these labor employment series demonstrates continual annual growth in the number of persons employed, thus illustrating that more jobs are created each year than are destroyed for various reasons, including out-sourcing.

Although the decade of the 2000s has witnessed much political rhetoric to the contrary, using either of the two BLS series, we can see the total number of public- and private-sector jobs has increased quarterly and annually. And growth has occurred in most sectors, with the primary exception of manufacturing (www.bls.gov/cps/home.htm).

Compiled since 1946, the payroll survey, which statistically extrapolates total and sector employment by sampling 300 thousand companies monthly, has continually trended upward in each decade, regardless of the point in the economic cycle in which the country resides (www.bls.gov/ces/home.htm). However, as the nature of work has shifted from the plant or office to include the home office, economists have come to realize that the population survey, which samples 60 thousand households monthly, provides a more accurate picture of total and sector employment than the payroll survey. In its totals, the population survey adds the following sectors to all sectors contained in the payroll survey: Agriculture, self-employed small business owners, and all persons who work under contract with the government or private firms (Fraser, 2004). Taken since 1998, the population survey has likewise trended upward continually.

A particularly vocal industrial segment, whose rhetoric has contributed to the perception that out-sourcing leads to job loss, has been the US manufacturing sector. That job losses have occurred in manufacturing cannot be argued, and this condition has persisted in every country with a substantial industrial sector, even while manufacturing out-put has continued a growth trend (Geewax, 2003). However, studies have found that the loss of less-skilled jobs in



manufacturing and other sectors due to out-sourcing has not necessarily led to a reduction in total jobs. A World Bank study found that large, developed countries such as the US and Canada and developing countries such as China and Mexico were only marginally affected by such job losses because there was a corresponding increase in skilled jobs created. Firms employing higher-productivity strategies (such as digital technology) created a greater number of replacement jobs than those that did not (Batra, 2000).

Another study supported the concept that manufacturing jobs are continually “churning,” with marginally more jobs being created than being destroyed. While this study did not relate its findings to out-sourcing and in-sourcing, it demonstrated that churning has occurred for many decades; therefore, the study called for further exploration of the causes (Klein, 2003).

Economist Paul Ormerod discovered the positive, exponential relationship between growth in corporate profits and retention in the percentage of profits—which is then used for reinvestment and growth in employment (Ormerod, 1997). So, it would seem that the ever-increasing flow of profits from foreign subsidiaries during the past 30 years, which is in contrast to the declining percentage of dividends being paid (Fama, 2001), has created a very powerful driver for employment growth in the US.

Further, substantial research by this writer strongly suggests that a direct, positive correlation exists between the growth in FDI flowing outward from the US and the flow, in the forms of capital investment, the importation of inventory and the retribution of profits, toward the US. All of these flows have contributed to the growth in profits in the past 30 years for the US-based multinational corporations. As noted above, this growth has been directly related to the growth in home-based employment in the US.

Finally, a study released in 2004 using the Commercial Activities Management Information System (CAMIS) database illustrated that, while approximately 5 percent of DoD jobs which competed successfully in the Department’s competitive-sourcing programs since 1995 were involuntarily eliminated, competitions led to savings on average of 44% and to improvements in quality of services provided to customers (Gansler, 2004, 6-7). The conclusions contained in the above comprehensive study appear to parallel many of the results (cited previously) obtained from the research into private activities.

EMPLOYEE TRANSITION FROM JOB LOSS TO JOB GAIN

Research and analysis of job loss versus job creation lead this writer to conclude that:

- The benefits derived from the use of out-sourcing are numerous and beneficial to national organizations based in the US.
- While job loss due to out-sourcing has occurred within organizations, at the microeconomic level, benefits usually outweigh the detrimental consequences to employment within the organization.
- While some job loss has occurred due to out-sourcing from the US, the total number of jobs has continually demonstrated an upward growth trend since the beginning of data collection shortly after the culmination of WW II.

While these conclusions may be good news on the macro- and microeconomic levels, if one is an unwilling participant in a reduction in workforce, it can be inferred that a serious, if not



critical, problem confronts that individual. Historically, initiatives to provide unemployment assistance and more jobs of the same kind have been seen as a solution, but these no longer address the core problem. The complicating feature is identified in numerous futuristic economic forecasts: while products and services will not be of less value than those of the present, the requisite labor skills and knowledge will often not be possessed by the workforce in the US (Klein, 2003).

Both President Bush and Federal Reserve Chairman Alan Greenspan have called for educational initiatives to address the problem of persons whose employment is terminated due to out-sourcing. Certainly, organizations participating in the changing workplace will be well positioned to identify the skills and knowledge needed by employees, at least within their own domains. Indeed, the argument can be made that these decentralized voices are superior to the centralized voice of the Federal Government in identifying their potential employees' educational needs.

It is this author's conclusion that a variety of partnerships between non-governmental entities and the Federal government could be formed to establish effective programs that would enhance the requisite skills and knowledge of those individuals involuntarily separated from existing positions. The government's role would be limited to establishing policies to financially motivate organizations to provide assistance in the form of training or education; these programs would make it possible for individuals to identify and acquire the knowledge and skills for employment which would best serve them in the future.

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Out-sourcing and Privatization: Creating Value at What Cost?

Presenter: Dwight A. Sheldon is presently a PhD candidate at Northcentral University in Prescott Arizona. Previously, he received an MPA from the University of Guam as well as a BA degree in Anthropology from the University of Florida.

Mr. Sheldon has contributed to research and development projects in Micronesia, Pacific Asia, Melanesia, Polynesia, and North America. In addition to his work on archaeological research projects and ethnographic studies on Guam and in the Northern Marianas Islands, he has worked on development projects related to agriculture in the Visayan Islands of the Philippines. Mr. Sheldon has authored, co-authored, and edited more than two dozen non-published technical reports of archaeological work including the benchmark studies, *An Archaeological Report on Miyama Hills, Guam* (1990) as well as *An Archaeological Assessment of Kagman/As Matuis, Saipan, CNMI* (1991). Mr. Sheldon worked for the Government of Guam (1992-96) as staff to three commissions including the Territorial Land Use Commission and the Territorial Seashore Protection Commission. He additionally supported review of infrastructure project and development applications before federal agencies throughout much of Micronesia. Mr. Sheldon is presently engaged as a consultant with Protec-services.com in Florida.

ABSTRACT

This report examines aspects of one form of privatization: Out-sourcing. The paper treats aspects of recent national publicity about the “off-shoring” of American jobs and displacement of workers in the US. The presentation promotes an informed stance on many perceptions about the loss of American jobs in a competitive global economy. Discussion of the contention that corporate tax codes need revision in order to protect American jobs, plus facts on how many jobs are lost due to outsourcing is provided. Lastly, this discussion shows how out-sourcing has actual benefits for American business and consumers in a greater global economy.

INTRODUCTION

Out-sourcing was once viewed differently from how it is seen in the context of current business practices and in a newer, global economy. At one time, out-sourcing was considered to be a last-ditch effort that troubled companies looked to in order to solve the problems of their “bottom lines.” Much more recently, out-sourcing has become recognized as the strategic management tool that it is, allowing companies of all sizes to remain centered on their core functions and their core competencies. Smaller companies have moved to out-sourcing for not only the completion of peripheral tasks but also to handle multiple tasks that are tied directly to their core function.

Through out-sourcing, a company can work with those players that are most competent to perform specific functions so tasks can be preformed at a greater level of quality and can often cost less than if the company had attempted to do the work itself. Out-sourcing can save money and can allow companies to better utilize resources. Companies can have smaller workforces that do not require the additional administrative tasks inherent in a larger organization (Ivancevich, Lorenzi, Skinner, Crosby, 1997).

Out-sourcing to offshore companies has garnished a new standing in the business world: Recent debate on the topic has placed out-sourcing in the national spotlight. Because of the ideal that “off-shoring” acts to displace workers here in America, out-sourcing has gained a



reputation as being bad for the United States. Certainly, savings in cost related to labor can be realized when the most competitive provider is utilized. The issue of added value is weighted by the matter of extraneous and societal costs, an issue actively debated in recent political campaigns.

OFF-SHORING AND THE RHETORIC OF CAMPAIGNS

While the purpose of this paper is not intended to be centered on aspects of the political process enshrined in the course of presidential elections, discussion of how that process has effectively created a greater public interest in off-shoring is necessarily in order. Among the most contentious issues of the recent campaign was that of out-sourcing work overseas and the subsequent threat to jobs in the US. During his 2004 presidential campaign, Senator John Kerry actively promoted the premise that the corporate tax code was largely responsible for the problem of sending American jobs overseas. The senator announced that he had a plan to remedy much of the problem. In key battleground states and in those states in which there had been substantially high levels of unemployment, Kerry made this issue the cornerstone of his campaign.

Additionally and to fuel the rhetoric of debate, Kerry often placed the blame for much of the problem of unemployment caused by off-shoring on the actions of his opponent, George W. Bush. Many of the party loyal picked up on the mantra while others, inside and outside of the party, suggested that out-sourcing jobs overseas was a minor problem and that Kerry's plan would accomplish very little in correcting it.

President George W. Bush actively contested Kerry's controversial proposal. The President continues to not support the senator's plan; the Bush administration supports measures that allow US-based multinationals a larger tax credit on their overseas income. While Democrats argue that such a plan would only increase incentives to move jobs overseas, the administration counters that its own approach would help US firms compete globally with foreign firms that are able to otherwise avoid US taxes altogether.

Senator Kerry had announced his plan to keep jobs in this country through a new economic plan for America. In part, the plan called for ending tax incentives that encourage American companies to send jobs overseas.¹ As presently allowed, corporations would still get a credit for any taxes paid in other countries. However, Kerry had proposed a tax immediately upon foreign income: businesses would no longer be able to defer the US taxes indefinitely.

Kerry proposed that the corporate tax rate be cut by 1.75 percentage points, to a top corporate rate of 33.25 percent. Kerry would have allowed a one-year "tax holiday" to allow businesses to avoid US taxes on repatriated earnings that would otherwise have been left overseas. The senator would also offer a tax credit to companies when they choose to hire workers in the US rather than out-sourcing jobs overseas.

In sync with any rhetoric planned to tug on the emotions of the electorate, one must state the certainty of the very human toll of off-shoring jobs. Before attempting a discussion that may appear unattached to the real anguish of those persons who have lost jobs or that might

¹ The plan additionally called for increases in education and for investments in new technologies (such as alternative fuel sources) that would create jobs in this country.

lose a job in the future, this writer wishes to acknowledge that such loss is regrettable. To any person, family, or community that must deal with the consequences of the loss of even a single job, off-shoring must necessarily seem to carry substantial and irrefutable costs.

As an engaged electorate continues to assimilate the differences in rhetoric between each camp, their representatives on Capitol Hill have begun a continued debate. Beyond the publicity gained during the campaigns, perhaps the single greatest effect of the exchange on American jobs and corporate taxes was that a fully engaged legislative branch continued the debate on the equity of tax codes and of the plight of the American worker. American lawmakers continue to debate the practicality and the possible ramifications of making specific changes in the code.

BEYOND CAMPAIGN RHETORIC: CONGRESSIONAL DEBATE ON CORPORATE TAXES

Moving past all the campaigns, the assertion that American businesses are “off-shoring” jobs merely to avail themselves of advantageous tax codes has some merit: There is indeed a tax break for US-based multinational corporations to conduct operations overseas. However, no seated president can be blamed for the situation because the codes have existed in much of their present form for decades. In discussion of issues brought forward during the campaign—especially the matter of outsourcing American jobs overseas—some specific points may well be succinctly addressed to further a greater discussion of out-sourcing.

Much of the problem with the present tax code is centered in the fact that it has not kept pace with changes in the economy of the United States and in a newer global economy. US International tax policy is based on tax principles that were developed in the 1950s and 60s.

There are at least two kinds of out-sourcing relevant to this report and which are subject to existing or revised corporate tax codes. In one type, an American company closes a facility in the US and opens its replacement in a foreign country. This form of out-sourcing may or may not be planned to deliberately take advantage of the tax “loophole” and to defer US taxes. In this scenario, and since the American company retains ownership of off-shore operations, often choosing to reinvest income abroad, the company would be impacted by changes in the tax code.

A second type of outsourcing—the primary type to affect information technology (IT) workers—involves American companies subcontracting work (and displacing workers in the US) to off-shore companies. Since the hypothetical US company doesn't own the off-shore facility, the company doesn't enjoy any tax break because it doesn't generate off-shore profits. In this type of out-sourcing, only deliberate incentives built into tax codes address the issue of the displacement of workers.

Some say that a plan similar to that which had been proposed by Senator Kerry would not accomplish much to solve the problem, or that such a plan could actually hurt American businesses and impede economic recovery. Some experts say that such a fix could actually send more jobs overseas as businesses seek to relocate abroad.

Tax incentives to increase retained earnings exist when the US corporate tax rate exceeds that of the country in which companies do business. Furthermore, the US also taxes income that US-based companies earn in other countries when such profits are repatriated to the US. Profits that remain invested overseas never get taxed at the higher US rates.



Apparently, the corporate decision to retain income outside the US is becoming more prevalent, and the amount of unrepatriated foreign earnings is growing substantially. In a report last year, the non-partisan Congressional Research Service said that such earnings had increased to \$639 billion in 2002 from \$403 billion in 1999 (US House, 2004).

DOMESTIC EMPLOYMENT AND OUT-SOURCING

Many economic analysts state that out-sourcing jobs overseas is a fairly minor problem compared to the total picture of the unemployment situation. Most experts agree that elimination of the present tax break would not end the off-shoring of many American jobs. While many multinational businesses choose to not repatriate earning because of the allowed savings in tax burdens, there are other important reasons that propel work to operations abroad. Certainly, the fact of lower wages realized in many foreign workforces is an extremely important factor. In fact, the reduction in costs of utilizing foreign workforces alone is a very powerful incentive; yet, there are other reasons beyond tax breaks and wage differences that drive out-sourcing.

For one thing, customer services must follow consumers. In the global economy, a growing proportion of consumers of American goods and services live outside the US. Many companies rightfully strive to be near their global customers in order to best serve them.

Factors of the economics of a greater global marketplace alone help to drive out-sourcing. Off-shore companies that contract to perform services continue to make substantial strides in investing in forms of higher-level technology and processes (as well as training and human resources) that add value to quality-based products.

Additionally, foreign governments that are home to service-based companies have succeeded in putting reforms in place that are highly conducive to increased business activities. In India, for example, telecommunications costs in have dropped by 70 percent over the past several quarters (McDougal, 2005). Since the integration of countries from the former Soviet Union, Eastern European countries now contribute ever-increasing numbers of highly skilled workers to the global workplace. The World Trade Organization has welcomed the economic and labor-rich giant, China. Globally, many antiquated trade barriers have been dismantled.

Development-oriented policies by governments, in cooperation with industry, have helped to increase transportation and communications around the world. Plummeting relative transportation and communications prices have allowed workers to be able to join the ranks of higher-level workforces. In all, a newer, global economy has continued to grow by the recent addition of 300 to 400 million highly educated workers.

In its report, "Extended Mass Layoffs Associated With Domestic and Overseas Relocation, First Quarter 2004 Summary," the Department of Labor concluded research on the matter of American jobs going overseas. The research found that out-sourcing jobs overseas accounts for a small proportion of the millions of American jobs that are lost each year. Of course, there are no official figures on the exact number of jobs that have moved overseas; yet, the Labor Department summary is one of the best sources of information on the impacts on labor as a result of off-shoring. The report looked at only those companies that lay off 50-or-more workers at one time for a period of 30 days or longer. The report indicates that only 2.5 percent of major layoffs in the first three months of 2004 were the result of off-shoring (Department of Labor, 2004).



One must be aware that the vast majority of jobs in the United States are those types that require geographic proximity to the end-user—jobs that produce goods and services that must be consumed locally. Such types of jobs include construction, agriculture, certain types of services, personal care and medical care, as well as restaurants and forms of entertainment and recreation. Out-sourcing these types of jobs overseas is not feasible. Other types of jobs that require production portions and processes that are fairly complex, interactive, or personal are relatively difficult to send abroad. Due to the sheer size of the American workforce and the number of workers employed in the above types of jobs, possible off-shoring would affect less than 2 percent of American workers.

Ben Bernanke, Governor of the Federal Reserve, has noted that the annual total number of jobs lost to "off-shoring" is approximately one percent of all jobs lost. He estimates that the US economy lost a total of about 15 million jobs each year over the past decade. At the same time, the same economy created an average of approximately 17 million new jobs each year. Bernanke said the portion of jobs lost to out-sourcing is quite small (Bernanke, 2004).

It is clear that off-shoring has had a relatively modest impact on unemployment when compared to all the other economic factors. Factoring in economic downturns, decreased demand, downsizing, streamlining, or other spoilers causing workers to lose jobs, the actual job loss resulting from off-shoring has been relatively minimal as a percentage of the total jobs lost in the United States.

Additionally, forms of improved productivity through the use of automation and improved processes (as well as through the availability of advanced forms of tools) are expected to continue to have the greatest impact on job creation and losses in this country. By the year 2015, the effect of those factors on IT-job displacement is expected to be six times greater than the impact of off-shoring (McDougal, 2005). Job losses from a greater level of productivity must be balanced by job creation—by newer types of industries that create and build such advanced tools, processes, and forms of automation.

Beyond the "bottom-line" loss of actual jobs, there are real costs to those American workers who have otherwise been able to hold onto their job. For several reasons, off-shoring contributes to wage levels that are stagnant and to benefits levels that are declining.

Off-shoring has the effect of forcing American workers to compete within a global economy with a workforce that continues to grow at a rate indicated by the recent addition of hundreds of millions of highly educated workers. Additionally, and due to practical management considerations, US workers find that the level of benefits provided to them is normally adjusted downward to more closely approximate the levels of benefits offered to workers in other countries. Presently, all workers do not enjoy benefits such as 401(k) plans and vacation pay. In some countries, there is less need for employer-paid health plans; yet, the health care system in the United States is relatively much more expensive than in other countries, so employer-subsidized health plans are more of a necessity.

THE UPSIDE OF OFF-SHORING

Conversely, recent studies show that when companies move some jobs abroad, the savings in costs stimulate job creation at home. Moving jobs overseas may have a direct short-term (adverse) consequence. Yet, in the long term, a greater global economy increases this country's total economic growth while increasing real wages and improving the national and global standard-of-living.



An examination of the amount of business that is out-sourced from other countries into the US shows a significant trade surplus in services, in contrast to a less-significant trade deficit in goods. In 2002, the US "in-sourced" nearly \$29 billion in business while it out-sourced less than \$11 billion. This shows an overall surplus of \$18 billion (Bernanke, 2004). The US in-sources mostly high-value services from foreign users; yet, in contrast, it out-sources relatively less-valuable services (Bernanke, 2004).

CONCLUSION

A solution to any problem of out-sourcing that is based on tax amendment is extremely complicated and controversial. No would-be remedies can ever impose US taxes on income earned in another country; enforcement of any such provisions would be impossible. Additionally, many businesses would merely find new ways to delay or avoid taxes. For this and other reasons, much of the root of the problem of displacement can not be found in the tax codes.

It remains nearly impossible to measure exactly what factors drive off-shoring and which related factors exacerbate unemployment. Companies can rightfully continue to assert that the main reasons they locate plants in other countries are to be near foreign markets and to be able to provide a better quality product.

In fact, off-shoring accounts for a relatively small portion of US unemployment. There is no denying that off-shoring can displace American workers; however, it does not cause the tectonic shift that many persons ascribe to it. The effects of out-sourcing on the US and in industrialized nations tend to be disproportionately exaggerated in popular discussion by politicians.

The best way to view out-sourcing is to consider it a form of adjustment in the greater environment of a global marketplace. Certainly, consumers around the globe benefit from this new economy by being exposed to a greater amount of high-quality goods and services at low prices. It must be stated that, with such access to goods and services, there must necessarily be some downside. Americans can no longer expect that, as has been the case in previous decades, the former "firewall" of national boundaries will negate international pressures in the current global economy.

Once, the strength of America's economy was centered in the capacity of its abundant natural resources and the sheer capability of its workforce. The nation continues to possess vast resources. The total of its workforce is the best-trained and best-equipped on the planet. Many countries continue to make inroads to compete with the US, especially in segments of service industries.

A newer, global economy provides substantial benefits to consumers and to workers around the world. Enhanced levels of quality in products and in services is expressed by the end-product of many interconnected players that no longer must be found in geographic proximity. The United States continues to be a leader in fostering innovation and in the creation of new technologies. The country's businesspersons show a remarkable capacity to respond faster and smarter to the commercialization of these technologies. Protectionist policies of the past will only serve to diminish the benefits of participation in a modern environment and global economy in which American products are required. The increasing ease of transferring digital information around the world is matched by the subsequent dislocation of workers. Optimally, American workers should be displaced upwards, to high-levels positions in an ever-expanding



theater of new processes and new forms of technology. America's preeminent resource today is its ability to innovate; the greatest possible problem for the US is the potential loss of such unsurpassed competency.

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Panel—Issues in Program Management

Wednesday, May 18, 2005	Acquisition Logistics/Support
2:45 p.m. – 4:15 p.m.	<p>Chair: Rear Admiral James B. Greene, USN (ret.), Naval Postgraduate School</p> <p>Discussant: Captain Stephen Huber, Naval Surface Warfare Center, Port Hueneme Division</p> <p>Papers:</p> <p><i>“A Decision Support Model for Valuing Proposed Improvements in Component Reliability”</i></p> <p>Keebom Kang, Naval Postgraduate School</p> <p>Michael Boudreau, Naval Postgraduate School</p> <p>Uday Apte, Naval Postgraduate School</p> <p><i>“Understanding the Impact of Mandated RFID Compliance on the DoD Supply Base”</i></p> <p>Kenneth J. Petersen, Arizona State University</p> <p>Mark A. Barratt, Arizona State University</p> <p><i>“Logistics Transformation through Sense-and-Respond Logistics Network”</i></p> <p>Jacques S. Gansler, University of Maryland</p> <p>Kenneth A. Gabriel, University of Maryland</p>

Chair: Rear Admiral James B. Greene, USN (ret.) – Naval Postgraduate School

<Insert Bio>

Discussant: Captain Stephen Huber—Naval Surface Warfare Center, Port Hueneme Division.

Steve Huber was born in West Chester, Pennsylvania. He graduated from the US Naval Academy and was commissioned in 1980, having earned a Bachelor of Science in Oceanography/Physics.

After graduation, Captain Huber served as a Naval Academy Seamanship and Navigation Instructor aboard a 44-ft Luders Yawl, followed by Surface Warfare Officers’ School in Coronado, California. He reported to USS STEIN (FF 1065) in 1981, where he served as Gunnery Officer, ASW Officer and Navigator/Administrative Assistant. In October 1983, Captain Huber reported to Naval District Washington, DC, as Aide to the Commandant. Following Department Head School in June 1986, he reported to USS REASONER (FF 1063) as Weapons Officer. He then reported to Destroyer Squadron 5 as Operations Officer in February 1988. In January 1990, he reported to the staff of Commander in Chief,



US Atlantic Fleet as the Assistant Surface ASW Officer and Special Operations Officer. From Norfolk he moved to Newport, Rhode Island where he began his studies at the Naval War College in March 1992. In October 1993 he reported aboard USS GARY (FFG 51) as Executive Officer. His following tour was with the staff of Commander, THIRD Fleet, as Flag Secretary. In March 1997 he moved to Washington, DC, where he served as the Combat Systems Training Officer on the staff of the Surface Warfare Division of the Chief of Naval Operations (OPNAV N869T2). He most recently served as Commanding Officer in USS FIFE (DD 991) September 1998 through April 2000. During his Command tour, FIFE deployed to the Eastern Pacific in support of Counter-Narcotics Operations, was the first ship to go through an availability using a private contractor in a public shipyard, and was awarded the SECNAV Energy Conservation Award. At NAVSEA, Captain Huber has served as the Warfare Area Roadmaps Officer in the Surface Ship Technology Directorate (SEA 53) and Deputy Program Manager in PMS 430—the BFTT program office. His last assignment was as Deputy Director, Human Systems Integration Directorate (SEA 03B).

Captain Huber's awards include the Meritorious Service Medal (with two gold stars), the Navy Commendation Medal (with four gold stars), the Navy Achievement Medal, and several unit awards. He holds a Master of Arts Degree in International Studies from Old Dominion University and a Master of Arts Degree in National Security and Strategic Studies from the Naval War College. He was inducted into the International History Honors Society, Phi Alpha Theta, in 1993. He was designated an Acquisition Professional in the January of 1997 and DAWIA Level III certified in Program Management in February of 2002. He was a 2003 National Security Studies Fellow at the Maxwell School, Syracuse University.



A Decision Support Model for Valuing Proposed Improvements in Component Reliability

Presenter: Dr. Keebom Kang joined the Naval Postgraduate School in 1988, where he teaches supply chain, logistics engineering and computer simulation modeling courses for the MBA program. His research interests are in the areas of logistics and simulation modeling in various military applications. He received his Ph.D. in Industrial Engineering from Purdue University. Prior to joining NPS, he was on the faculty of the Industrial Engineering Department at the University of Miami, Coral Gables, Florida (1983-1988). He had held visiting professor positions at Syracuse University (Summer, 1985), Georgia Institute of Technology (Fall, 2003), Asia Institute of Technology in Thailand (Winter, 2004), and Pohang Institute of Science and Technology in Korea (Spring, 2004).

Presenter: Michael Boudreau, Colonel, US Army (Ret), has been a senior lecturer at the Naval Postgraduate School since 1995. While an active duty Army Officer, he was the Project Manager, Family of Medium Tactical Vehicles, 1992-1995. He commanded the Materiel Support Center, Korea, 1989-1991 and the Detroit Arsenal Tank Plant, 1982-1984. COL Boudreau is a graduate of the Industrial College of the Armed Forces; Defense Systems Management College; Army Command and General Staff College; Long Armour-Infantry Course, Royal Armoured Corps Centre, United Kingdom; and Ordnance Officer Basic and Advanced courses. He holds a Bachelor of Mechanical Engineering degree and Master's of Business degree from Santa Clara University, California.

Presenter: Uday Apte, is Visiting Professor of Operations Management, Graduate School of Business and Public Policy, Naval Postgraduate School, Monterey, CA, and Associate Professor, Cox School of Business, Southern Methodist University, Dallas, TX. He teaches operations management courses in the Executive and Full-time MBA programs. His areas of expertise and research interests are in service operations, supply chain management and globalization of information-intensive services.

Prior to joining the Cox School, he worked for over ten years in managing information technology and operations functions in the financial services and utility industries. Since then he has consulted with several major US corporations and international organizations including IBM, Texas Instruments, Nokia, Kinko's, Nationwide Insurance, Nations Bank and The World Bank.

He holds a PhD in Decision Sciences from the Wharton School, University of Pennsylvania, where he taught in the MBA and undergraduate business programs for over ten years. His earlier academic background includes a MBA from the Asian Institute of Management, Manila, Philippines, and Bachelor of Technology from the Indian Institute of Technology, Bombay, India.

Dr. Apte has published over 30 articles, five of which have won awards from professional societies. His research articles have been published in prestigious journals including, *Management Science*, *Journal of Operations Management*, *Decision Sciences*, *IIE Transactions*, *Interfaces*, and *MIS Quarterly*. He has co-authored one book, *Manufacturing Automation* and has completed work on another co-authored book, *Managing in the Information Economy*.

ABSTRACT: Developing a methodology and a tool for estimating the operational availability (Ao) of a weapon system based on the component-level reliability and maintainability data is the goal of this research. Specifically, we present two spreadsheet models and one discrete-event simulation model using Arena simulation language. The first two models support lifecycle cost calculations and are static in nature. The third model incorporates the interactions among reliability, time to repair and operational availability into a discrete-event simulation model that can support a weapon-system-level risk analysis. These models are developed as proof-of-concept to demonstrate the potential methodology using hypothetical, yet realistic data.



I. INTRODUCTION

The US Department of Defense is engaged in a number of management initiatives (related to weapon system logistics and support) intended to provide reduced lifecycle cost while simultaneously improving operational availability, Ao. Performance-based Logistics (PBL) is one such program that entails the establishment of a particular kind of contractual vendor-client relationship between a logistic-service provider and a weapon-system manager. The Quadrennial Defense Review mandated the DoD implement PBL in order to, “compress the supply chain and improve readiness for major weapons systems and commodities” (OSD, 2001, 56). A key aspect of PBL contracts is their outcome focus; the client organization is supposed to specify key performance goals, and allow the vendor to determine the best way of obtaining those goals (ASN-RDA, 2003).

This paper will not re-examine the core questions of whether PBL works, or why it works, as those questions have been examined extensively elsewhere (e.g., Berkowitz, et al., 2003). Rather, we take as our starting point the question of how best to value the desired outcomes of a PBL contract. After all, as contractual vehicles, the price of the services to be provided must be negotiated. Also, given a limited budget but a proactive program manager, there will always be more opportunities to improve logistical support for a weapon system than dollars available to fund those opportunities.

We assume that opportunities to improve logistics outcomes should be valued on the basis of the cost-effectiveness of those opportunities.¹ As in the private sector, the cost effectiveness of an opportunity (investment) is its mission-value-over-time (profit, in the case of the private sector) divided by its cost-over-time. It would thus be a mistake to take the cost differentials of various logistic service alternatives as a statement of value because cost in no way informs the value of that service to the weapon-system operator. Even if one is willing to assume that current expenditures are cost effective (and hence, any cost reduction would be even more cost effective), there is no way to assess one alternative against another without a direct measure of value; mere cost differentials ignore the fact that the alternatives may have different impacts on mission value.

We will further assume that the mission value of a logistical service is a function of weapon-system performance, as neither a weapon-system component (such as a fuel cell) nor a logistic element (such as spares inventory) can contribute to mission objectives except through the weapon system. From a warfighter’s viewpoint, a weapon system is either capable of supporting a mission, or it is not. While a fuel cell may be a necessary condition for the system to be mission capable, it is not a sufficient condition.

Operational availability (Ao) is a primary metric used to determine the probability that a weapon system will be capable of supporting a mission. For example, in an aircraft squadron, Ao of 85% implies that an average of 85% of the aircraft will be available to fly in support of some mission objective. Goals are often stated for Ao levels, and mission planning must take Ao into account. Moreover, neither a war fighter nor a resource manager wanting to make contingency plans should be content with knowing the nominal (target) or the average Ao level.

¹ Caplice & Sheffi (1994), in reviewing a panoply of logistics metrics, categorized metrics based solely on comparisons of inputs (such as cost comparisons) as *utilization* metrics, while they categorized comparisons of outputs per input (such as what we are calling cost-effectiveness) as *productivity* metrics. They made the point that utilization measures are usually related to process (as opposed to performance) management.

He or she should have a sense of the distribution of Ao around the target levels: the probability that Ao will fall below some critical level.

It is also possible to measure Ao for fuel cells, as well as aircraft; an improvement in Ao for the fuel cell will provide at least some marginal improvement in Ao for the aircraft. But, this improvement will not be one-to-one; large improvements in fuel-cell availability may yield only trivial improvements in aircraft availability, depending not only on the failure rate of the fuel cells, but on the performance and availability of all the other critical components of the aircraft. Likewise, better fuel-cell availability will reduce the risk that a particular weapon system will not be operational for a particular mission, but the magnitude of that risk reduction depends on the probability that all the other critical components of the aircraft are available.

Hence, the value of an improvement of *component* logistics can only be understood in terms of the performance of all the other critical components of a weapon system. Similarly, the value of an improvement in a single logistics element (such as spares inventory) can only be determined in conjunction with other key logistics elements.

The modeling approach we will outline in this paper has applicability beyond PBL. It is useful in understanding the value of component-level logistic services, or services directed at only a subset of logistic elements (inventory only, or depot-level repair only). However, we contend that an implementation of PBL that is fully consistent with the original intent of performance-based service acquisition *must* use an approach similar to the one we outline, because it is impossible to put a value (and, hence, a contract price) on those services without such an approach.

II. LITERATURE REVIEW

While we are arguing for an assessment of value that will provide a more complete picture of the cost effectiveness of a PBL proposal (by providing a numerator to a productivity ratio), we recognize that an estimation of the lifecycle costs of such proposals is far from trivial. Outsourced logistic services for weapon systems are particularly difficult to cost; for example, the ongoing contract management (transaction) costs can be substantial, but are rarely measured (Domberger, Jensen & Stonecash, 2002).

We think such transaction costs are particularly important in light of a recent Government Accountability Office report (GAO, 2004) that was critical of systems-level PBL contracts; this document recommended greater emphasis on PBL contracts at the component level, especially for commodity-type components (which, according to the GAO, reflected “commercial best practices”). PBL contracts on commodities would be especially appealing because vendors providing commodities can expect to enjoy economies of scale that the DoD could not experience (as vendors would be able to offer those commodities across a broad population of users). These increased economies of scale would reduce the price of such services. Unfortunately, of course, aside from domestic transportation and depot-level spares for a relatively small set of components used commonly between defense and industry, the number of critical components (or logistics elements) of weapon systems that can be considered commodities is relatively small. For non-commodity items, a key economic consideration in out-sourcing is the increase in transaction costs entailed by dealing with an outside vendor (Gufstafson, et al., 1996). Such costs increase substantially when one is offering a PBL contract at the component level. As we will show, aside from the additional burden of contract maintenance for many small contracts, the proper valuation and

management of such component-level contracts entails the development of a comprehensive model which incorporates key performance dimensions of *all* critical components.

Perhaps in an effort to reduce such transaction costs, or perhaps in response to a complaint that PBL involved too many metrics, the Under Secretary of Defense for Acquisition, Technology and Logistics (USD-ATL, 2004) recently issued guidance for PBL metrics. While clearly indicating that PBL could be applied at the subsystem or major assembly level, the memo listed five key performance criteria: 1) *weapon system* operational availability, 2) *weapon system* operational reliability, 3) *weapon system* cost per usage, 4) logistics footprint for a *weapon system*, and 5) response time required for *weapon system* logistics support.

Of course, these measures are interrelated. We think the central non-cost measure is operational availability. The other three non-cost measures can all be seen in some ways as subsidiary to availability. Reliability (e.g., time to failure), footprint (e.g., number of spares and size of fielded or intermediate maintenance and repair facility) and response time (e.g., time to repair) are all critical determinants of availability. Yet, there may be good reasons to measure reliability, footprint and response time separately. For example, reliability affects not only availability, but also the probability of system failure in the field; likewise, footprint affects not only availability, but operational agility as well. However, operational availability in many ways summarizes reliability, response time and footprint. We will develop a model in the next section that demonstrates the precise interaction between time to failure, time to repair, and spare inventory levels. It also demonstrates how these variables determine availability. Thus, as they affect Ao, footprint, response time, and even reliability are all process and *not* performance measures. We will focus on availability (with the caveat that it may not be the sole determinant of value) because it is necessary to an understanding of value.

In specifying performance outcomes (but not processes) to a vendor, PBL contracts are deliberately designed to transfer some degree of operational and financial risk to a vendor (Doerr, Lewis & Eaton, forthcoming). As risk transfer is an intended outcome of the initiative, and as the risk of falling below a certain level of operational availability is an important performance dimension, it is clearly important to incorporate the risk associated with operational availability at the system level into a measure of value. From the warfighter's point of view, this risk may be the key performance dimension (Eaton, Doerr & Lewis, forthcoming). The warfighter, after all, is less concerned with the average number of mission-capable aircraft than he is concerned with the probability that he will have enough aircraft to fly a particular mission. The procedure we will outline allows the assessment of a proposed logistics improvement not only on the *average* impact that improvement would have on the operational availability of the aircraft, but on the *risk* associated with the operational availability of the aircraft as well.

Weapon systems are, of course, the military's key capital assets related to operational capacity, and the logistics services in question can be seen as primarily affecting the level of operational capacity available to the warfighter. The sort of risk measurement we are proposing is increasingly recognized as central to the valuation of operational capacity of corporate assets in the private sector as well.

Assessments of risk/return profiles for capital assets are, of course, behind the recent work on Real Options (Mun, 200x). And in capacity planning in particular, the incorporation of risk into capacity models was listed in a recent literature review as a key area in which research was expected to develop (Van Miegham, 2003). Risk-based models have recently been applied to the acquisition of production capacity for airfoils used in military aircraft (Prueitt & Park, 2003). Mostly, risk-based capacity models deal with technological, demand, or price uncertainty, and are not directly applicable to the valuation of logistic services and the uncertain impact those services will have on system availability (capacity). The point we are making is

that there is growing consensus that a proper valuation of capacity-related planning (such as the planning associated with offering a PBL contract) must include an assessment of risk.

In this paper we develop three models as decision-support systems (Keen & Morton, 1978; Power, 2002; Turban & Aronson 1998). The term “decision-support system” implies use of computer-based systems to:

1. assist the warfighters in their decision process in semi-structured tasks,
2. support, rather than replace, the warfighter’s judgment, and
3. improve the effectiveness of the practical decision-making process.

The dramatic improvements in computer power and software capability (such as spreadsheet and simulation models) allow convenient access to powerful decision-support systems for improved decision making. Making such models available as decision-support systems is the primary goal of this research.

III. MODELS

In this section, we present two spreadsheet models and one discrete-event simulation model using Arena simulation language (Kelton, 2004). The first model primarily supports lifecycle cost calculations but ignores the interactions among reliability, time to repair, and operational availability. The second model, while it does address these basic interactions, does not consider the full range of lifecycle costs. However, both the first and the second model are static—they can only support average case analyses and sensitivity analyses. The third model incorporates the interactions among reliability, time to repair and operational availability into a simulation model that can support a risk analysis, but which does not directly address lifecycle cost issues.

In their current form, these models are intended as a proof-of-concept only. That is, we are not presenting a research case involving field data; rather, we are demonstrating the potential of an approach using hypothetical data.

3.1. Spreadsheet Lifecycle Cost Model (Model 1)

Model 1 is a compressive lifecycle cost analysis model for a hypothetical UAV (unmanned aerial vehicle) case study intended as a proof-of-concept for our modeling approaches. This case study was adapted from Logistics Engineering class lecture notes at the Naval Postgraduate School (Kang, 2004). The complete case study is described in Appendix A, and the spreadsheet model is available from http://web.nps.navy.mil/~mn4310/UAV_Model_1.xls.

This model computes the total system lifecycle cost for major weapon systems from R&D to deployment to phase-out. The lifecycle cost includes research, development, test and evaluation, acquisition, production, operations and maintenance, and phase-out costs. This model is a comprehensive decision-support tool for program managers. The model can be used to establish the baseline total ownership cost of major weapon systems during the planning, as well as operations, stages. The user can conduct sensitivity analyses on various input parameters such as reliability, manning, training, and R&D cost. As the user changes any of the parameters, the model immediately updates the total lifecycle cost, so the user can see the financial impact of input parameter changes in the long run. We suggest the reader download the spreadsheet model and change some of the parameters in the “INPUT” worksheet.

3.2. Revised Spreadsheet Model (Model 2) and Simulation Model (Model 3)

A shortcoming of the spreadsheet model (Model 1) is that it cannot analyze the dynamic relationship between reliability and operational availability. For example, deterioration in reliability of a certain component will decrease the system's operational availability. At the same time, the workload at a repair shop will increase, forcing the repair turnaround time to become longer, which in turn will decrease the operational availability of the system. In Model 1, the average repair turnaround time remains the same regardless of the changes in component reliability.

To overcome this limitation, we have developed a discrete-event simulation model (Model 3) that can be used along with a revised spreadsheet model (Model 2). Model 2 is essentially derived from Model 1. It is a small-scale spreadsheet model to focus on reliability and maintainability. Given logistics input parameters (see Figure 1), Model 2 computes spare-parts requirements, inventory, transportation and repair costs followed by the total maintenance costs over the lifecycle of the system. Model 2 does not consider R&D cost or infrastructure costs. It only considers variable costs while operating the weapon system. Figure 2 shows the total lifecycle maintenance cost of \$442,656,976 based on the input parameters in Figure 1. To demonstrate how Model 2 could be used, suppose we improve the MTBF of the main display unit from 1,500 hours to 2,000 hours. The total cost will then be decreased to \$440,319,492, representing approximately \$2.3 million savings in maintenance cost. This is valuable information for the program manager when s/he makes the component-reliability improvement decisions.

Figure 1. Input Parameter for Model 2

No of Squadrons	4			
No of UAV systems per squadron	10			
No of Air Vehicles per system	4			
No of Ground Control stations per system	2			
Ground Equip Monthly Op Hrs Hours	300	hrs		
AV Flying Hours/Vehicle/month	120	hrs		
AutoLand & Launch/RecMonthly Op Hours	60	hrs		
Repair Turnaround Time	10	days		
Protection Level for Critical Components	0.95			
Protection Level for non-Critical Components	0.85			
Hourly charge for repair including material cost	\$500			
Transportation cost per failure	\$200			
Annual Inventory rate	21%			
Capital Discount rate	10%			
Lifecycle	20	years		
Ground Control Station Components	MTBF	<input type="checkbox"/>	Unit Cost	
Main Display Unit	1000	0.00100	\$ 500,000	Critical
Power Supply	4000	0.00025	\$ 400,000	Critical
Power Gen	3500	0.00029	\$ 300,000	Critical
Air Conditioner	6000	0.00017	\$ 400,000	Critical
Guidance & Control	500	0.00200	\$ 400,000	NonCritical
Other Ground Equip	MTBF	<input type="checkbox"/>	Unit Cost	
Launch & Recovery System	500	0.00200	\$ 1,200,000	Critical
AutoLand System	1000	0.00100	\$ 2,000,000	NonCritical

Data Terminal	3000	0.00033	\$ 1,000,000	NonCritical
AV	MTBF	□	Unit Cost	
Navigation/Avionics	1000	0.00100	\$ 200,000	Critical
Engine	500	0.00200	\$ 100,000	Critical
Propeller	500	0.00200	\$ 50,000	Critical
Video Scanner	2500	0.00040	\$ 150,000	NonCritical
IR Scanner	450	0.00222	\$ 150,000	NonCritical
IR Data-Link	800	0.00125	\$ 200,000	NonCritical

Figure 2. Sample Output of Model 2

Annual Spare Inventory Cost	\$	2,688,000	per squadron
Annual Repair Cost	\$	8,800,857	per squadron
Annual Transportation cost	\$	328,034	per squadron
Total cost per squadron per year	\$	11,816,891	
Total Annual cost	\$	47,267,566	
Total Lifecycle Cost		\$442,656,976	

Once the cost analysis is completed (using Model 2), the same input parameters are used for the simulation model (Model 3) to estimate the operational availability and other performance measures of the system (e.g., probability that the operational availability falls below some critical level). Model 2 and Model 3 (simulation model) complement each other.

3.3. Simulation Scenarios

In this simulation model (Model 3), we only consider the critical components (engine, propeller, avionics computer) for a squadron of 10 UAV systems with 40 air vehicles (see Appendix A). When one of these critical components fails, the faulty component is removed from the air vehicle, and an RFI (ready-for-issue) spare is installed. The faulty component is sent to the repair shop to be fixed. After repair, it becomes an RFI spare. When a critical component fails, and an RFI spare is not available, the air vehicle will be grounded (and will become not mission capable, or NMC) until an RFI component is available. A failure of non-critical components may degrade readiness, but the system is assumed to be operable (that is, mission capable or MC).

The input parameters—such as MTBF and number of spares for each component, repair times (in hours), transportation delay (one way, in days)—are read from the spreadsheet (see Figure 3). When a component fails in Scenario 1, it requires 9 days (4.5 days one way) of transportation delay with 10 hours of repair work; this work follows a triangular distribution with a mode of 10 hours, an upper limit of 50% above the mode (i.e., 15 hours) and a lower limit of 50% below the mode (i.e., 5 hours). The waiting time at the repair shop, if any, is estimated inside the simulation. The repair turnaround (TAT) time of 10 hours in Figure 1 for Model 2 approximates the repair TAT of Scenario 1.

Figure 3. Simulation Input Spreadsheet

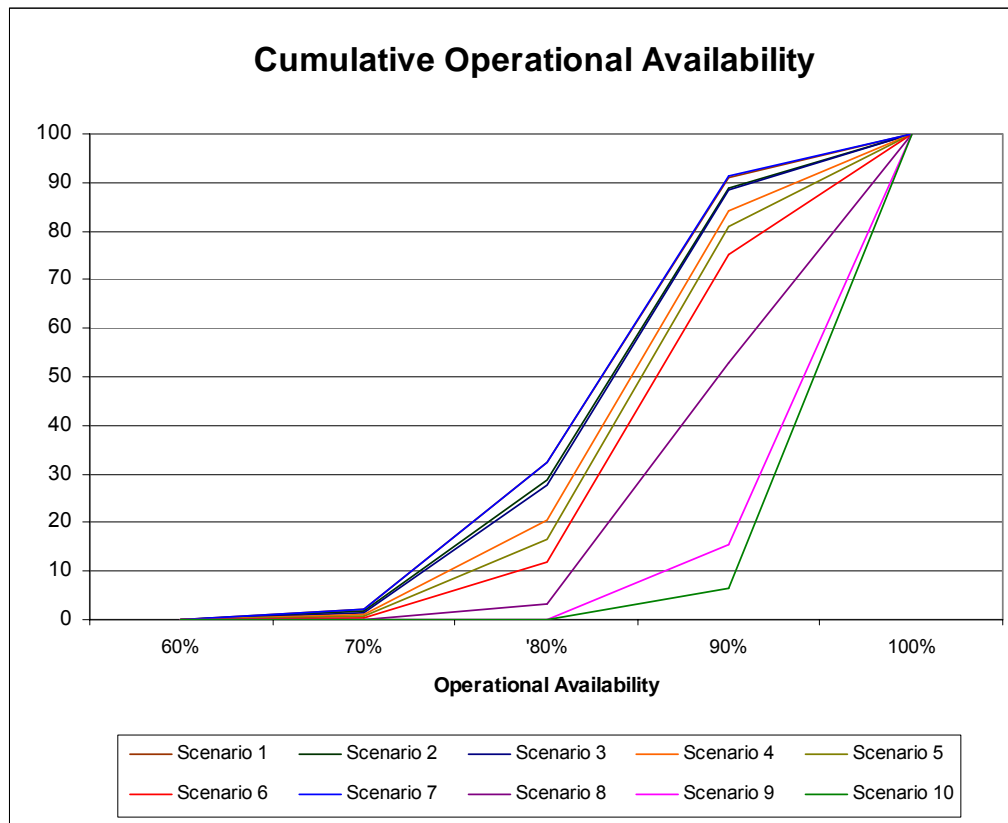
Scenario	MTBF_ Eng	MTBF_ Prop	MTBF_ AvComp	Spare Engines	Spare Props	Spare AvComps	Eng Repair hrs	Prop Repair hrs	AvComp Repair hrs	Trans Delays (Days)
1	1000	500	500	4	6	6	10	10	10	4.5
2	1250	500	500	4	6	6	10	10	10	4.5
3	1500	500	500	4	6	6	10	10	10	4.5
4	1000	750	500	4	6	6	10	10	10	4.5
5	1000	1000	500	4	6	6	10	10	10	4.5
6	1500	1000	500	4	6	6	10	10	10	4.5
7	1000	500	500	10	10	10	10	10	10	4.5
8	1000	500	500	4	6	6	10	10	10	2.25
9	1000	500	500	4	6	6	10	10	10	1
10	1500	1000	500	4	6	6	10	10	10	1

Given the input parameters in Figure 3, Model 3 simulates each scenario over 1,000,000 hours. Multiple scenarios can be executed in one simulation run (e.g., 10 in this case). The results captured for each scenario are the average operational availability (Ao) for the air vehicles in the squadron, along with the cumulative distribution of operational availability. These results are tabulated in Figure 4. The cumulative distribution of operational availability is also depicted graphically in Figure 5.

Figure 4. Simulation Output: Cumulative Operational Availability and the Average Operational Availability for Each Scenario

Cumulative Operational Availability												Avg Op Av
Scenario	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
1	0.00	0.00	0.00	0.00	0.00	0.02	2.27	32.25	90.91	100.00		0.837
2	0.00	0.00	0.00	0.00	0.00	0.01	1.68	28.76	88.99	100.00		0.843
3	0.00	0.00	0.00	0.00	0.00	0.01	1.50	27.53	88.47	100.00		0.845
4	0.00	0.00	0.00	0.00	0.00	0.01	0.95	20.50	84.35	100.00		0.857
5	0.00	0.00	0.00	0.00	0.00	0.00	0.55	16.50	80.87	100.00		0.865
6	0.00	0.00	0.00	0.00	0.00	0.00	0.22	11.70	75.25	100.00		0.876
7	0.00	0.00	0.00	0.00	0.00	0.04	2.27	32.43	91.39	100.00		0.837
8	0.00	0.00	0.00	0.00	0.00	0.00	0.03	3.14	52.74	100.00		0.906
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	15.37	100.00		0.948
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	6.63	100.00		0.962

Figure 5. Cumulative Operational Availability



Let's assume that the commander's goal is to maintain an average Ao of 85%. He also knows his mission capability will be critically jeopardized if Ao falls below 80%. Therefore, he wants to estimate the probability that this event might happen, maintaining the average Ao to be above 85%. The results in Figure 4 show that the average Ao of Scenario 1 is 83.7% (the last column of Scenario 1) and the probability of Ao falling to 80% or below is 32.25% (the 9th column with a heading of 80% for Scenario 1). Scenario 1 is not acceptable to the commander since the average Ao is below his goal, and the probability of Ao falling below 80% seems to be too high. He can generate more scenarios (e.g., Scenarios 2 through 10) to assess the impact of changes in component reliability or logistics elements (spare parts, repair and transportation times) on the entire system-level Ao.

In Scenarios 2 and 3, the MTBF of an engine is increased from 1,000 hours to 1,250 and 1,500, respectively. In Scenarios 4 and 5, the MTBF of a propeller is improved from 500 hours to 750 and 1,000, respectively. Improvement in Ao can be observed from the far right-hand side column of the Figure 4. Changes in Scenarios 4 and 5 are preferred to those of Scenarios 2 and 3. In Scenario 6, the MTBFs of both the engine and propeller are increased respectively to 1,500 and 1,000. The overall Ao is increased to 87.6% (from 83.7% of Scenario 1), and the probability of Ao falling below 80% has substantially reduced to 11.7% (from 32.25%). Increase in spare parts (Scenario 7) does not improve the performance at all. However, significant reduction in transportation time (Scenario 8) improves the system performance. In Scenarios 8 and 9, when the transportation delays are reduced from 4.5 days to 2.25 and 1 respectively, Ao jumps to 90.6% and 94.8%, respectively; likewise, the probabilities of Ao falling below 80% drop to 3.14% and 0.08%, respectively. The Scenario 10 is the same as Scenario 9 except that the

MTBFs of an engine and a propeller are increased to 1,500 and 1,000, respectively. Ao hits 96.2% with the probability of Ao falling below 80% now negligible (0.02%).

The parameters in Scenarios 2 through 10 can be input to Model 2 to compute the total maintenance cost for each scenario. For example, by entering the parameters from Scenario 10 into Model 2 in Figure 2, a PM will note results in a total lifecycle maintenance cost of \$375,712,781 (i.e., savings of approximately \$120 million over the base case of Scenario 1). Scenario 10 provides an Ao 12.5% higher than Scenario 1 (from 83.7% to 96.25%) with the risk of Ao falling below 80% becoming a non-issue.

Models 2 and 3 can potentially serve as a communication tool between the budget community and warfighters. When reliability improvements are made on several components in a complex system, the warfighter's primary concern is readiness, or Ao, while the budget analysts' focus is on financial implications. These two models provide valuable solutions to both communities.

IV. SUMMARY

Providing reduced lifecycle cost and, at the same time, improving operational availability are fundamental goals of the Performance-based Logistics (PBL) and other logistics initiatives of the U.S. Department of Defense. In many PBL contracts, the contractual arrangements are typically stipulated at the level of individual components (such as a fuel cell) or a logistic element (such as inventory of certain spare parts). While achieving component-level performance goals is certainly important, what really matters to a warfighter is the operational availability of the weapon system. Hence, there is a need to develop a methodology and an apparatus for estimating the operational availability (Ao) of a weapon system based on the component-level reliability and maintainability data. This current research is aimed at this need.

Specifically, we present two spreadsheet models and one discrete-event simulation model using Arena simulation language. The first model primarily supports lifecycle cost calculations, but ignores the interactions among reliability, time to repair, and operational availability. The second model, while it does address these basic interactions, does not consider the full range of lifecycle costs. However, both the first and the second model are static—they can only support average case analyses and sensitivity analyses. The third model incorporates the interactions among reliability, time to repair and operational availability into a simulation model that can support a weapon-system-level risk analysis. In their current form, these models are developed as a proof-of-concept. That is, we are not presenting a research case involving field data, but rather are demonstrating the potential methodology and a tool using hypothetical, yet realistic, data.

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APPENDIX A:

Unmanned Aerial Vehicle (UAV) Case Study

A UAV system consists of four air vehicles (AV's), two ground-control stations (GCSs), modular mission payloads (MMPs), data links, remote data terminals (RDTs) and an automatic landing system. A total of 8 squadrons (two squadrons in each coast of CONUS, and one each for Pacific, Indian, Mediterranean, and Atlantic Oceans) will be established to accommodate the new system. Each squadron will have its own intermediate-level maintenance capabilities. Each squadron will have 10 VTUAV systems. Detachment personnel (for each UAV system) will consist of three officers (one OIC and two mission officers), three Chief Petty Officers (CPOs) and 12 enlisted. I-Level Maintenance personnel will consist of one officer, one Chief petty officer and ten enlisted. Squadron headquarters personnel will be made up of seven officers, ten CPOs and twenty enlisted. Composite costs for personnel are estimated as follows: Officer—\$140,000 per year, CPO—\$115,000 per year, Enlisted—\$70,000 per year.

Production begins in Fiscal Year 2004, with all VTUAV's scheduled for field testing in the year following their production. A total of 80 VTUAV systems will be produced; the life-cycle of the program is estimated to be 30 years (2005-2034). The risk of loss of an AV in peace time is 2-7% per year, while the risk of loss of an AV in operation during a contingency is 15-30% per year. A chance of a contingency during the life-cycle of the program is 15% per year. Lost AVs will be replaced the next year. However, no orders for replacement AVs will be placed last 5 years of the life-cycle (i.e., YR 2025 – 2029). We are assuming by then new UAV systems will gradually replace the current ones.

Research and development costs are \$15 million for FY 01, \$20 million in FY 02 and \$50 million in FYs 03 and 04. The marginal production cost of AV (with payload) is \$1 million. The cost of maintaining a production capability throughout the life of the system is \$12 M per year for every year any aerial vehicles are produced. Thus, the annual production cost of AV is \$12M + \$1M * (# of AV produced). Ground-Control Equipment, which consists of two GCSs, RDTs, test equipment and an automatic landing system, will cost \$20 million per system. The I-level operating cost is \$6 million/yr per I-level plus an additional one-time capital investment of \$25 million (including installation of test equipment) prior to the year of operation. A capital discount rate of 10%/yr the inflation rate of 4%/yr will be used.

Billet requirements are based on all personnel fully qualified/current/certified to perform all missions/Navy Enlisted Classification Code (NEC)/Military Occupational Specialty (MOS). Operators are required to have functional applications of the use and control of the UAV, and will be trained in operation of all aspects of the UAV navigation, launch flight control and recovery. Officers and CPOs will attend additional training on preflight planning, mission profile construction and UAV tactical-intelligence integration. Costs for the training will be \$1,600/person/week for the basic training and \$3,000/ person/week for the advanced training.



An attrition rate of 25% per year is used after the first year, including personnel rotation.
Required training is as follows:

Detachment personnel

Basic UAV Training (Officers, CPOs, junior enlisted): 10 weeks
Advance Training (Officers and CPOs only): 5 weeks

I-Level Maintenance personnel

Basic Maintenance Training (Officers, CPOs, junior enlisted): 20 weeks
Advance Maintenance Training (Officers and CPOs only): 5 weeks

Squadron Headquarters personnel

Basic UAV intelligence course (Officers, CPOs, junior enlisted): 10 weeks
Advance Training (Officers and CPOs only): 5 weeks

Spare parts management will be consolidated at the I-Level on a one-for-one exchange. We will assume that the transportation cost is \$100 per shipment (i.e., \$ 200 per failure). Spares replacement and repair materials cost will be equal to 50% of the value of spares per year. Sparing levels will be as follows: critical units—95% and non-critical units— 85%. Maintenance turnaround time (TAT), including transportation delays, for I-Level is 10 days and D-Level is 40 days. It is assumed that 80% of failures can be repaired at the I-Level (thus 20% at the D-level). Spare-level calculations are based on " $t = 10 (0.8) + 40 (0.2) = 16$ days." D-Level cost is estimated to be \$5,000 per repair including the transportation costs. Ground equipment is expected to operate 300 hours per month; the AV flying hour is estimated at 120 hours per month per vehicle. The launch/recovery and the auto-landing systems are used 20% of the time the ground-control station is in operation (i.e., 60 hours per month). POL (petroleum, oil and lubricant) costs are estimated at \$60 per flight hour. The MTBF of each component, its cost, and the required protection level (customer service level) are included as follows:

	<u>MTBF</u>	<u>Cost</u>	<u>Criticality</u>
<u>I. Ground Station (2 per VTUAV system)</u>			
Main Display Unit	1,500 hrs	\$ 500,000	critical
Power Supply	4,000 hrs	\$ 400,000	critical
Power Generator	3,500 hrs	\$ 300,000	critical
Air Conditioner	6,000 hrs	\$ 400,000	critical
Guidance & Control	500 hrs	\$ 400,000	non-critical
<u>II. Other Ground Equipment (1 per VTUAV system)</u>			
Launch/Recovery System	500 hrs	\$1,200,000	critical
Auto-landing System	1,000 hrs	\$2,000,000	non-critical
Data Terminal	3,000 hrs	\$1,000,000	non-critical



III. AV and Payload

Engine	500 hrs	\$ 100,000	critical
Propeller	500 hrs	\$ 50,000	critical
Navigation/avionics	1,000 hrs	\$ 200,000	critical
Video Scanner	2,500 hrs	\$ 150,000	non-critical
IR Scanner	450 hrs	\$ 150,000	non-critical
IR Data-Link	800 hrs	\$ 200,000	non-critical

The System activation/deactivation plan is as follows:

System Activation plan:	FY 2005 - 20 systems
(2 squadrons at a time)	FY 2006 - 20 systems
	FY 2007 - 20 systems
	FY 2008 - 20 systems

System Deactivation:	FY 2031 - 20 systems
(phase-out) plan	FY 2032 - 20 systems
(2 squadrons at a time)	FY 2033 - 20 systems
	FY 2034 - 20 systems



Understanding the Impact of Mandated RFID Compliance on the DoD Supply Base

Presenter: Kenneth J. Petersen, is Assistant Professor of Supply Chain Management at the W.P. Carey School of Business at Arizona State University. He received his PhD from Michigan State University in Operations/Sourcing Management and Information Systems, an MBA in Management from The University of Akron and a BS in Finance and Economics from The University of Alabama. Dr. Petersen has published in the *Journal of Supply Chain Management*, *Journal of Product Innovation Management*, *Decision Sciences Journal*, *Journal of Operations Management*, *California Management Review* *Transportation Research: Part E* and the *Journal of Business Research*. Dr. Petersen's professional experience is in supply and logistics as an officer in the United States Navy Supply Corps.

Presenter: Mark A. Barratt, has over ten years experience in service operations and has been lecturing on logistics and supply-chain management for the last ten years at both undergraduate and postgraduate levels. He has extensive business experience encompassing law and supply-chain management. He received his PhD in Supply-Chain Management from Cranfield School of Management, Cranfield University. His PhD research focused on supply-chain relationships and information exchange and won an Economic and Sociological Research Council (ESRC) doctoral dissertation award. His research has been published in a number of leading journals. He is currently exploring how organizations develop and extend collaboration through information sharing across the supply chain. He is also interested in visibility in the supply chain, collaborative cultures, and the use of RFID in supply chains.

ABSTRACT

In response to the Department of Defense's (DoD) mandate that all of its suppliers should adopt Radio Frequency Identification Devices (RFID), this research seeks to understand the impact of the mandate on the DoD supply-base. Specifically, the goals of the research are to understand: (1) the compliance strategies for RFID in defense supply chains with mandated compliance, (2) the adoption factors, timeframes, and costs of such RFID implementation, and (3) the impact on purchasing, logistics, supply-chain continuity, and supply-chain relationships. To achieve these goals, two stages of data collection are currently underway: (1) several case studies are being developed and (2) an industry-based survey is being developed. In support of the case studies, multiple interviews are being conducted together with detailed process mapping. This approach facilitates the identification of enablers, timeframes, barriers, benefits, costs, impacts, organization, best practices, projects, etc. The industry survey will provide the opportunity to test the conclusions and findings from the case studies as well as to identify industry trends and directions. Currently, the early indications of the research reveal that, although DoD suppliers have developed an initial "slap and ship" capability, they are still some distance from having a robust enough capability to meet compliance for significant volumes of product order. Their development of a longer-term sustainable capability is being hampered by the immaturity of available technology and the lack of clarity in the detailed requirements from the DoD.



Logistics Transformation through Sense-and-Respond Logistics Network

Presenter: The Honorable Jacques S. Gansler, former Under Secretary of Defense for Acquisition, Technology, and Logistics, is the University of Maryland's Vice President for Research and the Roger C. Lipitz Chair in Public Policy and Private Enterprise. As the third-ranking civilian at the Pentagon from 1997 to 2001, Professor Gansler was responsible for all research and development, acquisition reform, logistics, advance technology, environmental security, defense industry, and numerous other security programs. Before joining the Clinton Administration, Dr. Gansler held a variety of positions in government and the private sector, including Deputy Assistant Secretary of Defense (Materiel Acquisition), assistant director of defense research and engineering (electronics), executive vice president at TASC, vice president of ITT, and engineering and management positions with Singer and Raytheon Corporations. Throughout his career, Dr. Gansler has written, published, and taught on subjects related to his work. He is a Member of the National Academy of Engineering and a Fellow of the National Academy of Public Administration. Additionally, he is the Glenn L. Martin Institute Fellow of Engineering at the A. James Clarke School of Engineering, an Affiliate Faculty member at the Robert H. Smith School of Business and a Senior Fellow at the James MacGregor Burns Academy of Leadership (all three at the University of Maryland). During 2003–2004, he served as Interim Dean of the School of Public Policy at that institution.

Presenter: Kenneth A. Gabriel, is Senior Research Scholar and Program Manager at the Center for Public Policy and Private Enterprise, School of Public Policy, University of Maryland, where he leads research and pilot demonstration of focused and efficient logistics. He is also Professor of Strategy and New Venture Creation at the RH Smith School of Business, University of Maryland. Prior to assuming his position at the University of Maryland, Dr. Gabriel served as Founder, President and CEO of High Performance Materials Group, Inc., Boothwyn, PA. He also founded and led InterConcepts, Inc., a consulting and business incubator firm in Alexandria, VA. Dr. Gabriel served in key technology leadership roles in the Department of Defense including serving as Director, US Army Research Office in Washington, DC and Director of Research, US Army, Pentagon, Washington, DC. Dr. Gabriel holds a PhD in Physical Chemistry and two MS degrees in Chemistry and Chemical Engineering from University of Illinois, Chicago. He also earned a MA in National Security from Georgetown University School of Foreign Service, Washington, DC.

Commercial and military logistics continue to evolve from amassing supplies, through supply chain management, to (more recently) sense-and-respond networks. The realization that “demand-pull” is inherently more efficient than a “supply-push” strategy propels the migration from supply chains to demand networks. Major commercial enterprises in the United States and abroad have already transformed their supply chains to include Sense-and-Respond Logistics (SRL) elements. Likewise, military planners and leaders have recently recognized the need to adopt SRL to transform military logistics to significantly enhance military readiness while reducing costs.

Military supply-chain modernization has recently been the subject of increasing interest as a result of publicized logistics challenges in Iraq and other fronts in the global war on terror. In response to the need for highly maneuverable, flexible, decentralized logistics, planners have sought to transform military logistics from “legacy” government-provided logistics support to Contractor Logistics Support (CLS). This, in turn, has brought about the need to retain multiple support strategies to satisfy both complex supply-chain issues and, as may be expected, the need to overcome much institutional resistance to this logistics transformation.

This paper presents the successful migration of logistics support of a modern weapon system from a traditional “legacy” approach to an efficient supply-chain management portal that



begins to incorporate a SRL strategy. The demonstrated web-based portal was the first of its kind to integrate Government logistics assets with CLS assets in real time. This study will review ongoing research and demonstration pilot projects to further migrate logistics from the supply-chain portal to sense-and-respond logistics (or Demand Network Logistics) through intelligent agents, fused sense-and-respond functionalities, Automatic Identification Technology (AIT) and Radio Frequency Identification (RFID).

Obstacles to logistics transformation within and between the nodes of the supply-chain network—as well as network security and availability—will be discussed along with prescriptions to overcome these hurdles. Strategies to implement these technologies within the military services—and ultimately across coalition forces—will be presented.



Panel—Performance Measurement

Thursday, May 19, 2005	Performance Measurement
9:00 a.m. – 10:30 a.m.	<p>Chair: Michael F. McGrath, Office of the Assistant Secretary of the Navy (Research, Development & Acquisition)</p> <p>Papers:</p> <p><i>"Choice and Change of Measures in Performance-Measurement Models"</i></p> <p>Mary A. Malina, Naval Postgraduate School</p> <p>Frank H. Selto, University of Colorado at Boulder</p> <p><i>"Performance Measurement in Defense Acquisitions: A Case Study of the Navy"</i></p> <p>Terry F. Buss, National Academy of Public Administration</p> <p>David Cooke, Pivotal-Insight, LLC</p> <p><i>"Impact of Diffusion and Variability on Vendor Performance Evaluation"</i></p> <p>Ken Doerr, Naval Postgraduate School</p> <p>Don Eaton, Naval Postgraduate School</p> <p>Ira Lewis, Naval Postgraduate School</p>

Chair: Michael F. McGrath—Office of the Assistant Secretary of the Navy (Research, Development & Acquisition)

Dr. Michael McGrath was appointed as the Deputy Assistant Secretary of the Navy for Research, Development, Test and Evaluation in February, 2003. His role is to aggressively drive new technologies from all sources across Navy and Marine Corps platforms and systems, and to develop programs to bridge the gap in transitioning from Science and Technology to Acquisition. He is also responsible for developing new ways to integrate Test and Evaluation (T&E) with the evolutionary acquisition process.

Prior to his appointment to this position, Dr. McGrath spent five years as Vice President for Government Business at the Sarnoff Corporation, a leading R&D company with both commercial and government clients. He was responsible for program development across all Sarnoff business units to meet government needs for innovative dual use technologies in sensors and microelectronics, networking and information technology, and bio-technology.

Dr. McGrath has 28 years of prior government experience. His early career was in weapon-system logistics planning and management, first at the Naval Air Systems Command, and later in the Office of the Secretary of Defense, where he developed policies for Integrated Logistics Support and reviewed implementation in major weapon system acquisition programs in all three Military Departments.

He was appointed to the Senior Executive Service in 1986 as Director of the OSD CALS Office, where he guided the Computer-aided Acquisition and Logistics Support program from its inception. Five years later, he became the Assistant Director for Manufacturing in DARPA's Defense Sciences Office where he managed programs in Agile Manufacturing, Electronic Commerce Resource Centers, and



Affordable Multi-Missile Manufacturing. He also served in leadership positions for several DoD-wide initiatives to improve manufacturing and reduce the cost of defense systems. In 1996-97, he served as the Assistant Deputy Under Secretary of Defense (Dual Use and Commercial Programs) where he directed the Commercial Technology Insertion Program, the Commercial Operating and Support Savings Initiative, and the Department's Title III industrial base investments.

Dr. McGrath holds a BS in Space Science and Applied Physics (1970), a MS in Aerospace Engineering (1972) from Catholic University, and a doctorate in Operations Research from George Washington University (1985). He has been active in several industry associations and study groups, including studies by the Defense Science Board and the National Research Council.



Choice and Change of Measures in Performance-Measurement Models

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ABSTRACT

This paper uses management control, resource-based, systems-based, and contingency-based strategy theories to describe a large US manufacturing company's efforts to improve profitability by designing and using a performance-measurement model (PMM). This PMM includes multiple performance measures relevant to its distribution channel for products, repair parts and maintenance services. The PMM is intended to reflect the company's understanding of performance relations among strategic resources, operational capabilities, and desired financial outcomes. The PMM also reflects its intended distribution strategy, the types of performance necessary to achieve that strategy by its distributors, and its desired financial outcomes. Furthermore, the company uses the model to evaluate its North American distributors and intends to use these evaluations as a partial basis for annual and long-term rewards. Thus, the PMM embodies the measurable portion of the firm's management control system of its distribution channel.

The study addresses four research questions: (1) Are measure attributes important considerations for performance measure choice? (2) Does the importance of attributes differ



according to firm strategy? (3) Does the importance of attributes for design and use differ according to firm strategy? (4) Does a company trade-off some individual attributes for others? The questions are investigated using qualitative and quantitative analyses of archival documents and interviews with top managers and distributors. Principal findings are that measure attributes are important considerations for choice and change of performance measures; design attributes are more important than use attributes; the importance of attributes does not appear to differ according to strategy; and some individual attributes are traded-off for other attributes.

KEY WORDS: performance-measurement model, management control, non-financial performance measures, strategy

1. INTRODUCTION

Improving performance measurement at key parts of the value chain is one of management accounting's major roles. Valid performance measurement allows a firm to effectively describe and implement strategy, guide employee behavior, assess managerial effectiveness, and provide the basis for rewards. Managers and researchers from diverse disciplines have sought to improve management of the value chain by building and using performance measurement models (PMM). PMM are comprehensive models of the firm as a system, which reflect organizational knowledge of the relations among various value-chain performance measures. Many organizations reportedly have created PMM that model performance relations among key value-chain activities and valued outcomes (e.g., the balanced scorecard of Kaplan & Norton, 1996).

Consulting reports, normative studies, and descriptive theories predict that these comprehensive models lead to superior performance. Magretta (2002) argues that business models are essential to tying insights to financial results. Furthermore, knowledge-based and systems-based theories of the firm hypothesize that superior performance results from systemic management policies, rather than myopic focus on elements of the value chain (e.g., Huff & Jenkins, 2003; Morecroft, 2002; Sanchez & Heene, 1996). Empirical evidence supporting normative claims or theoretical hypotheses is scant and is usually in the form of uncritical self-reports (e.g., Rucci et al., 1998; Barabba et al., 2002).

Systematic management requires a comprehensive Management Control System (MCS), but not all of a MCS need be measurable. However, the portion that is feasibly measured should be considered for the PMM; otherwise, the organization might lose valuable performance information. The choice of performance measures is critical in reflecting the organization as a system. Since an organization is always adapting to its environment, it must be able to change its performance measures to reflect current conditions. This study describes the determinants of a particular PMM and investigates the relatively unexplored issue of choice and change of a functioning PMM.

1.1 Knowledge-based and systems-based theories and PMM

Theories that explain management policies based on strategic resources, capabilities, learning, and systems offer guidance and predictions for the choice of performance measures. Recent strategic management literature has evolved the concept of a firm's product strategy beyond Porter's (1985) depiction of managing the value chain to achieve competitive advantage (e.g., through product cost leadership or differentiation). Porter's work on the importance of strategic positioning has greatly influenced later work that seeks to explain how firms might use

their resources to attain strategic positioning. Research that followed Porter explains how firms reach and maintain the positions of strategic advantage that he described.

Barney (1991) argues that successful firms achieve competitive advantage by acquiring and using unique resources to build inimitable capabilities that create strategic advantages (see also Amit & Schoemaker, 1993; Kogut & Kulatilaka, 2001). Organizational learning theory by Nonaka and Takeuchi (1995) and Senge (1990) predicts that successful firms create strategic advantages by learning dynamically to use their resources effectively. This learning is realized through development and deployment of the firm's capabilities, processes, or competencies to use resources (e.g., Prahalad & Hamel, 1990). Morecroft et al. (2002) hypothesize that successful firms manage strategic resources and capabilities through holistic management systems; that is, creating **and** maintaining strategic advantages are enhanced by systemic management. Our accounting interpretation of current management theories is that firms create and maintain strategic advantages or positions by efficiently creating, deploying, and using performance-based MCS. Furthermore, the measurable part of the MCS should itself be systemic, in the form of a PMM.

1.2 Prior work on PMM

The DuPont ROI formula is an early and enduring PMM that disaggregates financial performance into manageable elements (e.g., Zimmerman, 1997, p. 187). EVA is a similar, more current and complex approach to identifying the incremental contribution to shareholder wealth and the manageable elements of periodic income (e.g., Adimando et al, 1994). Rappaport's (1999) approach to building shareholder value recognizes incentive effects of over-reliance on periodic financial results and seeks to mitigate disincentives. Because all of these models focus primarily on financial outcomes, they do not qualify as systems models; that is, they do not model the determinants of financial performance even within the boundaries of the firm.

More comprehensive PMM include Otley's (1999) performance management model, Ittner and Larcker's (2001) value-based management model, Epstein et al.'s (2000) APL model, Kanji's business scorecard (Kanji & Moura e Sa, 2002) and the balanced scorecard (BSC) (Kaplan & Norton, 1996; 2001). These models describe links among business decisions and outcomes and serve to guide strategy development, communication, implementation, and feedback at multiple points along the value chain. Because these comprehensive PMM are business models reflecting inputs and both intermediate and final outputs, they generally include measures of operational, strategic, financial and non-financial performance. These models truly represent efforts to use organizational knowledge to model the firm as a system and implement management control.

This study investigates whether management control, knowledge-based and systems-based theories of the firm are descriptive in a particular case. Although a study such as this cannot generalize to the population of firms using PMM, the findings of this study can illustrate the theories applied to this investigation (Yin, 1994) and can provide a foundation for theory improvement, replications, and large sample tests.

This study addresses four research questions:

RQ1: Are measure attributes important considerations for performance measure choice?

RQ2: Does the importance of attributes differ according to firm strategy?



RQ3: Does the importance of attributes for design and use differ according to firm strategy?

RQ4: Does a company trade-off some individual attributes for others?

The questions are investigated both qualitatively and quantitatively using (1) archival documents that describe the company's distribution PMM and (2) interviews with top managers to understand the nature of the business and the objectives and dynamic structure of the PMM. Finally, the paper reflects on the implications of this study for performance measurement and management control. Subsequent sections of this paper address performance measure attributes, the research questions, the research site, analysis of qualitative and quantitative data, discussion of results, and conclusions.

2. PERFORMANCE-MEASURE ATTRIBUTES

Management control theory argues that MCSs, which include PMMs, are intended to insure that employees (1) know what is expected of them, (2) will exert effort to do what is expected, (3) are capable of doing what is expected, and (4) accomplish what is expected (e.g., Merchant, 1998). For more than 30 years, researchers have known that firms choose a portfolio of controls and performance measures (e.g., Khandwalla, 1972). However, subsequent research on firms' choices of performance measures often has focused on broad dichotomies of measures, such as financial vs. non-financial measures and mechanistic vs. organic controls. The theory commonly used in that research likewise characterizes the contingencies affecting choices of measures and controls as broad dichotomies (e.g., high vs. low environmental uncertainty; old vs. new technology).¹

One particularly popular research stream predicts that firms operating in complex and risky environments rely heavily on qualitative controls and non-financial performance measures and to a much lesser degree (if at all) on quantitative, financial-performance measures. Contingency research on choice of performance measures has yielded mixed results, perhaps because most of the reported studies are based on cross-sectional survey data, which can obscure the idiosyncrasies of firm-level definitions and implementations of performance measurements (e.g., Anderson & Young, 1999; Chenhall, 2003; Luft & Shields, 2002b). Enough evidence exists, however, to suggest that most firms rely to some degree on financial performance measures, and many use both quantitative and qualitative controls. In other words, firms evidently have great flexibility to choose the portfolio of measures and controls (especially when characterized as broad dichotomies) that they expect will work best in their situations. This equivocal result provides some motivation to search for additional theoretical explanation for the choice of performance measures.²

Recent management control research addresses specific factors that might explain firms' choices of performance measures to achieve and maintain strategic advantages. Laboratory experiments (e.g., Libby et al, 2002; Lipe & Salterio, 2000; Luft & Shields, 2001, 2002a) and surveys of management control practice (e.g., Ittner et al. 2002; Cavalluzzo & Ittner, 2002; Ittner & Larcker, 1998) have identified attributes of performance measures that are

¹ See Chenhall (2003) for a comprehensive review of management control research and contingency theory.

² Van de Ven and Drazin (1985) discuss the concept of equifinality as a serious impediment to progress in understanding firm behavior via contingency theory. We agree with the concept of contingency theory that MCS and, hence, PMM are idiosyncratic but not random.

associated with use, usefulness, and performance. When combined with current resource-based and systems-based strategy theories, what emerges is a focus on performance measures' attributes that supercede the popular financial vs. non-financial dichotomy. In all cases, the literature cited in the following subsections presumes that the organization seeks to improve performance relative to its strategic goals.

2.1 Measures are diverse and complementary

Firms' management controls can benefit from greater diversity of performance measures (i.e., operational, strategic, financial, and non-financial measures) if operational measures reflect the current drivers of future financial performance and are early in the value chain (Ittner & Larcker, 2002). Milgrom & Roberts (1995) argue that, if a diverse set of performance measures is a complete and complementary set (or system), using a subset of measures leads to inferior performance. From a similar systems perspective, Warren (2002) argues that successful management policies (e.g., PMM) reflect resource interdependence and complementarity.

2.2 Measures are objective and accurate

Ijiri (1967) long ago re-established the theoretical importance of (accounting) performance measure accuracy and objectivity. This topic has not lost relevance.³ More recently, Libby et al. (2002) find that experimental subjects in management-control tasks rely on performance measures that have been verified by third parties, which might create demand for accurate and objective measures. Other studies have found that low-quality measurement is associated with low MCS use or impact (Cavaluzzo & Ittner, 2002; Ittner & Larcker, 1998). However, it is unclear ex ante if investing in measurements is superior to measuring the wrong things or the right things poorly, or avoiding unreliable measures altogether (e.g., Cavaluzzo & Ittner, 2002; Gates, 1999). Objectivity (or verifiability) and accuracy (or error free) are theoretically independent concepts, yet are often coincident in practice with reference to performance measurement.

2.3 Measures are informative

Performance measures that differentiate managers facing similar, uncontrollable factors are informative. Informative measures can improve evaluations, even if they are not completely controllable by managers (e.g., Antle & Demski, 1988). In particular, early value-chain measures can be valuable if they are informative about managers' leading actions (Ittner & Larcker, 2001) in sufficient time to take corrective control actions.

2.4 Benefits outweigh costs of collection

Monitoring employee behavior through a PMM is a costly activity. Generating, organizing, and reporting performance information consume scarce company resources (Merchant, 1998; Simons, 2000). As management accounting researchers have known since the early days of the field (e.g., Horngren, 1967), the perceived benefits of using performance measures should outweigh the associated costs.

³ Discussions of many current accounting and performance-measurement issues can be traced back to Ijiri's classic work.

2.5 Measures reflect system causality

Some academics and consultants have prescribed forms of causal PMM (e.g., Kaplan & Norton, 1996; Epstein et al., 2000; Kanji & Moura e Sa, 2002). Regardless of the sources of business models, causal relations among firms' multiple performance measures often are neither specified nor measured well (Ittner et al., 2002). Quantifying cause-and-effect relations between actions and outcomes at key points in the value chain could help predict future effects of current actions (e.g., Eccles, 1991). A functioning causal PMM also might free managers to focus more on strategy and evaluation issues (e.g., Kaplan & Norton, 2001) than on information processing. Furthermore, a comprehensive, causal PMM might reduce the cognitive complexity of understanding and using multiple measures of performance (Luft & Shields, 2002a). Strategy theorists predict significant benefits from building causal models of firms' strategic resources and capabilities. Huff (1990) and Huff and Jenkins (2002) describe these models as knowledge-based, cognitive maps, which can connect and organize dispersed organizational knowledge.

2.6 Measures communicate strategy

Models such as PMM facilitate communication, learning, and creation of new knowledge and can be the key tool to building a learning organization (Huff & Jenkins, 2003). The right performance measures align actions and strategy by reducing managers' financial myopia (McKenzie & Schilling, 1998), and effectively communicate strategy (Kaplan & Norton, 2001; Malina & Selto, 2001). Systemic management understands and exploits knowledge of dynamic interrelations among resources and capabilities. The elements of a PMM are intended to reflect the strategic use of resources and deployment of efficient processes [e.g., Sanchez et al., 2002].

2.7 Measures create incentives for improvement

Using performance measures that capture inherent time delays between certain decisions (e.g., investing in R&D and employee development) can lead to improved incentives (e.g., Rappaport, 1999; Cloutier & Boehlje, 2002). Ittner and Larcker (2001) also observe that operational measures, which have good "line of sight," can increase the expectancy of rewards based on those measures (e.g., Green, 1992).

2.8 Measures improve decision-making

Organization of measures into distinct categories can affect decision-making, perhaps by reflecting the structure of knowledge about the firm's value chain (Lipe & Salterio, 2000). Measures with tangible connections to processes being managed also might activate more knowledge and promote better learning and decision-making compared to relying on financial measures alone (Luft & Shields, 2001, 2002a). Huff and Jenkins (2002) argue that models (e.g., PMM) organize and express the rationale of complex systems, which aid planning and evaluation activities. Furthermore, such models can represent micro- or macro-levels of knowledge of activities, processes, and systems, thus aiding individuals at all levels of the organization. PMM might improve decision-making by identifying actions and impacts that heretofore have been hidden by traditional measurement systems (e.g., Huff & Jenkins, 2002).

Management control and strategy theories identify eight desirable attributes of performance measures. Measures should be:

- A1 Diverse and complementary
- A2 Objective and accurate
- A3 Informative
- A4 More beneficial than costly
- A5 Causally related
- A6 Strategic communication devices
- A7 Incentives for improvement
- A8 Supportive of improved decisions

3. RESEARCH QUESTIONS

3.1 RQ1—Are measure attributes important considerations for performance measure choice?

The discussions in section 2 provide extensive support for the prediction that an organization chooses measures for their PMM (initially and subsequently) based on at least the eight attributes summarized in this study. The initial choice of performance measures may be based on perceived expected attributes since little history exists upon which to base the assessment. However, changes may occur after experience proves the perceptions correct or incorrect. Therefore, this study predicts that an organization will delete previously chosen PMM measures, which after experience, are perceived to not exhibit these attributes. Whether for initial choice or subsequent change, the theoretical basis for attribute importance remains the same. We expect that a company chooses measures that it expects to have the eight attributes and keeps only those that display the attributes in practice.

More specifically, contingency-based research has shown that firm strategy can affect the design of PMM (Chenhall, 2003). These studies typically use one of several taxonomies to describe firms' strategies, including entrepreneurial or conservative (Miller & Friesen, 1982), prospector, analyzer, or defender (Miles & Snow, 1978), build, hold, or harvest (Gupta & Govindarajan, 1984), and product differentiation or cost leadership (Porter, 1980). More conservative strategies include defender, harvest, and cost leadership, while more entrepreneurial strategies are prospector, build, and product differentiation. Guilding (1999) found that companies following a prospector or build strategy are more likely to use a broad scope of PMM information. Govindarajan and Gupta (1985) found that companies with a build strategy are more inclined to use subjective controls than those pursuing a harvest strategy. Several studies find that firms following a more conservative strategy place more emphasis on cost control than those following a more entrepreneurial strategy (Chenhall & Morris, 1995; Dent, 1990; Simons, 1987). Bouwens and Abernethy (2000) found that firms going through a strategic change process, typically categorized as an entrepreneurial activity, place more importance on integrated PMM information. Finally, Abernethy and Brownell (1999) found that hospitals following a prospector strategy focused more attention on dialogue, communication and learning. No prior strategic-fit work was found leading to a strategy-based preference for attributes of informativeness and incentives for improvement. Table 1 maps the prior strategic-fit research to the eight performance measure attributes in Table 1.

Table 1. Framework for Performance-Measure Attributes

Performance-Measure Attribute	Strategy		Study
	Entrepreneurial Firm (prospector, build, product differentiation, entrepreneur)	Conservative Firm (defender, harvest, cost leader, conservative)	
A1 Diverse and complementary	X		Guiliding, 1999
A2 Objective and accurate		X	Govindarajan & Gupta, 1985
A3 Informative	?	?	No studies of informativeness related to strategy
A4 Benefit exceeds cost		X	Chenhall & Morris, 1995 Dent, 1990 Simons, 1987
A5 Causally related	X		Bouwens & Abernethy, 2000
A6 Strategic communication device	X		Abernethy & Brownell, 1999
A7 Incentive for improvement	?	?	No studies of incentives related to strategy
A8 Improved decision-making	X		Abernethy & Brownell, 1999

Although each of the eight attributes is desirable (*ceteris paribus*), strategic-fit research implies that some attributes may be more relevant than others depending upon company strategy. It is expected that firms following an entrepreneurial strategy will be more likely to prefer measures that are diverse and complementary (A1), causally related (A5), strategic communication devices (A6), and improve decision-making (A8). It is also expected that firms following a more conservative strategy will tend to prefer performance measures that are objective and accurate (A2) and more beneficial than costly (A4).

3.3 RQ3—Does the importance of attributes for design and use differ according to firm strategy?

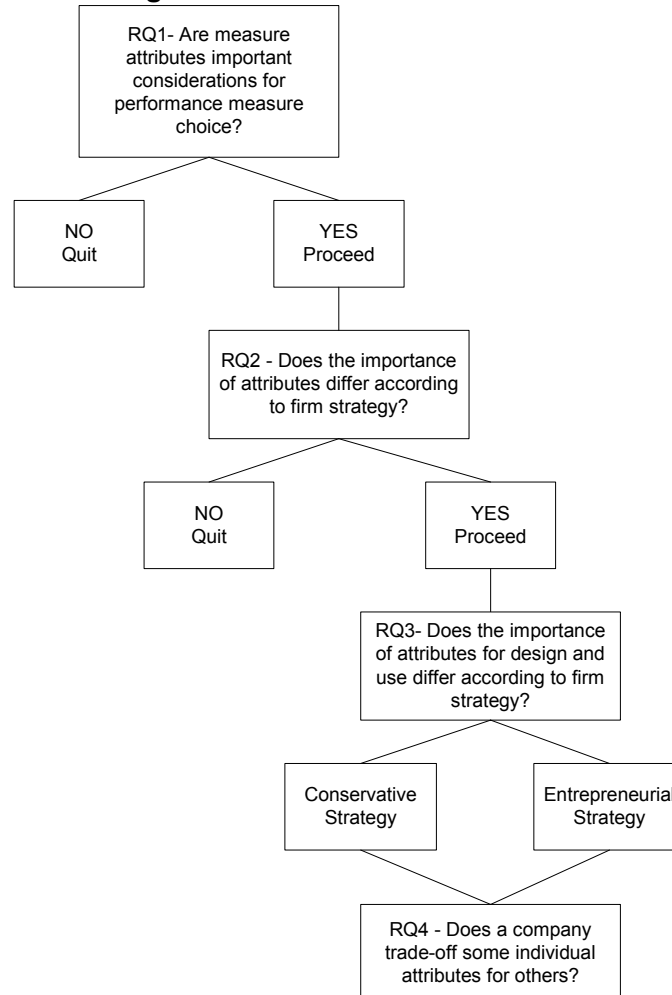
Although all eight are desirable attributes, a company may deem some more relevant than others when designing or using measures in a PMM. The exploratory third question explores subjective classifications of the eight attributes as being primarily being driven by either design or use concerns. Performance measure attributes reflecting primarily design considerations are diverse and complementary (A1), objective and accurate (A2), informative (A3), more beneficial than costly (A4), and causally related (A5). Although all performance measures are at least minimally designed, we conjecture that some are selected as means to achieve specific ends. They can be used to communicate strategy (A6), provide incentives for improvement (A7), and improve decision-making (A8). We test whether the importance differs according to this partition of design and use attributes.

Because it is possible that a measure can be useful and kept in a PMM even if it does not exhibit all attributes, we also explore whether an organization trades-off one attribute for another. The strategic-fit literature cited previously can lead one to expect tradeoffs when

measures' attributes are not consistently high. For example, a company following conservative strategies, given costly measurement, might (not) choose or retain a measure that is high (low) on accuracy and objectivity but low (high) on strategic communication. A more entrepreneurial firm, on the other hand, might (not) choose or retain a measure that is high (low) on improved decision making but low (high) on the benefit-cost ratio. Although one generally might expect these tradeoffs, they would be quite difficult to predict for a specific firm without having more precise attribute measurements. Thus, the fourth research question also is exploratory.

Figure 1 summarizes the four research questions.

Figure 1. Research Questions



4. RESEARCH SITE

The research takes place within a single firm to benefit from close investigation of (1) a PMM developed by the firm, not imposed by the researchers (or external consultants), (2) measures of performance relevant to that firm, not generic measures that might or might not apply to the firm, and (3) access to multiple levels of managers to enrich the understanding of the origins and uses of the PMM. Thus, this study offers some advantages compared to cross-sectional analysis at the firm level, particularly given the difficulty of comparably describing

performance measurement in many firms simultaneously [e.g., Luft and Shields, 2002b]. This study had access to company documents, archival data, and employees at various levels.

This study focuses on a PMM developed by a US *FORTUNE* 500 equipment manufacturer for its distribution channel.⁴ The company employs over 25,000 people in its domestic and foreign operations. Competition is from similarly large domestic and international firms. The company sells its major equipment assemblies through OEM contracts and independent, exclusive distributors, who also sell repair parts and maintenance services. The distribution system is the company's primary contact with retail customers. Each distributor operates within an assigned geographic area. The distributors may not compete with each other or sell competitors' products or services. While the distributorships are independent entities, most are owned by individuals with prior company experience.

4.1 Company Strategy

Per archival documents, the company follows five strategic initiatives, which are:

1. Demonstrate a comparative advantage in each of our markets worldwide, measured in product performance, economic value to the customer and all aspects of customer support.
2. Achieve an average return on equity of at least x% over economic cycles in order to afford the investment required to sustain a comparative advantage in each market into the future, and afford investment in new business.
3. Grow in order to provide superior total return to our shareholders over time.
4. Demonstrate our commitment to help improve the community in which we operate and be a responsible citizen of society.
5. Attract, train, challenge and fully utilize people at all levels in order to achieve these objectives.

The company's strategy can be characterized along the lines of conservative, defender, harvest, and cost leader. Competitive advantage is gained by aggressively preventing competitors from entering the primary product market. Product performance, quality and efficiency have been the company's means to success.

Historically, the company has managed its distributors top-down and strictly by the impact on the company's "bottom-line." However, recent changes in the marketplace have affected the company's approach to measuring distributor performance. Because both domestic and foreign competitors now have similar products, competition for market share has shifted to customer service. In response to this increased competition, the company revised its distributor strategy to focus attention and resources on improving customer service and customer satisfaction.

The company's top-down approach to distributor management is consistent with the theory that firms following a conservative strategy rely more heavily on centralized control systems and on feed-forward control (Langfield-Smith, 1997). Its main distribution goal is

⁴ The company has created PMM for other elements of its value chain but gave access to only the distribution PMM. Other PMMs reportedly are being used successfully.

improving the primary market share for its products. Profitability at the distributor level was important (particularly to distributors) but less important than primary market share because most of the company's profit derived from sales in this market. Again, this supports the classification of the company strategy as more conservative. Conservative companies tend to use control systems that signal the need for innovation by highlighting substantial drops in market share and declining profitability (Miller & Freisen, 1982).

4.2 Distributor Performance Model

A major step in the company's management of its distribution system was to develop a strategically oriented PMM for its 31 North American distributorships that communicates the new customer focus, guides distributors, and provides additional bases for evaluation. This study will refer to the company's *distributor performance model* as the DPM.⁵

According to company documents, the purposes of the DPM are to:

- Highlight areas within distributorships that need improvement to enhance customer relations,
- Provide an objective set of criteria, consistent with the company's strategic initiatives, to guide and measure total distributor performance,
- Be used as the starting point for the three-year distributor contract renewal process, and
- Be used for comparing and ranking distributors and, perhaps, for performance-based compensation.

The DPM was developed internally by company employees—without the aid of external consultants. As was customary in this company, a top-down approach was used. The DPM designers created the initial DPM with selective input from distributor personnel, although the designers had the final say. The DPM was designed to focus on outcomes that the company felt were important for the distributors to accomplish in order to meet company goals, not necessarily distributor goals. Therefore, the company's key success factors do not perfectly mirror those of its distributors.⁶

The data for this study come from interviews with managers, from company documents and from archival performance data. During the second quarter of 1999, sixteen interviews were conducted: nine with distributor-owners and seven with DPM designers and administrators. Distributors, designer and administrator views were sought in order to have a 360 degree view of the DPM process.⁷ The length of the telephone interview was determined by how much the interviewee had to say; all lasted between 45 and 75 minutes. The researchers asked each interviewee the following open questions:⁸

1. In your own words, what is the DPM?

⁵ Company employees refer to the DPM as a "balanced scorecard," but the term has acquired a generic label that might obscure the unique characteristics of this PMM.

⁶ For a discussion of the conflict resulting from this initial mismatch, see Malina and Selto (2001).

⁷ For a complete discussion of the sampling technique, see Malina and Selto (2001).

⁸ These interviews also were used to explore communication effectiveness in Malina and Selto (2001). The present study reflects an independent use and extension of these qualitative data.

2. What do you think is the objective of the DPM?
3. What are the nine measures that distributors report really measuring?
4. What are the measures that are filled out by the company really measuring?
5. How do the measures that distributors report relate to the company's measures?
6. Do the measures help you in any way?
7. Are there any benefits from the DPM itself?
8. Do you have any (other) recommendations for improving the DPM?

Note that the questions do not directly prompt respondents to discuss the factors that are predicted to determine choices or changes in either measures or weights. The questions were purposefully generic (providing a framework for discussing DPM measures) but not directly asking about choice or change. Interviewees freely revealed these factors during the interviews. Their unprompted responses were used to support or deny the predictions.⁹

Company documents provided archival background for the structure of the DPM and quantitative data for each quarterly DPM from the first quarter of 1998 to the fourth quarter of 2001. The interviews were analyzed using qualitative data software (Atlas.ti). Qualitative data software is used to systematically code the qualitative data. A predetermined set of codes was used to identify portions of interview text referring to a choice or a change in DPM measures according to each of the eight attributes developed from the literature. Although all respondents had multiple, coded comments, the coding procedure gave each respondent only a single code for each intersection of performance measure and attribute. Thus, if one interviewee, for example, offered a paragraph describing the accuracy of a specific measure, this response generated a single set of codes—one code for the measure and one for the attribute. For each coded comment regarding an attribute, an additional code was attached regarding whether the measure was dropped from the DPM or remained on the DPM during the time period tested.¹⁰ This restrictive approach to coding qualitative data is designed to illustrate or test theory.¹¹ A complete list of codes used in this research is shown in Table 2.

⁹ Perhaps respondents would have made more comments specific to the hypothesized attributes if we had posed direct questions. However, we wanted to avoid responses that were artifacts of leading questions. We do not have the luxury of a parallel case study where we could have asked leading questions to compare with our results.

¹⁰ Two researchers independently coded the qualitative data. The average coding reliability between the two coders was 87%, which falls above the minimum norm of 80 percent coding reliability (Miles & Huberman, 1994). Coding discrepancies were reconciled by consensus. The consensus coding supports the reported qualitative analyses. For a complete discussion of insuring coding reliability, see Malina and Selto (2001).

¹¹ Miles and Huberman (1994) provide extensive explanations of alternative coding methods.

Table 2. Coding Scheme

Code	
1.1	A1+: Diverse and complementary
1.2	A1-: Not diverse and complementary
2.1	A2+: Objective and accurate
2.2	A2-: Not objective and accurate
3.1	A3+: Informative
3.2	A3-: Not informative
4.1	A4+: Strategic communication devices
4.2	A4-: Not strategic communication devices
5.1	A5+: Incentives for improvement
5.2	A5-: No incentives for improvement
6.1	A6+: Supportive of improved decisions
6.2	A6-: Not supportive of improved decisions
7.1	A7+: More beneficial than costly
7.2	A7-: Not more beneficial than costly
8.1	A8+: Causally related
8.2	A8-: Not causally related
9.1	Measure dropped from DPM
9.2	Measure kept on DPM

5. DATA ANALYSIS

Section 5 is divided into two sub-sections. The first sub-section describes evidence regarding the initial choice of performance measures. The second sub-section uses both qualitative and quantitative analyses to evaluate interview evidence related to the eight attributes regarding changes of performance measures.

Throughout the four years covered by this research, the company made many changes to the DPM. Weightings changed, measures were added, and measures were dropped. The initial DPM (implemented in the first quarter of 1998) and the revised DPM are shown in table 3. Table 4 contains DPM measure definitions. The most obvious change in the revised DPM is a reduction in the number of measures included. The first DPM contained 29 measures while the most recent has 14. Also, all three of the “people” measures (performance reviews, industry involvement, and training) were dropped from the DPM. Of the fifteen measures dropped from the initial DPM, fourteen were eliminated at the end of 1999.

Table 3. Comparison of Distributor Performance Models Q1 1998 to Q4 2001				
Q1 1998		Q4 2001		
Measure	Weight	Measure	Weight	
Customer Satisfaction	3.0	Customer Satisfaction	10	
Market Share – Traditional Market	27.0			
Market Share – New Market 1	3.0			
Market Share – New Market 2	3.0			
Dealer Survey	2.0	Dealer Survey	10	
Parts Fill Rate	3.0	Parts Fill Rate	5	
Service Cycle Time	10.0			
CME	3.0			
Best Practices	1.0			
PBIT as % of Sales	4.0	PBIT as % of Sales	10	
Cash Flow as % of Sales	2.0			
Parts Inventory Turns	2.0	Parts Inventory Turns	5	
Whole Goods Inventory Turns	2.0	Whole Goods Inventory Turns	5	
Days Sales Outstanding	2.0	Days Sales Outstanding	5	
Service Utilization	2.0	Service Utilization	5	
Parts Sales Growth (traditional)	2.0	Parts Sales Growth (traditional)	5	
Service Sales Growth (traditional)	2.0	Service Sales Growth (traditional)	5	
New Market 1 Sales Growth	2.0	New Market 1 Sales Growth	10	
New Market 2 Sales Growth	1.0	New Market 2 Sales Growth	10	
Other Sales Growth	2.0			
Environmental Assessment	2.0			
Safety	2.0	Safety	5	
Performance Reviews	1.0			
Industry Involvement	1.0			
Training	2.0			
Warranty Audit	8.0			
Building Condition	3.0			
Policy Dollars	2.0			
Days to Fin. Statement Submission	1.0			
		Image	10	
DPM Total Weight	100	DPM Total Weight	100	

Table 4. DPM Measure Definitions

Measure	Definition
Customer Satisfaction	Score on customer satisfaction event card
Market Share Measures	
Market Share – Traditional Market	Monthly percentage of distributor share of total traditional market
Market Share – New Market 1	Monthly percentage of distributor share of total new market 1
Market Share – New Market 2	Monthly percentage of distributor share of total new market 2
Dealer Survey	Annual survey of dealer satisfaction with distribution system
Parts Fill Rate	Percentage of parts orders filled within 24 hours
Service Cycle Time	Percent of service repairs diagnosed within one hour and completed within six hours
CME	Audit of distributor use of Company Marketing Excellence system
Best Practices	Number of best practices submitted or number of best practices implemented from data base in the last 12 month period
PBIT as % of Sales	PBIT as a percentage of sales
Cash Flow as % of Sales	Cash flow from operations as a percentage of sales
Parts Inventory Turns	Parts cost of sales divided by average parts inventory
Whole Goods Inventory Turns	Whole goods cost of sales divided by average parts inventory
Days Sales Outstanding	Average trade receivable balance divided by sales per day
Service Utilization	Technician hours billed divided by hours available to be billed
Parts Sales Growth	12 quarter rolling regression over the most recent 12 quarters parts sales growth
Service Sales Growth	12 quarter rolling regression over the most recent 12 quarters non-warranty sales growth
New Market 1 Sales Growth	12 quarter rolling regression over the most recent 12 quarters new market 1 sales growth
New Market 2 Sales Growth	12 quarter rolling regression over the most recent 12 quarters new market 2 sales growth
Other Sales Growth	12 quarter rolling regression over the most recent 12 quarters other sales growth
Environmental Assessment	If distributor has completed an environmental assessment per Company guidelines.
Safety	Lost-time accidents per 200,000 hours worked
People Measures	
Performance Reviews	Random sample of percent of employees evaluated annually
Industry Involvement	Evidence of membership in industry and trade associations
Training	Percent of hours spent on training per hours worked
Warranty Audit	Percent of compliance of warranty repairs
Building Condition	Company determined rating of distributor properties
Policy Dollars	Comparison of actual versus planned expenditure on non-warranty repairs
Days to Fin. Statement Submission	Number of days from close of accounting period to submission of financial statement to Company
Image	(Not implemented at the time of this research)



Other obvious changes in the DPM are the weights assigned to measures. In the first DPM, weightings ranged from 1.0 to 27 points. As the company shortened the DPM, remaining measures ultimately were given either a 5- or 10-point weight. Table 5 chronicles the revisions in the weights assigned to the measures dropped from the DPM over the study period.

Table 5. Revised Performance Weights of Dropped Measures

	Q198	Q298	Q398	Q498	Q199	Q299	Q399	Q499	Q100	Q200	Q300	Q400	Q101	Q201	Q301	Q401
Market Share Measures																
Market Share – Trad. Mkt	27	28	28	28	28	18	18	18	10	10	10	10	10			
Market Share – New Mkt 1	3	3	3	3	3	7	7	7								
Market Share – New Mkt 2	3	3	3	3	3	7	7	7								
Service cycle time	10	10	10	10	10	10	10	10								
CME	3	3	3	3	3	3	3	3								
Best Practices	1	1	1	1	1	3	3	3								
Cash Flow	2	2	2	2	2	2	2	2								
Environmental Assessment	2	2	2	2	2	2	2	2								
People Measures																
	1	1	1	1	1	1	1	1								
Performance Reviews																
Industry Involvement	1	1	1	1	1	1	1	1								
Training	2	2	2	2	2	2	2	2								
Warranty	8	8	8	8	8	8	8	8								
Audit																
Building Condition	3	3	3	3	3	3	3	3								
Policy Dollars	2	2	2	2	2	2	2	2								
Days to Fin.	1	1	1	1	1	1	1	1								
Stmt Sub.																

The following subsections discuss evidence from the interviews that indicates support or lack of support for predicted reasons behind the company's initial choices of all measures and changes to them.

5.1 Initial choice of performance measures

Company designers and managers volunteered eleven comments regarding how and why the initial measures appeared on the DPM. The most cited reason (5 comments, or almost half of total comments) for including the initial measures was that they are objective and accurate. A company employee stated:

The objective of the DPM is to have an objective, documented, factual measurement system rather than a subjective one.

Several interviewees commented that the initial measures were chosen for strategic communication and causality. Three comments were made that the initial measures were designed to communicate the corporate strategy down to the distributor level. A DPM designer stated:

The measures were chosen to dovetail the core objectives.

The measures were also chosen with cause-and-effect relations in mind. Three comments were made that, by design, the initial DPM measures were intuitively related to each other. A DPM designer commented:

The theory of how the measures tie together is good. There are logical correlations.

The coded interviews show objectivity and accuracy, strategic communication devices and causality as the primary bases for initial choices of DPM measures. The company's conservative tradition can be seen in its emphasis on objectivity and accuracy in performance measures. However, the change in the approach to measuring distributor performance appears as emphasis was also placed on the attributes of strategic communication and causality.

5.2 Analysis of RQ1—Are measure attributes important considerations for performance measure choice?

5.2.1 Qualitative analysis of RQ1

The following subsections describe the results of the qualitative analysis of changes in measures summarized in Table 6. Table 6 presents the distributions of codes, by positive or negative form of the attributes, for measures dropped from the DPM and for those retained on the DPM. Columns record the frequency of comments associated with dropped and kept measures. Rows record the frequency of comments associated with positive and negative perceptions. The code frequencies in columns 1 and 2 are meant to reassure the reader that the authors did not selectively focus on unrepresentative comments for the analyses that follow. Column 3 shows the number of respondents comprising the frequency of comment and is meant to reassure the reader that one or two interviewees did not dominate the results.

Table 6. Changes in DPM Measures Code Frequency

	Measure Dropped	Measure Retained	Number of Respondents
Design Attributes			
A1+: Diverse and complementary	0	3	3
A1-: Not Diverse and complementary	11	4	8
Total	11	7	
A2+: Objective and accurate	14	12	13
A2-: Not Objective and accurate	46	19	13
Total	60	31	
A3+: Informative	0	0	0
A3-: Not Informative	0	0	0
Total	0	0	
A4+: Benefits exceed costs	3	2	3
A4-: Costs exceed benefits	17	0	9
Total	20	2	
A5+: Causally related	13	23	13
A5-: Not Causally related	4	0	4
Total	17	23	
Use Attributes			
A6+: Strategic communication devices	17	6	13
A6-: Not Strategic communication devices	1	0	1
Total	18	6	
A7+: Incentives for improvement	18	6	14
A7-: No Incentives for improvement	2	3	5
Total	20	9	
A8+: Supportive of improved decisions	20	7	9
A8-: Not Supportive of improved decisions	3	0	3
Total	23	7	
Total Positive Comments	85	59	
Total Negative Comments	84	26	
Total Comments	169	85	

5.2.1.1 Diverse and complementary (A1). The DPM was intended to be a broad set of measures that encompasses the activities that distributors must manage well to create a successful distributorship. The original intent was to reinforce that distributors needed to look at all aspects of the business, from hiring and training employees to winning market share. Distributors recognized the complementarity of the DPM's diverse measures. For example,

We can't have good results without good people who are trained. We can't have good customer satisfaction without good fill rate and cycle time results. They all relate to sales growth and profitability. I see them definitely [as complementary].

Most distributors, however, complained about the lack of diversity in original market-share measures. Distributors felt that traditional market-share measures were overrepresented and over-weighted on the DPM. Distributors face diverse opportunities. Some make most of their profit from the traditional, mature market, but many can earn more from the new, growing markets. Although diverse market-share measures were included on the initial DPM, only the traditional measure carried significant weight.

*They aren't measuring anything but [traditional] business. [sarcastically:]
If they are only interested in about one-third of their business, then it's good.*

The measures chosen to be on the DPM were to be diverse and complementary. As noted above, this was not perceived always to be the case. Of the 18 comments coded to this attribute, 15 supported the negative form that measures are not diverse and complementary.

5.2.1.2 *Objective and accurate (A2)*. Objectivity, accuracy, reliability, and auditability appear to have been the company's and distributors' primary concerns for DPM measures. Interviewees commented on this attribute most frequently, with 91 comments in total.

The traditional market-share measure dominated the original DPM in part because it was highly objective and accurate.

*We know every single [product in the traditional market] that gets sold to
the tenth of a percentage point.*

In contrast, the new market-share measures were perceived to be less accurate and less objective.

*How we would measure [new] market share is strictly information we
would generate ourselves.*

Almost every distributor commented on certain measures being inaccurate or subject to manipulation. In general, the distributors felt that the people measures were not well defined or verifiable. Six of the nine distributors mentioned that these measures involved some guessing and that there was no rigorous audit process in place to verify the data reported. Early in the life of the DPM, the distributors manually collected and reported service cycle time, which the company dropped after a few years. Six of the nine distributors commented on the lack of accuracy in reporting this measure.

*I'm going to make that number look as good as I can without outright lying
or cheating.*

DPM administrators also were aware that the measure might not be accurate.

*I wouldn't put a lot of stock in either the [service cycle-time measures] we
got before or the ones on this scorecard.*

Nearly every measure dropped from the DPM lacked perceived objectivity and/or accuracy. The exception was the traditional market-share measure which was replaced with the almost equally objective sales-growth measure. The majority of the comments supported the negative form of the attribute that measures are neither objective nor accurate.



5.2.1.3 *Informative (A3)*. Relatively few respondents indicated that informativeness was an important design criterion. The company uses the DPM to compare, benchmark, and rank distributorships and as a stimulus to peer communication. Each distributor receives its own report and its relative numerical ranking (e.g., 7th out of 31). To promote information exchange and competition; the names of distributors achieving top ratings are posted on the company's intranet for all distributors to see.

Individuals can determine their performance against someone else in the corporation performing the same function, so they would know how effective they were at accomplishing their goals and their tasks.

Several distributors recognized the influence of peer pressure on their behavior.

Anytime you publish a report and there are 31 entities being measured using the same metric, you create competition. We are competitive, so it matters what rank you are. Even if no one looks at the rank, I want to be #1.

Qualitative evidence exists to support the importance of DPM informativeness, but not necessarily at the individual-measure level. That is, the company appears to use the overall DPM score to rank distributor performance more than the scores on individual measures. Therefore, this attribute cannot be analyzed at the individual-measure level and will be withheld from the quantitative analyses that follow.

5.2.1.4 *Costs versus benefit (A4)*. The company perceived a number of DPM measures to be misleading or unreliable and also perceived the costs of resolving disputes about these subjective measures to be greater than the benefits derived. Seventeen comments stated that the cost to compile or the time spent resolving disputes outweighed the benefits received from collecting the measure. The performance evaluation and service cycle-time measures in particular were seen as consuming too many resources.

To do [performance evaluations] four times a year for everyone in the company, there aren't enough hours in the day. They need to find something more appropriate for technicians and clerks.

It's just adding time and effort to report [service cycle time] to the company. If we're doing this, we're not doing things for the customer.

Agreement existed among the interviewees that the cost of some measures exceeded their benefits, providing support for the negative form of this attribute.

5.2.1.5 *Causally related (A5)*. The causal nature of the DPM was intended by designers and generally perceived by distributors. The DPM measures were grouped and saliently displayed to guide decisions and recognize the company's beliefs about the relations among measures within the group. Representative comments from distributors reflect the intuition and general belief in the DPM's causal relations.

A lot of business tends to run with financial and market share measures. Those are pretty crude handles. You have to get underneath to things like quality and cycle times, and softer things like employee development. That's where the leverage of the business is. The others are the results of what you've done.



My intuition is that the growth goals help drive market levels, but we don't know the quantitative consequences. Some measures are more tightly correlated, but I don't have a sense of which of these are the key ones that seem to have the most leverage compared to others.

Ninety percent of the comments coded to this attribute supported the positive form that DPM measures reflect causality.

5.2.1.6 Strategic communication devices (A6). At the time of the DPM rollout, the company also launched its new customer-oriented objective. The original DPM measures covered the value-chain activities that the company felt were critical to creating a distributorship that competes successfully on customer satisfaction—the keystone of the company's strategy to sustain market share. DPM designers observed:

Those [measures and categories] are right in line with the strategic initiatives, aligned with our customer and quality objectives. We try to dovetail any plans the company has into those objectives.

All but one comment were in support of the positive form of A6 that measures are strategic communication devices. Distributors and designers all agreed that DPM measures helped communicate corporate strategy to the distribution system.

5.2.1.7 Incentives for improvement (A7). The comments regarding incentive effects of DPM measures were generally in support of the positive form of this attribute that measures provided incentives for improvement. Service cycle time, best practices, and people measures were all cited as creating incentives for distributors to improve performance.

Best practice is a positive measure because it forces you to take a look at other ways to run your business.

Comments regarding market share were split. Distributors commented that the emphasis on traditional market was discouraging to those distributors who saw more growth potential in the newer markets.

If you did poorly on [the traditional market share] and well on [the new market share measures], then you're still viewed as a poor distributor.

The ultimate control over distributor behavior has been the three-year contract review, when the company evaluates distributor performance and either renews or terminates the relationship. The DPM in total is intended to provide a constructive and evaluative structure and to be an objective basis for the contract review. Designers stated:

The only incentive is losing the distributorship and [the DPM] is the centerpiece of the contract review.

The stick might be more evident than any carrot, because as one top manager candidly stated,

It [the DPM] helps when it comes time to terminate a distributor. If you've set up goals and a distributor has failed to achieve them, you can get around

sales representation and franchise laws for wrongful termination. It's not the primary objective, but it's a benefit.

Nearly every comment supported the positive form of A7 that measures provide incentives for improvement.

5.2.1.8 Supportive of improved decisions (A8). The company chose measures for the DPM to reflect the activities and types of financial and non-financial performance believed to be effective to achieve increased company profitability. Most distributors agreed:

The elements and the structure [of the DPM] are outstanding, and they have a lot of potential to help us all improve. [...] I grew up working for a CPA and he ingrained in me that, if you can't measure it, you can't improve it.

Several of the measures on the initial DPM that were subsequently eliminated also were perceived to be helpful for decision-making. In regard to training, one distributor mentioned:

As a result of the measure, we more formally measure this. I like that because it lets me see which areas of the company are doing training and which aren't. I can chat with those not doing training. They get so tied up doing other work that it's hard to put time aside.

The service cycle-time measure, when it was part of the DPM, did affect decision-making in the service process at most distributorships. Distributors often mentioned that it helped them to redesign processes and re-schedule work.

I wasn't an advocate [of the service cycle-time measure] at the start, but now I am. It tells us to quickly figure out what's wrong so we can make an intelligent statement to the customer, so they can say go ahead or not. We have been able to flow more work through our show by getting the quick, easy stuff through the shop. [...] It's helping us.

All but three comments supported DPM measures as being helpful in day-to-day managing and decision-making, therefore providing support for the positive form of the attribute.

5.2.2 Quantitative analysis of RQ1—Are measure attributes important considerations for performance measure choice?

If theories of performance measurement choice are descriptive, comments from interviewees should tend to reflect favorable perceptions of the attributes of retained measures (the positive form of the attributes), whereas comments should reflect unfavorable perceptions of the attributes of dropped measures (the negative form of the attributes). Table 7 presents the distributions of codes, by positive or negative form of the attributes, for measures dropped from the DPM and for those retained on the DPM. A chi-square test compares the observed distribution of comments to the expected distribution, which assumes that dropping or keeping a measure is unrelated to positive or negative forms of the attributes.

**Table 7. Research Question 1:
Positive versus Negative Comments
Analysis of Attribute Codes and Measure Retention**

	Actual Distribution		No Effect Distribution		Chi-square	p-value <
	Measure Dropped	Measure Retained	Measure Dropped	Measure Retained		
Positive comments	85	59	96	48	8.42	0.01
Negative comments	<u>84</u>	<u>26</u>	73	37		
Total comments	169	85				

The Chi-square test of RQ1 indicates that the comment pattern is not random, but is significantly different ($p < 0.01$) from the expected (no effect) distribution. This result reinforces the fact that the qualitative results that measure attributes are important considerations for dropping or keeping DPM measures. Retained measures are more likely to have positive forms of the attributes, and dropped measures are more likely to have negative forms of the attributes. This result, which is consistent with the theory presented in section 2, demonstrates that measure attributes are important considerations for performance-measure choice.

Research question 2 asks if organizational strategy is related to the relative importance placed on performance-measure attributes. As described in the previous section, the company itself follows a rather conservative strategy and is expected to prefer conservative performance measures. Table 8 presents the distributions of codes, by positive or negative form, of attributes expected to be consistent with a conservative strategy and of those expected to be consistent with an entrepreneurial strategy.

The Chi-square tests of the conservative and entrepreneurial strategy attributes indicate that the patterns are not random, and significant differences exist between the observed and expected (no effect) distributions ($p < 0.025$). For the conservative attributes test, the largest impact on the Chi-square statistic results from a larger-than-expected number of positive comments about retained measures. Conversely, for the entrepreneurial attributes test, the largest impact on the Chi-square statistics stems from a smaller-than-expected number of negative comments that are associated with retained measures. These results indicate that both conservative and entrepreneurial attributes have been important to the company's choices, in subtly different ways. Measures consistent with a conservative strategy were retained if they were positively perceived, while measures consistent with an entrepreneurial strategy appear to be retained if comments were not overly negative.

**Table 8. Research Question 2:
Conservative versus Entrepreneurial Strategy Attributes
Analysis of Attribute Codes and Measure Retention**

	Actual Distribution		No Effect Distribution		Chi-square	p-value ≤
	<u>Measure Dropped</u>	<u>Measure Retained</u>	<u>Measure Dropped</u>	<u>Measure Retained</u>		
Conservative Attributes						
Positive comments – Conservative Attributes ^a	17	14 ^c	22	9 ^c	5.26	0.025
Negative comments – Conservative Attributes	<u>63</u>	<u>19</u>	58	24		
Total comments	80	33				
Entrepreneurial Attributes						
Positive comments – Entrepreneurial Attributes ^b	50	39	55	34	5.40	0.025
Negative comments – Entrepreneurial Attributes	<u>19</u>	<u>4^c</u>	14	9 ^c		
Total comments	69	43				

^a Attributes predicted to be most applicable for a conservative strategy are A2 (objective and accurate) and A4 (cost versus benefit).

^b Attributes predicted to be most applicable for an entrepreneurial strategy are A1 (diverse and complementary), A5 (causally related), A6 (strategic communication device), and A8 (improved decision-making).

^c Distribution value that contributes the most to the Chi-square statistic. The 5-comment variance represents a 55.5% difference between the actual and expected distribution.

5.4 Quantitative analysis of RQ3—Does the importance of attributes for design and use differ according to firm strategy?

Table 9 presents the distributions of comment codes, by positive or negative form, of the attributes divided into design and use. This exploratory Chi-square test indicates that the overall pattern is not random, but is significantly different ($p < 0.001$) from the expected (no effect) distribution. The largest impact on the Chi-square statistic comes from positive comments about design attributes. Next, strategy is introduced to investigate whether firm strategy affects the importance of design and use attributes. Since attributes associated with a more conservative strategy are exclusively design attributes, the Chi-square test is run solely for design attributes. Thus, this test is identical to that reported in Table 8; the firm appears to have considered positive design attributes identified with a more conservative strategy when deciding to retain a performance measure ($p < 0.025$).

The final Chi-square test indicates that the firm also considered design attributes associated with an entrepreneurial strategy to be important considerations ($p < 0.001$). Thus, design attributes of measures appear to dominate usage attributes, regardless of the strategic orientation of measures.

**Table 9. Research Question 3:
Design versus Use Attributes
Analysis of Attribute Codes and Measure Retention**

	Actual Distribution		No Effect Distribution		Chi-square	p-value <
	Measure Dropped	Measure Retained	Measure Dropped	Measure Retained		
Overall						
Positive comments – Design attributes ^a	30	40 ^d	47	23 ^d	24.61	0.001
Negative comments – Design attributes	78	23	67	34		
Positive and negative comments – Use attributes ^b	<u>61</u>	<u>22</u>	55	28		
Total comments	169	85				
Conservative						
Positive comments – Design attributes	17	14 ^e	22	9 ^e	5.26	0.025
Negative comments – Design attributes	<u>63</u>	<u>19</u>	58	24		
Total comments	80	33				
Entrepreneurial						
Positive comments – Design attributes	13	26 ^f	24	15 ^f	20.28	0.001
Negative comments – Design attributes	15	4	12	7		
Positive and negative comments – Use attributes ^c	<u>41</u>	<u>13</u>	33	21		
Total comments	69	43				

^a Design attributes include A1 (diverse and complementary), A2 (objective and accurate), A4 (cost versus benefit), and A5 (causally related)

^b Use attributes include A6 (strategic communication devices), A7 (incentive for improvement), and A8 (improved decision-making). Cells with small expected counts ($n < 5$) have been collapsed.

^c Use attributes associated with an entrepreneurial strategy include A6 (strategic communication devices) and A8 (improved decision-making). Cells with small expected counts ($n < 5$) have been collapsed.

^d Distribution value that contributes the most to the Chi-square statistic. The 17-comment variance represents a 73.9% difference between the actual and expected distribution.

^e Distribution value that contributes the most to the Chi-square statistic. The 5-comment variance represents a 55.5% difference between the actual and expected distribution.

^f Distribution value that contributes the most to the Chi-square statistic. The 11-comment variance represents a 73.3% difference between the actual and expected distribution.



To explore whether the company trades-off some attributes for others, comments contrary to expectations for dropped measures were investigated further, as shown in Table 10. The first column of numbers in Table 10 reproduces comment frequencies shown in Table 6 for entrepreneurial use attributes. The company dropped measures that are strongly perceived as strategic communication devices (A6+, 17 comments) and supportive of improved decisions (A8+, 20 comments), when straightforward predictions indicate that the measures should have been retained.

**Table 10. Research Question 4:
Trade-Off of Individual Attributes**

Comments in Unexpected Direction		Associated Unfavorable Comments						
Measures are:	Favorable Comments on Dropped Measures	A1-	A2-	A4-	A5-	A6-	A8-	None
A6+: Strategic communication devices	17	1	4	2	0	-	1	9
A8+: Supportive of improved decisions	20	0	6	9	0	0	-	4
Total	37	1	10	11	0	0	1	13
Proportions of total comments	1.000	.027	.270	.297	.000	.000	.027	.350

A1-: Not diverse and complementary

A2-: Not objective and accurate

A4-: Not more beneficial than costly

A5-: Not causally related

A6-: Not strategic communication devices

A8-: Not supportive of improved decisions

To determine whether the company trades off these apparently beneficial attributes, we investigated comments referring to other attributes within the same section of text. A qualitative database query using Atlas.ti identified co-occurrence or associations between coded sections of text.¹² The columns of Table 10 labeled A1- to A8- present the number of times that favorable comments in the first column are associated with negative comments for each of the other attributes. For example, interviewees said that the people-related performance measures, among others, help distributors make improved decisions (i.e., support for A8+). However, the people measures (among others) were dropped from the DPM.

The Atlas.ti query tool found co-occurring comments (27 percent of the total) stating that the dropped measures, which ought to support improved decisions, are not objective and accurate (A2-). This indicates that the DPM attribute of improved decision-making is subordinate to the attribute of objectivity and accuracy. More co-occurring comments (27.9 percent) stated that dropped measures were not cost-beneficial. Almost no other types of co-

¹² Co-occurrence or proximity rules include coded quotations of one type that enclose, are enclosed by, overlap, are overlapped by, preceded by one-line, or followed by one-line coded quotations of another type. See Appendix B of Malina and Selto (2001) for a complete discussion of finding associations among codes using qualitative software.

occurring negative comments appeared. When the company unexpectedly dropped measures, it consistently made choices consistent with the proposition that the attributes of objectivity and accuracy (A2) and benefits versus costs (A4) were more important than attributes of strategic communication (A6) and support of improved decisions (A8).

6. CONCLUSIONS AND DISCUSSION

This study focuses on the efforts of one large firm to model drivers of its distribution performance. It complements recent research and offers an analytic generalization to an emerging theory of performance measurement and management control. This study contributes to analytic generalization about performance measurement by empirically examining choices and revisions of diverse performance measures in a live setting. The results of this qualitative investigation augment previous survey, experimental, and normative studies that collectively are refining a theory of performance measurement.

6.1 Theory-based analyses

Management control and strategy theories identify at least eight desirable attributes of performance measures. Measures should be diverse and complementary, objective and accurate, informative, more beneficial than costly, causally related, strategic communication devices, incentives for improvement, and supportive of improved decisions. Analysis of interviews with company PMM designers and users find that, taken as a whole, these attributes are relevant to decisions to delete or retain performance measures. This study finds that the studied organization's choices of performance measures appear to be strongly influenced by measures' attributes, consistent with theory.

Further analysis yields two results related to the attributes' relative importance for retaining or dropping performance measures. First, the relative importance of performance measure attributes in decisions to drop or retain measures differs subtly according to firm strategy. Positive attributes of conservative-strategy measures and relative lack of negative attributes of entrepreneurial-oriented measures are associated with the measures retained on the PMM. Because the company itself followed a rather conservative strategy, we expected conservative-strategy measures to be dropped only if they had an abundance of negative attributes. This appeared to be the case. Likewise, because of the top-down nature of distribution management, we expected that the company would keep only the entrepreneurial-strategy measures (urged by entrepreneurial distributors) that had a relative abundance of positive attributes. However, in this case, entrepreneurial measures tended to be kept as long as they were perceived to not have excessive negative attributes. This result appears somewhat inconsistent with our interpretations of prior contingency theory strategic-fit research on attributes.

We identify three possible reasons for this mild contradiction. First, prior research investigates strategy fit at the PMM level, not at the individual-measure level. Our predictions of which attributes are more applicable for the two broad definitions of firm strategy are based on the applicability of these PMM-level results to measure-level analysis. The measurement-level of analysis may be contributing to the unexpected result.

Second, the classification of firm strategy does not lend itself to a clear-cut conservative or entrepreneurial dichotomy. As cautioned by Chenhall (2003), the extant typologies might be overly simplistic for modern, dynamic firms. Most aspects of the company strategy reflect a conservative strategy; yet, not all follow neatly in line. For example, the recent change to focus



on customer satisfaction is more in line with an entrepreneurial, differentiation strategy than a conservative strategy.

Finally, and related to the difficulty of neatly categorizing a company's strategy, two related entities are being studied. The company might follow a conservative strategy while the distributors, although still fitting mostly into a conservative-strategy classification, have distinct entrepreneurial tendencies. The company's narrow performance focus had caused considerable tension between management and regional distributors who saw more profitable opportunities in the company's secondary markets. Unlike the company, many distributors' success stems from tapping the less-established and growing secondary markets. This strategic tension played out in the evolution of a PMM for the distribution channel and may be contributing to the subtle difference in criteria for keeping or dropping performance measures. In other words, distributors, because they have direct impacts on customers and company sales, might have more influence on PMM design than we anticipated.

6.2 Exploratory analyses

Attributes that we associated with design appear to be more influential than those associated with use. This finding led to an investigation of trade-offs among attributes. Although all of the attributes might be desirable, the two attributes that appear most associated with keeping or dropping individual DPM measures are (a) the objectivity and accuracy of measures and (b) the cost versus benefit balance of measurement. A measure might promote good decision-making and communicate strategy, for example, but the company dropped it if experience showed it could not be measured inexpensively, accurately and objectively. Trade-offs also permitted a more detailed analysis of the effect of strategy on PMM choice. At an aggregate level, only a subtle difference was found in the importance of attributes consistent with either a conservative versus an entrepreneurial strategy. However, at the individual-attribute level, we find that objectivity and accuracy (as well as cost versus benefit—both consistent with the company's conservative strategy) accompany changes in DPM measures.

6.3 Discussion

The trade-off of attributes can be seen clearly in the treatment of market-share measures. As mentioned previously, the company initially emphasized the importance of the traditional, primary market share. Primary market share was important to corporate strategy, but the company also had the ability to measure primary market share extremely accurately and objectively. Many distributors complained that the traditional market did not afford them growth opportunities and that more weight should be attached to new market shares. Unfortunately, new market shares are difficult to measure accurately and objectively. The company ultimately eliminated all the market-share measures from the DPM. The company decided to move the weight assigned to primary market share to sales-growth measures. Measurement of sales growth is easily obtained, and relatively accurate and objective for both the traditional market and the new markets, although sales growth does not speak directly to the company's strategy to grow market share. However, the addition of sales-growth measures retained diversity among measures and recognized distributors' entrepreneurial opportunities.

Apparently this company, with its long history of conservative, bottom-line financial management, could not tolerate subjectivity in measurement or high costs of improved information, nor could it tolerate the costly disputes that inevitably follow the use of subjective measures for performance evaluations and contracting. This finding has implications for the use of performance measures (e.g., some non-financial measures) that cannot be measured or

audited as objectively or accurately as financial measures. For example, many organizations currently measure employee capabilities; some might use these measures in performance evaluations. A full understanding of the “softness” of such measures might preclude non-productive disputes that can arise if they are used to evaluate and reward performance, particularly in firms that are accustomed to using hard, financial measures. The creative task facing PMM designers is to find measures that are: diverse and complementary, informative, strategic communication devices, incentives for improvement, supportive of improved decisions, causally related, but are also objective and accurate and not too costly. Clearly, this is a challenging task.

6.4 Future research

Future research might replicate this study in similar or dissimilar firms or to a large sample of diverse firms to obtain useful contrasts or further support for the theory of performance-measurement models. Future research questions include:

- What are the measurement tradeoffs among measure attributes that might be necessary to implement feasible PMM?
- Do all firms (or only those with a conservative strategy) stress cost of measurement, accuracy and objectivity of performance measures above all other attributes?
- Is complementarity an issue beyond initial design? Do returns or tradeoffs to scale and scope of measurement exist?
- What are the performance opportunity costs of trading-off performance-measure attributes?

6.5 Epilogue

Three years after the introduction of the DPM, as reported in Malina and Selto (2001), distributors' measured financial performance improved significantly. The DPM is alive and well as of May 2005, and it is used for managing and evaluating distributors and distributorships. Top management commitment to using and refining the DPM was and continues to be strong. Distributors continue to adapt their behavior to the DPM's guidance, and the DPM has undergone several more changes since the completion of this research. An example of adaptation is that all distributors now meet the DPM's challenging safety goal, despite many early complaints that it was an impossible standard (see Malina & Selto, 2001). Changes to the DPM include dropping formal reporting of profit (PBIT/S) because of unforeseen claims by labor unions for a greater share of profits, and inclusion of several new measures that had been proposed earlier but not yet developed. The DPM continues to be the center point of the contract-renewal process, and its increasing objectivity and relevance has added to its acceptance. The DPM has become an integral part of management control at this company and undoubtedly will continue to evolve.

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Performance Measurement in Defense Acquisitions: A Case Study of the Navy

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ABSTRACT

The federal government is becoming increasingly “corporate” and, consequently, business-like operations are now more prevalent than ever. Part of the mandate to “act like a business” is a need to develop strategic plans and goals, which require metrics to quantify what is to be attained. In this environment, an effective performance-management program is essential to success.

The ASN (RD&A) has updated its strategic plan in support of the DoD’s efforts to transform the military based on these environmental changes. Its efforts to implement a revised



performance-management program in support of its revised plan offer potential insights into performance measurement in defense acquisitions.

INTRODUCTION

The federal government is becoming increasingly “corporate” with ever more focus on issues such as competitive sourcing (A-76), President’s Management Agenda (PMA), OMB 300, the Performance Assessment Rating Tool (PART), the Government Performance and Results Act (GPRA), and Management Initiative Decision (MID) 901, to name a few. And, with its focus on transformation under the Bush Administration, the Department of Defense (DoD) is part of that trend. Under Secretary Donald Rumsfeld, the DoD has reorganized to become more like a business, with management teams, a top-down strategy, and a focus on performance-based management. Consequently, business-like operations are becoming more prevalent in the Department, and the DoD (like other agencies) is incorporating to a greater degree management artifacts like cost analysis, cost accounting, trade-off analysis, and performance measurement into daily operations. As the Government Accountability Office (GAO) states in its report on performance budgeting: “Performance language and tools have become part of the culture of governance” (GAO, 2005, 22).

Part of the mandate to “act like a business” includes a need to develop strategic plans, as well as objective goals around those plans. The goals, then, require metrics to quantify what is to be attained, followed by processes to track and report on progress against those goals. With its transformation, the DoD, like many organizations, needs to make difficult management decisions—trade-offs among several worthwhile projects—and it requires strong, meaningful, verifiable information to do so. That kind of information comes only from a good performance-metrics program.

In support of the DoD’s decision to transform the military, and understanding the highly dynamic acquisition environment, John J. Young, Jr., Assistant Secretary of the Navy for Research, Development and Acquisition (ASN (RD&A)) recognized the need to revise and update the *Naval Research and Acquisition Team 1999–2004 Strategic Plan*. Mr. Young identified two key needs within the community that the updated plan had to address: (1) to develop systems flexible enough to respond to the many different challenges the organization could face; and, (2) to create an organization that could reinvent itself on an ongoing basis, not only in response to specific threats.

Mr. Young’s revised plan, the *Blueprint for the Future*, starts with a vision statement:

Build a strategic capability to strike anyone, anywhere, anytime.

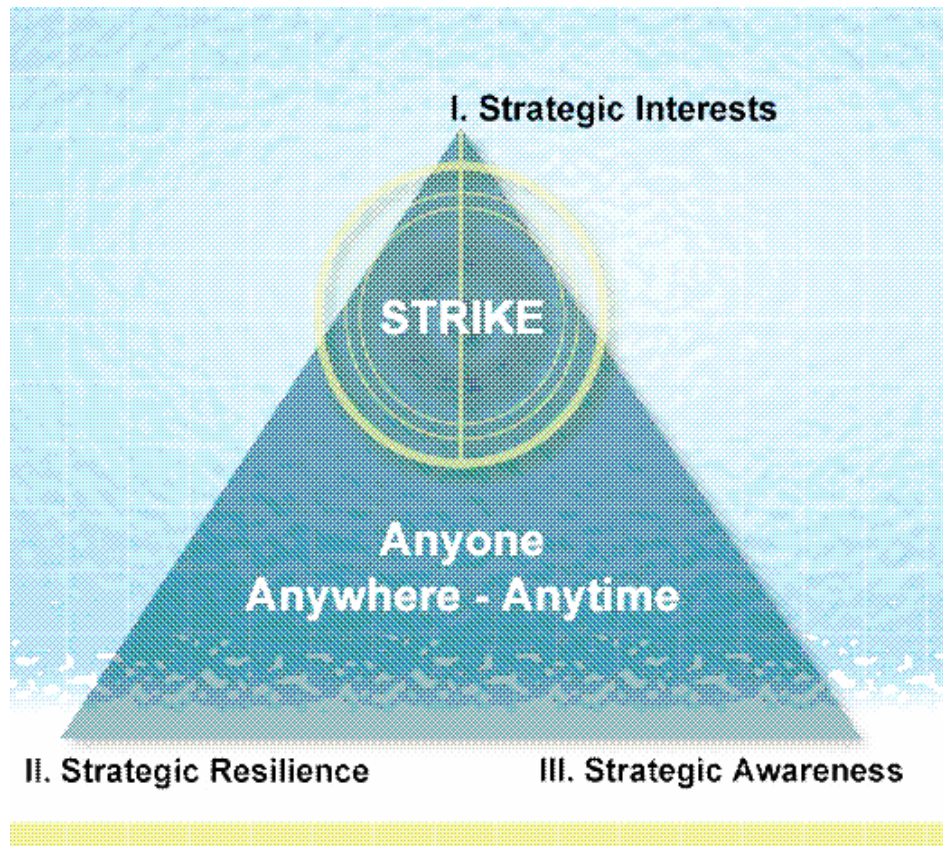
The vision statement is supported by three vision concepts:

1. **Strategic Interests:** must think globally
2. **Strategic Awareness:** must be able to collect, analyze, and communicate information
3. **Strategic Resilience:** must be resilient/innovative

Figure 1 illustrates ASN (RD&A)’s vision concepts.



Figure 1: ASN (RD&A)'s Pyramid of Strategic



The vision, in turn, is supported by three principles, under which Mr. Young outlines high-level organizational goals and initiatives/projects for fulfilling the strategic plan:

Principle Number 1: The Naval Acquisition Team must think like a business and run a tight ship.

Specific Goals: We will work with industry on a business-to-business basis and measure our organic businesses against the best industry benchmarks.

Sample Goals:

- Every program will seek to continuously cut government and industry cost.
- Each SYSCOM Commander, PEO, and PM should ensure that at least 5 lean events are held in each depot or industrial activity—government or industry.

Initiatives/Projects: The Naval Acquisition Team will deliver to budgets and schedules we define.

Sample Initiatives/Projects:

- Deliver LPD-17, SSN-775, and the USS EISENHOWER to the Fleet.
- Complete contracts for DDX lead ship construction, SHA(R), and MPF(F).

Principle Number 2: The Naval Acquisition Team must innovate and collaborate to deliver effective, affordable weapons for Sailors and Marines.

Specific Goals: We must change how we do business in both major and incremental ways to deliver resilient strategic capability at the lowest possible cost.

Sample Goals:

- Define the path to ForceNet by collaborating with both the operational and requirements communities and with our allies
- Define Sea Basing concepts and work with the Army and Air Force to jointly enable these programs

Initiatives/Projects: The Naval Acquisition team must use incentives and metrics to hold industry and ourselves accountable.

Sample Initiatives/Projects:

- Contracts are the key management tools for program managers, and DASNs, PMs, and PEOs should ensure that an appropriate profit/incentive strategy structure is included in all new contracts.
- DASNs, PEOs and PMs will define realistic budgets and schedules to deliver appropriate capabilities and will be prepared to be held accountable to those plans.

Principle Number 3: The Naval Acquisition Team will operate as a neighborhood to jointly integrate systems and develop people.

Specific Goals: The Naval Acquisition Team must, as individuals, take responsibility for growth and enhancement of our neighborhood.

Sample Goals:

- Every person in the neighborhood should daily seek to change things to more effectively and efficiently deliver value for the warfighter and taxpayer.
- Managers will ensure that our system rewards unselfish collaboration and innovation.

Initiatives/Projects: We will create an Enterprise Culture and achieve Operational Excellence: \$1 billion in real improvements.

Sample Initiatives/Projects:

- We need to think and act like a fleet-footed business—instead of a big bureaucracy that moves at glacial speed—if we are to realize our vision of strike anyone, anywhere, anytime.
- We need to develop clear acquisition strategies and goals in a collaborative manner with our customers in the Navy and supply-chain partners in the Defense Industry.

UPDATING ASN (RD&A)'S BSC

Given the effectiveness of the BSC model within other like organizations, it is an optional model for ASN (RD&A)'s leaders (working under Mr. Young's direction) to implement the *Blueprint*. The original four perspectives of the ASN (RD&A)'s BSC are still valid:

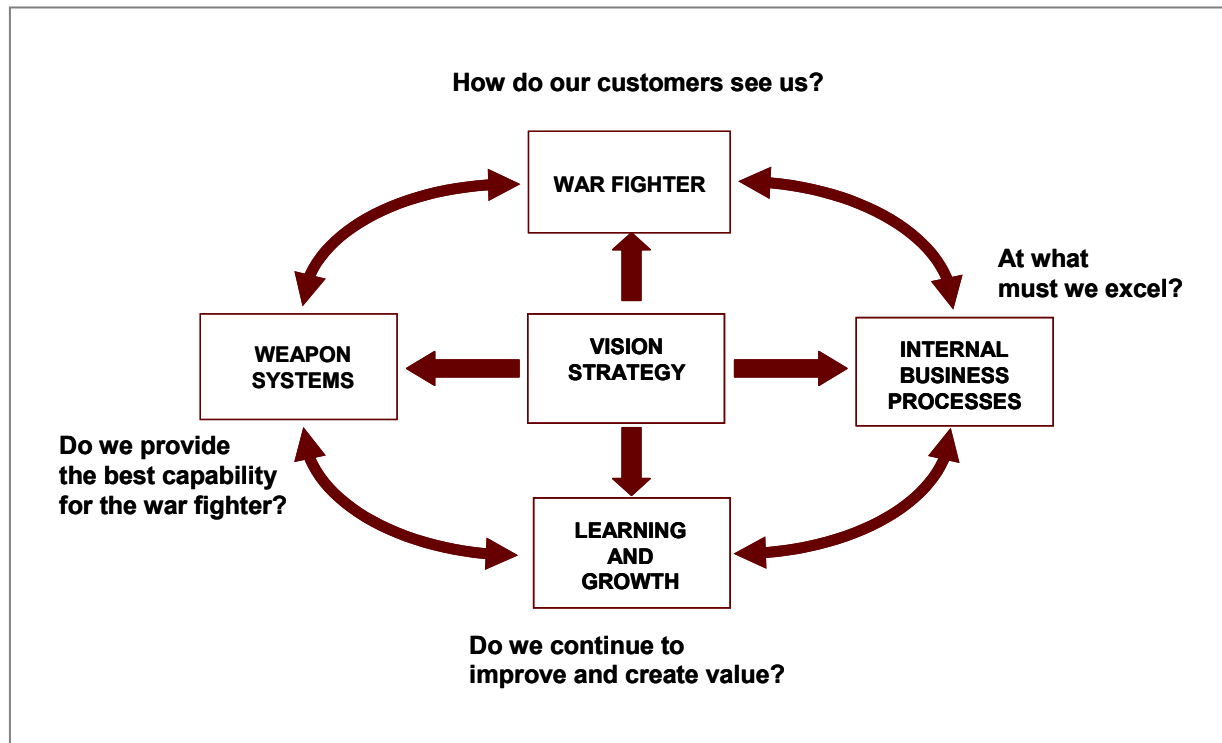
1. **Warfighter:** How do customers see us?



2. **Internal Process:** At what must we excel?
3. **Growth & Learning:** Do we continue to improve and create value?
4. **Financial:** Do we provide the best capability for the warfighter?

Figure 2 shows the ASN (RD&A)'s four BSC perspectives.

Figure 2: Four Perspectives of the ASN



As part of the initiative to update the organization's BSC to support the *Blueprint*, ASN (RD&A) managers should review and update the Balanced Scorecard (BSC) with a focus on metrics management, keeping in mind the need for:

- **Baseline review:** establishing processes necessary to determine current status, focusing on the basis for performance-data analysis.
- **Performance-data collection and analysis:** placing greater emphasis on
 - activity-based cost
 - operational and support (O&S) cost accounting
 - economic trade-off analysis.
- **Performance measurement:** incorporating metrics into BSC and the strategic plan.
- **Flexibility:** incorporating change mechanisms to accommodate the new environment.
- **Community involvement:** involving stakeholders inside and outside ASN (RD&A) to offer input and support.

- **Institutional commitment:** obtain institutional commitment at all levels.

ASN (RD&A)'S BSC: INFLUENCING FACTORS

As with most organizations, ASN (RD&A) does not work in a vacuum. It has many influencing factors to consider as it develops and implements its BSC model.

Challenges

ASN (RD&A) leaders face multiple challenges—some common to other organizations, some unique to their own—that could impede efforts to effectively implement its BSC:

- **Proliferation of agendas:** Many agendas affect the organization—individual staff, the many areas of ASN (RD&A) itself, DoN, DoD, government-wide, Congressional, etc.
- **Changing control:** An ASN (RD&A) BSC must meet current needs, but be flexible enough, and sensible enough, to succeed through regular control changes, such as Congressional and Presidential elections.
- **Unforeseen/uncontrolled “environmental” changes:** The ASN (RD&A) is greatly affected by environmental issues over which it may have limited control, such as the changes brought on by the end of the Cold War or the events of 9/11/01.
- **Overlapping roles and responsibilities:** Within the Navy, overlapping responsibilities in areas such as requirements and budgets impact ASN (RD&A)'s strategic plans and metrics management.
- **Changing focus:** The short timeframe of civilian political appointees and military leadership can dilute institutional energy for some projects.
- **Stakeholder consensus:** Lack of consensus by stakeholders on the selection of measures reported often scuttles an otherwise well-developed plan.
- **Data reliability:** Any program that relies on data faces concerns about the reliability of the data, and ASN (RD&A)'s program must alleviate these concerns—both by ensuring it has the technical capability to collect and analyze the data, as well as by gaining stakeholder buy-in on the method of collection.
- **Data volume:** Large quantities of data in ASN (RD&A) can limit their usefulness by making it difficult for decision makers to ascertain the most relevant information.

Existing Performance-Management Initiatives

At the same time, ASN (RD&A)'s BSC must integrate—or at least consider—many existing performance-measurement initiatives:

- **GPRA:** The Government Performance and Results Act of 1993 requires federally funded agencies develop and implement an accountability system based on performance measurement, including setting goals and objectives and measuring progress toward achieving them.
- **CFOA:** The Chief Financial Officers (CFO) Act of 1990 requires DoN to provide auditable financial statements that link performance measures and financial information.



- **PMA:** The President's Management Agenda (PMA) is a coordinated strategy to reform federal management and improve program performance. It targets five government-wide initiatives for every department and agency: Strategic Management of Human Capital, Competitive Sourcing, Improved Financial Performance, Expanded e-Government, Budget and Performance Integration.
- **PART:** PMA's Performance Assessment Rating Tool (PART) is one of five cross-cutting initiatives in the PMA. PART uses a set of questions, the answers to which are translated into a numeric score designed to assess program performance in four areas: Purpose, Strategic Planning, Program Management, and Program Results.
- **CM:** PMA's Common Measures section is also part of the PMA's Budget and Performance integration.
- **SEC Metrics:** SECDEF established the Senior Executive Committee to lead the revitalization process. The Deputy Secretary leads the SEC, which consists of the Service Secretaries and USD (AT&L). The SEC directed the formation of the DoD Metrics Working Group. The executive secretary of the SEC leads the working group, which consists of members from OSD/PA&E, P7R, AT&L, and representatives from each of the Services and the Joint Staff. The DoD Metrics Working Group's task is to develop metrics strawmen with proposed measures for each of the DoD Risk Management Areas.
- **Management Initiative Decision (MID) 901:** Establishes performance outcomes and tracks performance results for the DoD in consolidating the management goals in the PMA; also utilizes Quadrennial Defense Review (QDR) performance goals under a balanced scorecard and designates the metrics SECDEF will use to track associated performance results. The SEC is coordinating with the services in building metrics and a strategic plan to a framework outlined in MID 901.
- **AT&L BSC:** AT&L already had initiated development of a BSC to address its priorities in response to QDR.
- **SECNAV:** SECNAV has implemented its own initiative to create effective performance measures within DoN.
- **ACAT Program Metrics:** These metrics address program effectiveness for Acquisition Category I & II programs.
- **Acquisition Economics:** Economic Order Quantity.
- **RDA Strategic Plan:** Finally, of course, ASN (RD&A) had to address its own performance measures.

Sources of Strategic Guidance

In addition to its common and unique challenges and existing performance metrics, ASN (RD&A)'s efforts are further impacted by the abundance of strategic guidance—some of which is found in the same programs that outline performance metrics, and others that offer only strategic direction:

- National Security Strategy
- PMA
- Quadrennial Defense Review (QDR)
- Defense Planning Guidance

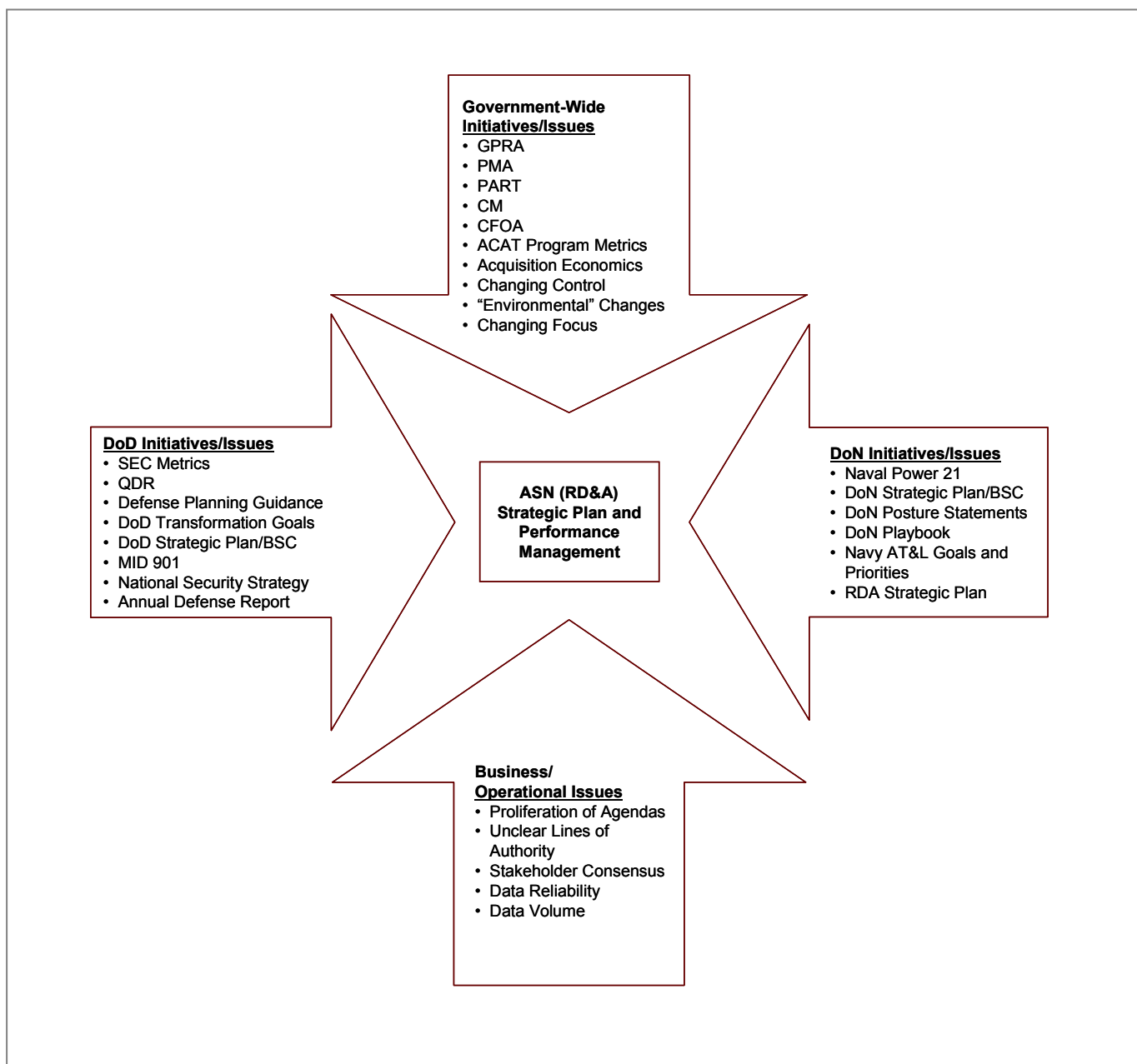


- Naval Power 21
- Government Performance and Results Act (GPRA)
- Annual Defense Report
- Department of the Navy Posture Statements
- Department of the Navy Playbook

These challenges, existing metrics, and strategic directions create sometimes inconsistent and/or overlapping needs, data needs that could overwhelm operations, and a lack-of-context to ensure that different initiatives will be effective.

Figure 3 shows the impacts on ASN (RD&A)'s strategic-planning effort.

Figure 3: ASN (RD&A) BSC Influencing



IMPLEMENTING THE BLUEPRINT THROUGH A BSC MODEL

One way to implement Mr. Young's vision is through a balanced scorecard approach. The following information is relevant if this model is the chosen path.

Issues to Address

In order for DASNs, PEOs, and SYSCOM Commanders to effectively utilize Mr. Young's vision using a BSC approach, they will need to address the following issues.

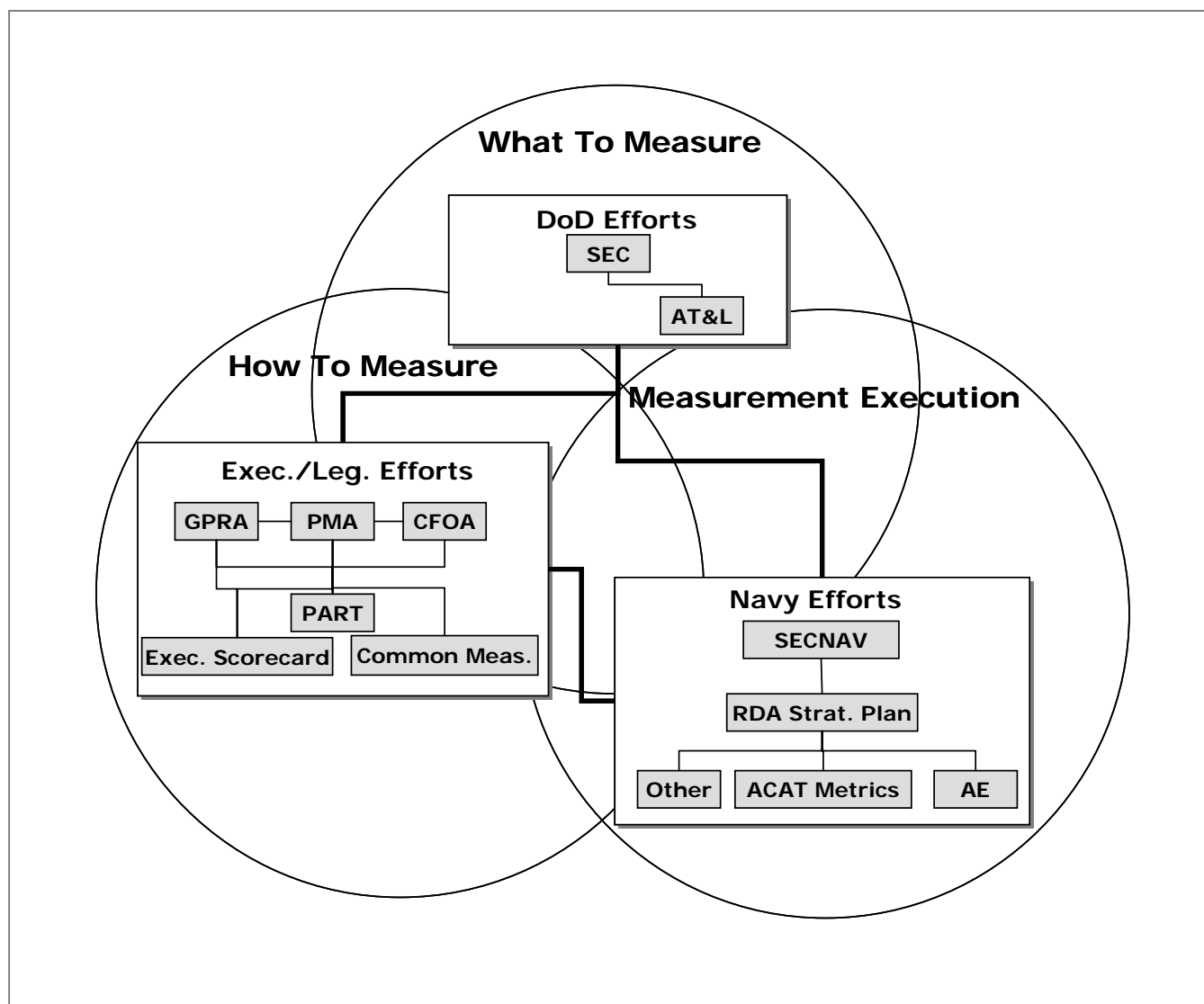
- **Focus metrics:** Effective performance management efforts must expand beyond cost, schedule, and risk. If they do not, they run the risk of concentrating on activities that are not necessarily those most important to the support of the community's strategic goals.
- **Think longer term:** Part of Mr. Young's strategy is to plan for a longer time horizon.
- **Orient metrics to outcomes:** The metrics being used, and, therefore, the performance being measured, need to focus on outcomes—not activities.
- **Create a line-of-site:** Each PEO, DASN, and SYSCOM Commander must have a scorecard to create a line-of-site throughout the organization that demonstrates how the work of each employee supports the organization's overall goal.
- **Create accountability:** Implementing metrics throughout the organization drives accountability.
- **Select SMART metrics:** Metrics need to be SMART, as well as consistent, understood, accepted, and evaluated (at least on a quarterly basis).
- **Align metrics with DoN, DoD, and government-wide initiatives:** Metrics need to demonstrate a relationship to the broader initiatives of the organizations of which ASN (RD&A) is a part. ASN (RD&A)'s performance-management program must support its own goals first-and-foremost, but the absence of alignment to outside performance metrics simply creates an additional layer of collection and analysis.

Putting it Together: Start Large and Work Down to the Detail

DoN Strategic Context

The DoN provides a context for strategy and metrics development and implementation starting at the top and working down through the organization at ever-increasing levels of detail. Figure 4 depicts the Navy's strategic context.

Figure 4: Navy's Strategic Context



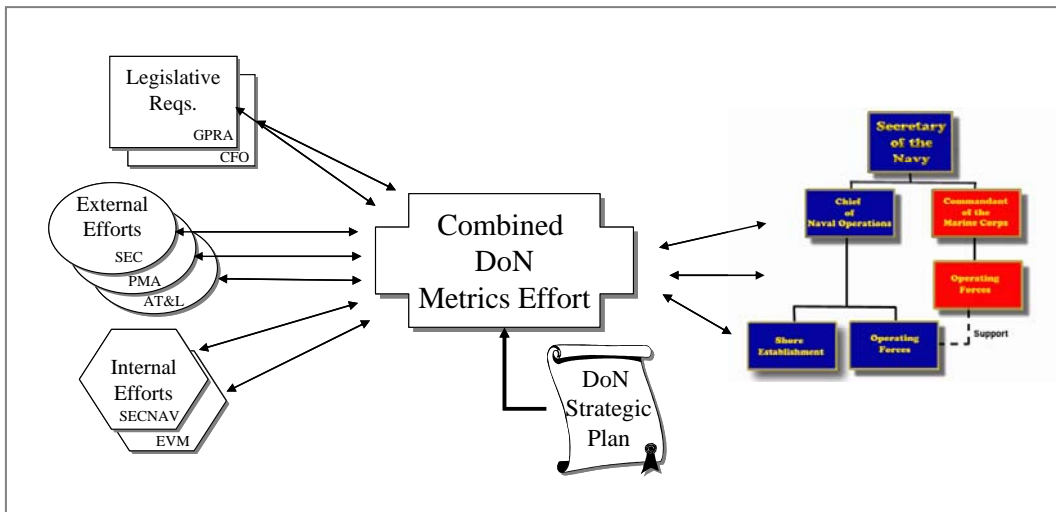
DoN Combined Metrics Effort

The Navy's vision includes a single coherent effort to develop performance metrics that address both long-range goals for current capabilities as well as for transformation. The vision calls for its units to proceed from a common Navy vision and strategy, and then to consolidate efforts to develop metrics that:

1. make sense for the Navy
2. are useful to decision-makers and managers
3. are effective for managing performance and driving change

Figure 5 demonstrates how the DoN's metrics efforts interact.

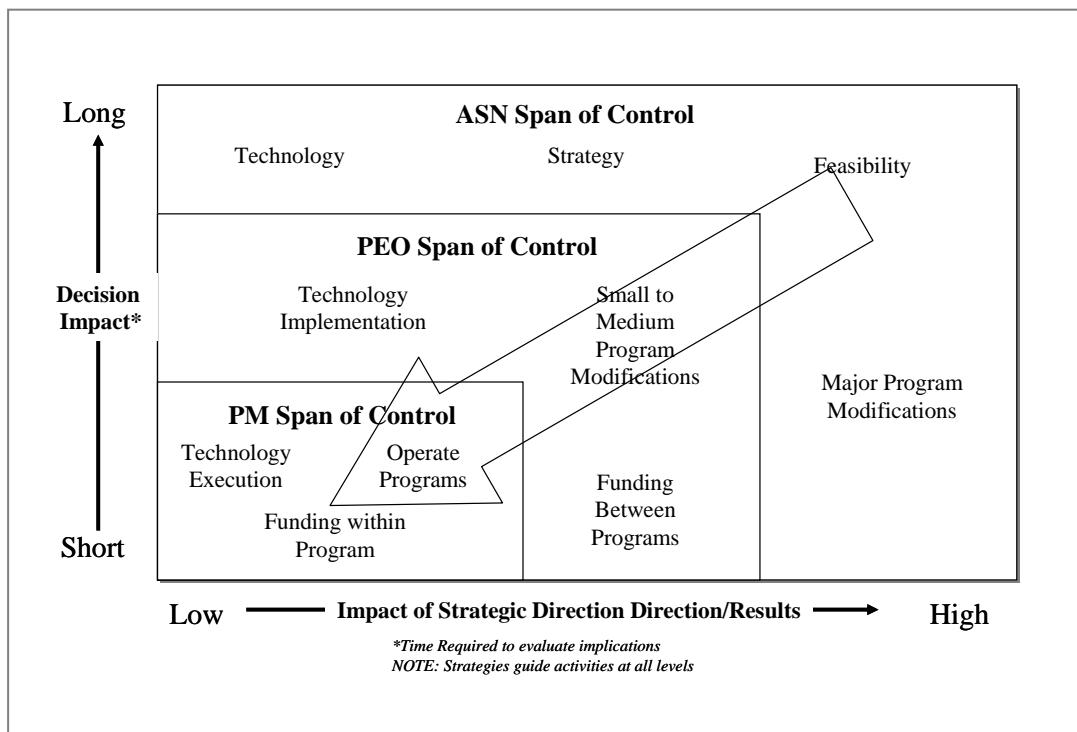
Figure 5: Combined DoN Metrics



Span of Control

In developing its performance measures from top to bottom, managers need to consider the timing and impact of each stratified level of performance measurement. Clearly, as spans of control decrease, impacts decrease. Yet, at the same time, effort needed to implement plans also decreases as spans of control decrease. Important points to remember in thinking about stratified performance measures are (a) the measures must work like a pyramid, each level supporting the level above it, and (b) the impacts of decisions will decrease as spans of control decrease. Figure 6 illustrates how span of control relates to level of impact.

Figure 6: Span of Control Relative to



ASN (RD&A) Integrated BSC

With a full understanding of the government-wide initiatives, of DoD's strategic plan, of DoN's strategic plan, of the Navy's vision, strategic context, and combined metrics effort, of the span of control issues, and (most important) of their own strategic plan, ASN (RD&A) DASNs, PEOs, and SYSCOM Commanders can construct a performance measurement plan that integrates them with the program's BSC.

The table below shows how the BSC can be integrated with other important initiatives.

ASN RD&A BSC	ASN RD&A Strategy	ASN (RD&A) Objectives	PMA/PART LINK
Warfighter	Deliver effective, affordable weapons for warfighters	Define the path to ForceNet by collaborating with both the operational and requirements communities and with our allies.	- Expanded e-government
Internal business processes	Think as a business	Each DASN, PEO, and PM should seek to reduce the volume of acquisition documents by 50%, including only essential, relevant information.	- Budget and performance integration - Competitive sourcing
Learning and growth	Integrate systems and develop people	Every DASN, PEO, and PM should create a notional personnel development plan that would identify candidates to assume leadership responsibilities at scheduled or future transition points.	- Strategic management of human capital
Weapon systems	Run a tight ship	Every program will seek to continuously cut government and industry cost.	- Improved financial management - Expanded e-government

Implementing Performance Measurement Based on the BSC

From here, ASN (RD&A) managers can determine the measures, targets and initiatives that will support their overall objectives. Completing these three determinations (measures, targets, and initiatives) will create a line-of-sight for all employees in the unit, provide a dashboard for understanding and reporting against progress, and align activities with overall strategic goals.

Figure 7 and Figure 8 are sample performance matrices (one each for a DASN and a PEO) including key areas, measures, weights, and sample data.

Figure 7: Sample DASN Performance

DASN PERFORMANCE MATRIX									YTD	YE
Common to all	Key Area	Measure *	Weight (%)	4	3	Goal	2	1		
Common w/some negotiation	SYSTEMS (30%)	External Reports	#Nunn-McCurdy breaches	7	0	0	1	>1	0	0
Weighting negotiated		Prog Cost	# Programs on DAES agenda	6	<3	<4	5	>5	3	3
		Schedule	% Annual growth	5	<0.4	<0.6	0.8	>1	0	0.5
		Performance	# APB breaches	4	1	2	3	>3	0	0
		Performance	# APB breaches	4	<3	<4	4	>4 or KPP	2/KPP	3/1 KPP
Measures and values negotiated	PROCESSES (40%)	Program Decision Meetings	% meetings delayed due to documentation	10	<3	3	4	>4	2	2
		Requirements	% meetings delayed due to unresolved issues	10	1	2	3	>3	2	3
		Requirements	% ORDs w/non- CAIV changes	2	<10	<15	18	>20	4	14
		Requirements	Ave days pending ORD app	2	<180	<210	285	>285	200	200
		Requirements	Ave days pending APB app	2	<100	<120	150	>150	160	115
	STAKE-HOLDERS (15%)	PPBS	% programs changed (excludes execution & taxes)	6	<25	<40	50	>50	0	20
		PPBS	% adverse issues favorably resolved	8	>50	>25	25	<25	100	30
		Fleet	Fleet visit frequency	7	>1.5	1	0.8	<8	0.3	2.1
		Congress	% late congressionals	8	<2	<5	5	>5	2	4
		OPNAV/SECNAV								
	LEARNING & GROWTH (15%)	Quality workforce	% DAWIA qualified	4	>80	>70	60	<60	65	85
		Motivated workforce	% meeting cont learning objective	4	>75	>50	20	<20	40	80
		Motivated workforce	% current performance plans & scheduled reviews	4	>95	>85	75	<75	75	100
		Motivated workforce	Award-reward rate (%)	3	>15	>10	10	<10	12	20
		Motivated workforce	Award-reward rate (%)	3	>15	>10	10	<10	12	20
* Portfolio weighted average unless otherwise specified				Trend	QTR 1	QTR 2	QTR 3	QTR 4	SUMMARY	
				YTD					3	3
				YE						

Figure 8: Sample PEO

PEO PERFORMANCE MATRIX											
Key Area	Measure *	Weight (%)	4	3	Goal	2	1	YTD	YE		
					Prior Year						
SYSTEMS (40%)	Contract Perf	# OPI	6	>0.95	>0.93	0.92	<.91	0.91	0.96		
	Prog Cost	% Annual growth	7	<0.4	<0.6	0.8	>1	0	0.6		
	Affordability	# APB breaches	2	1	2	3	>3	0	0		
		% Progs w/goals	4	>80	>70	60	<60	65	100		
	Schedule	% Progs exceeding goals	6	>10	>5	5	<5	5	21		
	Performance	# APB breaches	3	1	2	3	>3	0	0		
PROCESSES (25%)	Risk	# APB breaches	6	<3	<4	4	>4 or KPP	2/KPP	3/1 KPP		
	Risk	Risk Index	6	>9	>8	0.8	<.75	0.81	0.91		
	Contracts	Current CPAR to total applicable contracts (>\$5M)	5	>90	>75	50	<50	65	100		
		Current IPAR to total applicable contracts	5	>75	>50	25	<25	30	80		
		Ave PALT days past 12 mos	5	<180	<200	270	>270	230	165		
	EVM	% applicable contracts	5	>85	>60	50	<50	65	100		
		% Replan IBRs to replans	2	>75	>50	25	<25	60	80		
		% Current EVMS MOAs	2	>80	>70	10	<10	75	85		
	Requirements	% ORDs w/non- CAIV changes	1	<10	<15	18	>20	4	14		
		Ave days pending ORD app	1	<180	<210	285	>285	200	200		
STAKEHOLDERS (20%)		Ave days pending APB app	1	<100	<120	150	>150	160	115		
	PPBS	% programs changed (excludes execution & taxes)	1	<25	<40	50	>50	0	20		
	Fleet	Miss Cap Rate	5	>90	90	85	<85	90	92		
		Fleet visit frequency	4	>1.5	1	0.8	<8	0.3	2.1		
	OPNAV/SECNAV	Establish Infrastructure plans/targets (%programs)	4	>75	>50	25	<25	35	80		
		Actual Infrastructure savings/target (%)	4	>90	>80	70	<70	90	95		
		Establish Human Sys Int plans/targets (% programs)	3	>75	>50	25	<25	35	80		
	Quality workforce	% DAWIA qualified	4	>80	>70	60	<60	65	85		
		% meeting cont learning objective	4	>75	>50	20	<20	40	80		
	Motivated workforce	% current performance plans & scheduled reviews	4	>95	>85	75	<75	75	100		
	Award-reward rate (%)	3	>15	>10	10	<10	12	20			
* Portfolio weighted average unless otherwise specified			Trend	QTR 1	QTR 2	QTR 3	QTR 4	SUMMARY			
			YTD					2	3		
			YE								

CRITICAL SUCCESS FACTORS

Several factors contribute to success in implementing a BSC to manage performance.

- **Engage leadership:** Because performance management is a big commitment, it is absolutely necessary to ensure the involvement of leadership by engaging decision-makers in determining what activities to measure, the goals for each measure, and methodology for measurement. It is essential, too, to maintain consistent and regular communications with leaders to ensure their continued support.
- **Analyze decision-maker needs:** End-user involvement is critical to any process redesign—particularly for a performance-measurement system because the end-user is upper management. The metrics put in place must truly support decision-makers' needs.
- **Establish an overall metric framework:** A framework is needed to address the multiple metric requirements and organizations within a performance-management program, including issues such as:
 - alignment with higher-level initiatives
 - procedures, standards, regulations
 - funding
 - organizational buy-in
- **Appoint a metrics arbiter:** A performance-management program creates several metrics, pulled from various sources, which also can be complicated and conflicting. A metrics arbiter can save the organization time and trouble by providing the last word in disagreements over metrics.
- **Establish coordinating structures:** Again, given the number and potential complexity of metrics measurement, coordinating structures limit confusion and work by coordinating metrics collection and sharing information where possible.
- **Test:** A measurement program is a big undertaking, and generally the processes are new. In order to ensure greatest opportunity for success, it is best to run a limited test of the roll-out framework (as well as a data call test), to evaluate results, improve the framework, then roll out the framework to the entire affected community.
- **Use appropriate technology:** Performance measurement, when properly implemented, is often designed around an integrated database and web-based technologies. Information systems in most organizations contain incompatible hardware, software, data structures, and communication protocols, and these incompatibilities must be addressed. Additionally, security must be reviewed and addressed. Transitions to a new data system cannot be accomplished overnight, and the performance-measurement framework should be designed with this in mind.

COMMON MISTAKES

Organizations commonly make many mistakes in the implementation of performance-management programs:

- **Metrics don't relate to objectives/priorities:** In some cases, objectives and priorities are assumed and found to be either wrong or out-of-date by the time the metrics program is implemented. In other cases, metrics simply are not well matched to the organization's objectives. The danger in these two cases is that metrics become



irrelevant, and the program's success is limited by a sense among those collecting statistics that the program is simply make-work.

- **Metric programs take too long to produce results:** The assessment and design phases of metrics programs frequently generate an abundance of new metrics without consideration of the time, complexity, and expense involved in their ultimate implementation; this lack of forethought can disconnect management expectation from the project's capability to deliver.
- **Recycling old metrics:** Performance-management programs often take advantage of existing metrics, which can be valuable. But, there are considerable risks to recycling this data:
 - Pre-existing metrics are often fragmented and do not form part of a cohesive whole. This is especially the case if the metrics were defined at a departmental, rather than an organizational, level.
 - Pre-existing metrics may be at the level of granularity, scope, or focus they were when they were first conceived, and, therefore, are ill-suited to the new requirement.
 - The decision to accept pre-existing metrics on a "temporary" basis until a comprehensive metrics system is implemented can lead to failure. Temporary solutions tend to become permanent solutions as investment dollars are spent on implementation.

LESSONS LEARNED

As with common mistakes, there are several lessons learned among organizations that have successfully implemented performance-management programs.

- Leadership must be committed to strategy and performance-management program implementation and accountability.
- Managers must communicate strategy in an easily understandable, logical structure and framework.
- Organizations must manage performance with a deliberate process.
- Alignment and visibility of all processes and activities are important.
- Measurement is essential.
- It is important to select a good strategic-planning and performance-management model and continue to use it.
- Measurable outcomes are critical to success.
- Managers must ensure ownership throughout the organization.



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Impact of Diffusion and Variability on Vendor Performance Evaluation

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EXECUTIVE SUMMARY

Performance-Based Logistics (PBL) is an initiative that the Department of Defense (DoD) has targeted for “aggressive implementation” in FY 2006-2009 (Wolfowitz, 2004). It is an initiative intended to improve weapon-system logistics outcomes, and to reduce weapon system life-cycle costs. Provider evaluation in PBL is intended to center on clearly specified outcome metrics, and mutually-agreed upon goals on those metrics (DUSD-LMR, 2001)—with the idea that the DoD knows best what it wants in terms of logistic services, but the vendor may know best how to provide those services. PBL can be seen as an extension of the principle of “commander’s intent” in which leadership presents goals, but subordinates are encouraged to choose methods and processes (Apgar & Keane, 2004).

Within the field of behavioral decision making, there is a substantial literature which shows that decision makers use sub-optimal heuristics to value and negotiate agreements such as PBL contracts for services; these are subject to systematic biases in judgment when evaluating performance (Kahneman, Slovic et al., 1982). In this paper, we draw a connection between the intent of PBL on the one hand, and the literature on biases and heuristics on the other. Specifically, we review the literature on PBL and logistics service measurement as it relates to: 1) the distinction between process and outcome measures and 2) the significance of risk. We then review the literature on behavioral decision making and performance evaluation that relates to those same two topics, and develop hypotheses regarding: 1) the potential impact of process measurement *on* outcome measurement, and 2) the absence of stated metrics and goals for the variance (risk) of outcomes. We develop specific, testable hypotheses from this review of the literature, report on a test of these hypotheses in a laboratory experiment, and discuss the implications of our findings in practice.

PBL is an evolving concept within the DoD, and clarification on the metrics which should be used to assess weapon-system logistics outcomes has been recently issued which emphasizes that system-level outcomes such as operational availability should be used to evaluate PBL candidates and the performance of PBL providers (Wynne, 2004). The system-level emphasis of this clarification is significant and proper, as warfighting outcomes are clearly only impacted by system-level (as opposed to component-level) performance.

But PBL is still being applied at the component level, and there is no clear guidance (to our knowledge) on how to link component-level variables like time-to-failure to system level outcomes like operational availability. Indeed, a recent Government Accountability Office (GAO) report found that most of the 185 PBL contracts they were able to identify in the DoD were written at the component or subsystem level, and they suggested that contracting at the component level should continue to be preferred to contracting at the system level (GAO, 2004).

Even in the private sector, the measurement and performance assessment of logistic services is known to be a difficult task. Proper valuation of the outcomes of logistic services (as opposed to merely valuing inputs, such as cost) must include some assessment of difficulty to quantify factors such as customer satisfaction, and risk reduction (Lambert & Burduroglu, 2000). This outcome-measurement problem is made more difficult because so many of the traditional logistics measures are process measures (Caplice & Sheffi, 1994). Nor is this situation easier when the services are provided to the DoD, yet, outcomes cannot be reduced to measurable quantities like profit or shareholder value (Camm, Blickstein et al., 2004).

The DoD, of course, has no simple overarching valuation metric such as profit, and it has no simple revenue surrogates. Valued outcomes have to do with military missions; thus,



even if logistic services for a weapon system are provided at an aggregate level by a single provider, they are difficult to value and price. At the level of a subassembly or single logistic element, the problem is compounded. Unless decision makers have comprehensive models of weapon-systems logistics, (in which the important performance dimensions of all critical components are modeled), they cannot value a component-level contract in terms of system-level outcomes like operational availability. Such models have not been required, and we have no evidence that they are being used in the field.

In situations without clearly observable outcome measures and valuation functions, decision makers are known to place a heavy weight on surrogates (such as process measures or even input measures) (Chinander & Schweitzer, 2003). Some of these surrogates, however, may not correlate well with system-level outcomes. Under PBL, decision makers must determine relevant outcomes for component-level contracts and separate *diagnostic* measures (those that correlate well with desired system outcomes) from non-diagnostic ones. However, decision makers are known to pursue information even when it is non-diagnostic and non-instrumental (knowledge of the measure would not or should not change decisions). Unfortunately, once obtained, such non-instrumental information may be treated as if it were instrumental (Bastardi & Shafir, 1998). That is, decision makers pursue information they do not need, then act upon it. In our paper, we investigate this tendency in decision makers who were asked to evaluate provider performance under a hypothetical PBL contract.

It might be claimed that additional information could never hurt the decision process (aside perhaps from the cost of gathering it), but at least two sets of research findings indicate that such confidence would be misplaced. The *curse of knowledge* is a dysfunctional decision-making pattern that occurs when a decision maker knows information they would be better off to ignore; yet, once it is known, they cannot ignore it (Camerer, Loewenstein et al., 1989). The classic example is a wine merchant who over-prices his good wine and under-prices his bad wine; thus, he loses revenue on both sides from customers who do not know as much about wine as he does. Thus, the wine merchant is "cursed" by his superior knowledge of wine quality, and he loses revenue: he would be better off to price his wines according to market demand. In our case, the decision maker who pursues non-diagnostic process information may misestimate provider performance because of it. A related bias is the *dilution effect*: the tendency for non-diagnostic information to cause diagnostic information to be undervalued (Nisbett, Zukier et al., 1981). In the case of PBL, if a decision maker captures process metrics, he or she may not be able to place them in the proper context relative to a system-level outcome, and the impact of an important outcome metric may be diluted. In our paper, we investigate the tendency of decision makers to dilute system outcomes when given knowledge of process variables.

A special case of the misuse of non-diagnostic information is the use of information about inputs. The *input bias* is the tendency to make judgments about the quality of outcomes based on the value of inputs (Chinander & Schweitzer, 2003). For example, people tend to judge the quality of a product or service higher when they have to wait longer for it (Maister, 1985). This bias is thought to play an especially significant role in evaluation when outcomes are difficult to observe or measure. In the case of PBL contracts, the evaluation of proposals based solely on the relative cost of alternatives would be an example of an input bias. Also, a performance evaluation that considered investments a provider made in achieving outcomes would be an example of an input bias. In our paper, we investigate the susceptibility of decision makers to an input bias when evaluating the performance of logistic service providers.

There are other reasons why decision makers may seek out component-level process measures, even when they have been directed to look for system-level outcome measures. Process measures allow a better degree of control over the internal workings of a process. They may not reduce uncertainty around outcomes, but they do give decision makers a sense that outcomes are more directly under their control. Risk preferences vary widely, but in addition to individual differences in risk aversion or risk-seeking behavior, decision makers tend to prefer controllable to uncontrollable ones even to the extent that they will maintain illusions about the degree of control they have over a situation (Langer, 1975). The preference for controllable risks is said in part to be related to a general bias decision makers have that their own abilities are better than others' (Howell, 1971). Of course, part of the logic of performance-based outsourcing is that *providers* are more capable of dealing with the internal processes of the logistics service. But, decision makers appear to maintain this preference for controllable risks, and to support their bias toward exaggerated self-assessments, even when they would be better off with less control (Klein & Kunda, 1994).

In delegating the decisions on how to accomplish outcome goals to a provider, programs seek to use PBL to transfer some of the process and financial risk of the logistic service to the provider; in contracting to deliver outcomes while assuming responsibility for processes, providers accept that risk at a specified price. The assessment of these risks is part of a business-case analysis required for every implementation of PBL in the Navy (Young, 2003). To our knowledge, however, DoD-level PBL guidance does not require any specific measures of outcome risk, or process risk transfer.

The biases and heuristics literature make it clear that human decision makers are poor intuitive statisticians (Kahneman, Slovic, et al., 1982). Indeed, one of the early criticisms of that research was that, in part, it merely represented tests of intelligence or educational achievement (Cohen, 1982). As Cohen (1982) pointed out, if decision makers could intuitively grasp statistical concepts, what would be the point of offering classes about these concepts? However, whether it is a question of education or irrationality, it seems clear that most decision makers do not have an intuitive model that allows them to value variance in, for example, operational availability. In our paper, we investigate the tendency for decision makers, even when trained in risk assessment, to undervalue the impact of outcome variance.

The investigations in our paper are all made through laboratory experiments: questionnaires asking decision makers to evaluate PBL scenarios. The results have only limited generalizability to the actual management of extant PBL contracts, or to the valuation and pricing of PBL contracts. However, the results do have implications for the continued evolution of PBL, and the need for greater specificity in guidance. That is, if decision makers under PBL are subject to the same limitations as decision makers in our study, our research indicates the need for the DoD to develop specific guidance with regard to risk measurement and valuation, and to require comprehensive system-level models to value and price component-level contracts, and evaluate component-level logistic-service provider performance.



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Panel—Financial Management

Thursday, May 19, 2005	Financial Management in Programs
9:00 a.m. – 10:30 a.m.	<p>Chair: Dan Nussbaum, Naval Postgraduate School</p> <p>Papers:</p> <p><i>“Business Case Analysis and Contractor vs. Organic Support: A First-Principles View”</i></p> <p>Raymond Franck, Naval Postgraduate School</p> <p><i>“A Framework for Calculating Indirect Costs and Earned Value for IT Infrastructure Modernization Programs”</i></p> <p>Richard F. Suter, High Performance Technologies, Inc.</p> <p><i>“Navy Acquisition via Leasing: Policy, Politics, and Polemics with the Maritime Positioned Ships”</i></p> <p>John Shank, Naval Postgraduate School</p> <p>Joe San Miguel, Naval Postgraduate School</p> <p>Don Summers, Naval Postgraduate School</p>

Chair: Dan Nussbaum—Professor at the Naval Postgraduate School, Operations Research department, Monterey, California. His expertise is in cost/benefit analyses, lifecycle cost estimating and modeling, budget preparation and justification, performance measurement and earned-value management (EVM), activity-based costing (ABC) and Total Cost of Ownership (TCO) analyses.

From December 1999 through June 2004, he was a Principal with Booz Allen Hamilton, providing estimating and analysis services to senior levels of the US Federal government. He has been the chief advisor to the Secretary of Navy on all aspects of cost estimating and analysis throughout the Navy, and has held other management and analysis positions with the US Army and Navy, in this country and in Europe.

In a prior life, he was a tenured university faculty member.

Dr. Nussbaum has a BA in Mathematics and Economics from Columbia University, and a PhD in Mathematics from Michigan State University. He has held post doctoral positions in Econometrics and Operations Research, and in National Security Studies at Washington State University and Harvard University.

He is active in professional societies, currently serving as the President of the Society of Cost Estimating and Analysis. He has previously been the VP of the Washington chapter of INFORMS, and he has served on the Board of the Military Operations Research Society.

He publishes and speaks regularly before professional audiences.

Finally, he is married, has two children and four grandchildren. He is a lap swimmer and a dedicated herb and vegetable gardener.



Business Case Analysis and Contractor vs. Organic Support: A First-Principles View

Presenter: Raymond Franck, Senior Lecturer, Graduate School of Business & Public Policy, Naval Postgraduate School, retired from the Air Force in 2000 in the grade of Brigadier General after thirty-three years commissioned service.

BGen Franck was born in Sac City, Iowa, on August 28, 1945. He graduated from Denison Community High School, Denison, Iowa, in 1963. Upon graduation, BGen Franck entered the United States Air Force Academy, earning his Bachelor's degree in 1967. The recipient of a National Science Foundation Fellowship, he entered Harvard University, receiving a Master's degree in Economics in 1969. He completed his Doctorate in Economics in 1983. BGen Franck is a graduate of Squadron Officer School, Air Command and Staff College, the National Security Management course, and Air War College.

Following his tour at Harvard University, BGen Franck entered Undergraduate Pilot Training at Columbus AFB, Mississippi in July of 1969. His first operational flying assignment was as a B-57 Canberra pilot and instructor pilot. These duties took him to Holloman AFB, New Mexico; MacDill AFB, Florida; Ubon RTAFB, Thailand; Kadena Air Base, Japan; and Malmstrom AFB, Montana.

In 1975, BGen Franck was assigned as the Officer-in-Charge, Air Force Element of the Joint Operational Control Center at Keflavik Naval Station, Iceland. In 1976, he returned to the United States as Instructor and Assistant Professor of Economics in the Department of Economics, Geography, and Management at the Air Force Academy.

In 1980, BGen Franck was assigned to the Pentagon. He served as Staff Analyst for Bomber Programs, Office of the Assistant Secretary of Defense for Program Analysis and Evaluation. In 1985, he returned to operational flying. After B-52 training, he was a flight commander and on the operations staff of the 2nd Bomb Wing, Barksdale AFB, Louisiana. BGen Franck reported to Headquarters, Strategic Air Command, Offutt AFB, Nebraska, in 1985. He served as Deputy Chief, Program Evaluation Division, and was later assigned as Special Assistant to SAC's Commander-in-Chief.

He assumed duties as Permanent Professor and Head, Department of Economics and Geography, United States Air Force Academy, in 1989. From 1994 to 1996, he served at the Joint Military Intelligence College as Visiting Professor and Associate Dean, School of Intelligence Studies in Washington, D.C. and returned to the Academy in the summer of 1996.

His responsibilities at NPS have included the interim chairmanship of the newly-formed Systems Engineering Department from July 2002 to September 2004.

BGen Franck is a Command Pilot with 2300 flying hours. His military decorations include the Defense Superior Service Medal, the Legion of Merit, Defense Meritorious Service Medal, Meritorious Service Medal, Air Force Commendation Medal, Vietnam Service Medal, and Armed Forces Expeditionary Medal. He is a member of the Air Force Association, the American Economic Association, the Western Economic Association, and the Order of Daedalians.

BGen Franck is married to the former Meredith Ann Ballard of Broken Bow, Nebraska. They have two children, Gretchen Marie and Matthew Edward.

ABSTRACT

The Business Case Analysis (BCA) is regarded as a highly-useful management tool. BCAs are mandatory, among other things, for formulating Product Support Strategies (PSSs) in the development of major systems. While defense managers appear to have sufficient guidance regarding BCA documentation, a comparable level of guidance regarding analytical methods is not evident. In fact, there is extant OSD guidance which leaves analytical methods as a task for the services. Accordingly, this essay addresses theoretical foundations useful for BCAs, and practical foundations for analysis in the defense arena—with special attention to the



choice of contractor vs. organic support in the formulation of Product Support Strategies (PSSs). The report concludes with a proposed partnership involving the Navy with the defense academic and analytical communities. It also offers words of advice based on current state-of-the-art for Program Managers doing BCAs assessing contractor vs. organic support.

KEYWORDS: Business Case Analysis (BCA), Product Support Strategies (PSS), Program Management, Contracts, Outsourcing, Cost-Benefit Analysis (CBA), Transactions Cost Economics (TCE).

CHAPTER 1. INTRODUCTION AND OVERVIEW

Business cases and Business Case Analyses (BCAs) have become a fact of life for DoD Program Managers. Used well, they can do much to make sense of the very difficult environment of contemporary defense management. Defense decision-making must take into account a threat environment that has become increasingly difficult. We've traded the insecurities of the Cold War, along with the analytical comforts of dealing with one main enemy for a more favorable military balance, along with a multiplicity of national security concerns. Included are terrorism, drug trafficking, and the rise of new powers (China, India, Brazil, ...).

Related to the changed environment are DoD initiatives toward "transformation" of military forces for more effectiveness in the new national security environment. Accordingly, to take one example, the Navy finds itself considering a large number of new classes of warships as candidates for development. At the same time, funding is scarce and so is end-strength—while operating and personnel tempos are very high.

In an era of new complexities, new mandates, and worrisome resource constraints, it's especially important that defense managers of all types, but Program Managers especially, make resource-allocation decisions informed by solid analysis. BCAs are intended to provide that basis.

There's much useful guidance regarding the major steps to doing a BCA, and, with it, useful templates for producing one. However, there is much less that's visible regarding the methodological foundations that make BCAs analyses and not just reports and briefings. In fact, one authoritative DoD source (Wynne) explicitly leaves development of analytical methods to the services. Accordingly, this study reports on analytical foundations of useful and effective Business Case Analyses. There is, however, a focus (sometimes implicit) on analytical methods useful for making organic vs. contractor support decisions, as part of choosing the best Product Support Strategy (PSS) for a new system.

Chapter 2 discusses the theoretical foundations of methods useful for BCAs. It starts (Section 2A) with a general discussion of problem-solving methods, and states a theme that runs throughout this discussion. Next, 2B is Input-Output Analysis, a method of tracing the interdependencies of complex economies, with obvious applications (potentially) to complex organizations such as the US Navy. The central idea is that outsourcing decisions reduce military manpower requirements directly in the activity that was outsourced, but also indirectly in the support structure for those personnel. Following, 2C is Transactions Cost Economics (TCE), a relatively recent branch of economic theory. It starts with the notion that markets are not frictionless media, and that activities in any market have associated costs (called "transactions costs"). Therefore, while outsourcing promises savings in production costs, it



involves greater participation in market activities—and increases transactions costs. Moreover, TCE strongly indicates that the size of the transactions costs is highly sensitive to the nature of the outsourcing action. Finally, 2D is Cost Benefit Analysis (CBA). BCAs are intended to find best-value solutions, and cost benefit analysis is a highly-developed analytical method to find best value (defined as “benefits minus costs”).

Chapter 3 considers some practical foundations for putting such analysis into Business Case Analysis. Section 3A considers BCAs, as currently viewed by DoD, and discusses their nature, intent, and capabilities. Next, 3B lists defense-related methods which are conceptually akin to the input-output perspective—DRM for costs (3.B.1.) and Navy manpower calculations with supporting data bases (3.B.2.). Both are described and assessed. The tentative conclusion is that neither is well designed to support determination of the indirect manpower effects of outsourcing actions. Also, in all likelihood, they cannot be made to do so in a timely manner (even as a special project). (Testing that proposition would be an interesting topic for further research, but is outside this project’s scope.) Finally, Section 3C considers outsourcing methods. The A-76 process is discussed in Section 3.C.1. Also, a risk-assessment method for outsourcing actions arising from a recent NPS thesis (Powell) is summarized (3.C.2.).

This report concludes with Chapter 4. This section sketches out a proposed research program to carry out the Navy’s mandate to develop analytical foundations for BCAs. It also offers some interim thoughts on how to frame the choice between organic and contractor support for new systems.

CHAPTER 2. THEORETICAL FOUNDATIONS

2A. Structuring and Solving Problems

A Method for Structuring and Solving Problems

Finding the best (or least bad) solution to a problem with significant stakes attached warrants careful and systematic attention to fully understanding the problem itself; identifying and developing alternatives for its solution, determining with reasonable completeness the consequences associated with each alternative, assessing those consequences, and, finally, using that analysis to make a decision or recommendation.¹

1. Understand the problem. Recognizing there is a difficult problem and having considerable relevant expertise does not guarantee sufficient understanding to reach the best solution. It’s important first to thoroughly understand the context. To take a very simple example, suppose our “problem” is to insert a fastener in a block of wood. If at first inspection the fastener appears to be a nail, it is natural to consider alternatives that involve hammers. If a closer look reveals the fastener is a screw, then it’s apparent the hammers in our toolbox are less useful than the appropriate screwdriver.² That is, lack of understanding can greatly affect the solution.

¹ This discussion borrows heavily from Stokey and Zeckhauser. However, that approach is not the only effective method for structuring and solving problems. For example, Hitch and Ragsdale also offer useful problem-solving frameworks.

² An extensive repertoire of problem-solving methods is also valuable. “If all you’ve got is a hammer, everything looks like a nail,” is an old saying with considerable truth.

A related issue of perhaps greater importance is the understanding of objectives. What do we want to accomplish? Are we willing to cut back in achieving one objective for the sake of better meeting another? Perception of objectives can and does affect the nature of solutions. Suppose, for example, customers must frequently wait to be served at our facility. This is causing considerable dissatisfaction among those in our clientele who can and will take their business elsewhere. If we define our objective as reducing wait time, we will consider solutions that increase ability to quickly take care of customers when they arrive. If we define our objective as (more generally) increasing customer satisfaction, we might also consider solutions that make waiting for service less irksome.

Likewise, if we decide in the interests of economy, or effective support, to consider outsourcing certain functions, then it's important to fully understand the context. What does the function in question do for the organization? Who's affected by the quality of performance? Affected in what way? We can then more completely define the tasks to be accomplished and the relevant standards of performance.³

2. Develop Alternatives. If we understand the problem, then we can consider useful ways to solve (or at least mitigate) it. Typically, a number of alternatives are available. They are best understood as "courses of action" or "programs," not as titles. It is accordingly useful to develop (as outlines) alternatives suitable for plans which might actually be executed, rather than as entries on a briefing chart.

3. Predict consequences associated with each alternative. Consequences typically are manifest in both effectiveness (what's gained) and costs (what's given up or risks incurred). While alternatives in real problems have a large number of consequences, some tell more about achieving the objectives than others. In many complex problems, prediction involves modeling, a formal process of relating key features of the alternatives to their important consequences.

4. Assess the consequences associated with the alternatives. This may be relatively easy or quite difficult. Alternatives which are less effective and more costly than others are said to be "dominated" and are not candidates for implementation. Similarly, if all available alternatives are equally costly (or equally effective), then the most effective (or least costly) alternative is clearly best.

Other comparisons are more difficult. If Alternative A is both more costly and more effective than B, then sorting between the two entails further analysis. Available methods include multi-attribute utility or cost-benefit analysis.⁴ In choosing between two support alternatives, such as organic and contractor, a well-crafted statement of work can facilitate comparison based on equal effectiveness.

5. Make a decision or provide a recommendation. In many respects, this phase of the process involves reconsideration and review of the entire process, especially the quality and relevance of the analysis. It's useful to consider whether further iterations of the process are useful.⁵ If our analysis includes assumed, or baseline, values of key parameters, it's important

³ This is not new information for those who have participated in outsourcing studies.

⁴ Clemen and Boardman offer excellent textbook treatments of multi-attribute utility analysis and cost-benefit analysis, respectively.

⁵ The process outlined here is inherently iterative. Analysis may lead directly to a conclusion. It might also surface insights that warrant further analysis. If, for example, a new alternative surfaces, then it's appropriate to go back to the second step, developing alternatives, and re-accomplish part of the problem-solving process.

to consider how our results vary (if at all) with different values of those parameters (sensitivity analysis).

When we're convinced our reasoning is sound, that further analysis will not improve the quality of our conclusions, or we've just run out time, it's appropriate to make our best decision, or make our best recommendation to the decision makers.⁶

2B. Input-Output Analysis

Input-output analysis originated as a method of studying the operations of an entire economy. It postulates a number of sectors (or industries) and a number of primary factors of production (the most important being labor).⁷ The primary factors (or inputs) support the various industries. Industries support each other; intermediate goods flow within industries and between industries. Thus, for example, a finished automobile may have an engine supplied by another automobile firm, and tires purchased from the rubber products industry. Every primary input is supplied to the goods-producing sectors. For example, labor services are part of every industry's production process.

Industries also supply goods and services that directly enhance society's material well-being. This is called "final demand." A van delivered to a household is part of final demand, while a van supplied to a delivery service is a shipment to another industry. (Some of the latter van's deliveries are eventually part of final demand.)

There are some relationships which are always true in this model. First, the sum of deliveries from each industry to final demand plus all deliveries to other industries adds up to total output of that industry. If there are m industries (or sectors) in an economy, then:

$$Q_i = q_{i1} + q_{i2} + \dots + q_{im} + F_i = \sum_{j=1}^m q_{ij} + F_i, \text{ where } i = 1, \dots, m, \quad (2.B.1)$$

where Q_i is Industry i 's total (or gross) output, q_{ij} is deliveries from the i -th industry to the j -th, and F_i is deliveries from the i th industry to final demand.

Standard input-output analysis assumes that every unit of Industry J 's output entails a specific amount of output from Industry I . For example, it's safe to say that new automobiles include five tires (with rare exceptions with more)—which are almost always a delivery from one industry to another. Thus:

$$Q_i = a_{i1} Q_1 + a_{i2} Q_2 + \dots + a_{im} Q_m + F_i = \sum_{j=1}^m a_{ij} Q_j + F_i, \quad (2.B.2)$$

where a_{ij} is the deliveries from Industry I associated with each unit of Industry J 's output, and other terms are defined as in Equation (2.B.1).

Frequently, these relationships are summarized in an input-output table that looks something like Table 2.B.1 below. The economy represented has m industries and r primary

⁶ The time dimension is not trivial in problem-solving processes. In particular, a good decision (or recommendation) that's timely is better than a decision that's perfect but too late.

⁷ Excellent discussions of input-output analysis are available in Henderson and Baumol.

inputs. For the simple case of two industries and one primary input (usually labor), we have the situation described in Table 2.B.2.

Table 2.B.1. An Input-Output Table

Sectors	1	...j	m	Final Demand	Total Output
1	a_{11}	a_{1j}	a_{1m}	F_1	Q_1
...i	a_{i1}	a_{ij}^*	a_{im}	F_i	Q_i
m	a_{m1}	a_{mj}	a_{mm}	F_m	Q_m
Primary Inputs					
m+1	$a_{m+1,1}$	$a_{m+1,j}$	$a_{m+1,m}$	---	---
...	$a_{m+i,1}$	$a_{m+i,j}$	$a_{m+i,m}$	---	---
m+r	$a_{m+r,1}$	$a_{m+r,j}$	$a_{m+r,m}$	---	---

* Note: each unit of output for Industry J entails a_{ij} units of Industry I output.

Table 2.B.2. Input-Output Table with Two Sectors and One Primary Input⁸

Sectors	1	2	Final Demand	Total Output
1	.2	.4	F_1	Q_1
2	.6	.3	F_2	Q_2
Primary Input				
3	.2	.3	---	---

As noted above, the following must be true for the simple economy of Table 2B.2:

$$Q_1 = .2 Q_1 + .4 Q_2 + F_1$$

$$Q_2 = .6 Q_1 + .3 Q_2 + F_2. \quad (2.B.3)$$

If we know final demands (the F 's) and the technical characteristics of the economy (the a 's), then we can find the total output for each industry (the Q 's). Thus,

$$Q_1 = 2.1875 F_1 + 1.25 F_2$$

$$Q_2 = 1.875 F_1 + 2.5 F_2. \quad (2.B.4)$$

Also, the primary input needed turns out to be

$$Q_3 = .2 Q_1 + .3 Q_2 = .2 (2.1875 F_1 + 1.25 F_2) + .3 (1.875 F_1 + 2.5 F_2) = F_1 + F_2. \quad (2.B.5)$$

A Military Input-Output Model

A simple input-output model based on the military establishment is more hierarchical, and also simpler. Suppose we have three sectors: "capability" (or operations), designated C , direct support, designated S , and infrastructure, designated I . In addition, there is a fourth variable: personnel (or manpower), designated P . Our input-output model would then look something like Table 2.B.3.

⁸ Taken from Henderson.

This model is hierarchical, as indicated. There are the four sectors indicated above. The Capabilities Sector makes “deliveries” only to “Final Demand” (or operational capabilities) and the Capabilities Sector itself. The Support Sector provides support for the Capabilities Sector and itself. The Infrastructure sector makes deliveries to the Capabilities and Support Sectors, as well as itself. Finally, the Personnel Sector supports all the other sectors, as well as itself.⁹ Labor, or personnel, is shown as a sector instead of a primary factor since it provides support to itself in the form of personnel support, or overhead.

Table 2.B.3. A Military Input-Output Model

“Sectors”	C	S	I	P	Final Demand	Total Output
Capability (C)	a_{CC}	0	0	0	F_C	Q_C
Support (S)	a_{SC}	a_{SS}	0	0	0	Q_S
Infrastructure (I)	a_{IC}	a_{IS}	a_{II}	0	0	Q_I
Personnel (P)	a_{PC}	a_{PS}	a_{PI}	a_{PP}	0	M

*Note: Q_k is total output for Sector k. F_C is total operational capabilities.

If we include the complication of using contractor services in lieu of organic activities (except for the Capability Sector), we now have total sector outputs as follows:

$$Q_C = (1 - a_{CC}) Q_C + F_C$$

$$Q_S = Q_{SO} + C_S = a_{SC} Q_C + a_{SS} Q_S$$

$$Q_I = Q_{IO} + C_I = a_{IC} Q_C + a_{IS} Q_S + a_{II} Q_I$$

$$P = P_O + C_P = a_{PC} Q_C + a_{PS} Q_S + a_{PI} Q_I + a_{PP} P_O, \quad (2.B.6)$$

where P_O is total military personnel, P is total personnel billet-equivalents (from organic or contractor sources) and C_k is contractor services provided in Sector K (to include personnel services). It's useful to remember that some inter-sector “deliveries” take the form of goods and services provided to support each sector's productive activities, and some involve support of the military personnel in those sectors. Hence, deliveries from the personnel sector involve, for example, people on operational unit rolls and the overhead personnel which support them.

We can solve the system of equations stated in (2.B.6) above:

$$Q_C = F_C / (1 - a_{CC}) \quad (2.B.7.1)$$

$$Q_{SO} = F_C * \{a_{SC} / [(1 - a_{CC})(1 - a_{SS})]\} - C_S \quad (2.B.7.2)$$

$$Q_{IO} = F_C * \{[a_{SC} a_{IS} + a_{IC} (1 - a_{SS})] / \{(1 - a_{CC})(1 - a_{SS})(1 - a_{II})\}\} - C_I \quad (2.B.7.3)$$

$$P_O = \{F_C a_{PC} / [(1 - a_{CC})(1 - a_{PP})]\} + \{F_C (a_{PS} a_{SC}) / [(1 - a_{CC})(1 - a_{SS})(1 - a_{II})]\}$$

⁹ Because the Personnel sector provides support for itself, the model has been reformulated. Table 2.B.3 is a “closed” input-output model; the models summarized in Tables 2.B.1 and 2.B.2 are “open.”

$$\begin{aligned}
& + \{F_C a_{PI} a_{IC} / [(1-a_{CC})(1-a_{SS})(1-a_{II})]\} \\
& + \{F_C a_{PI} a_{IS} a_{SC} / [(1-a_{CC})(1-a_{SS})(1-a_{II})(1-a_{PP})]\} - C_P / (1-a_{PP}) \quad (2.B.7.4)
\end{aligned}$$

The results stated in Equations (2.B.7.1) – (2.B.7.4) are consistent with intuition. Total level of activities in the Capabilities Sector depends directly on operational capabilities delivered (F_C). The appropriate levels of activity in the Support and Infrastructure Sectors depend on final operational capabilities required and the extent to which organic activities (subscripted O) is replaced directly by contractor support activities (C_S and C_I).

The solution for P_O is more conveniently stated as:

$$P_O = \{[a_{PC}Q_C + a_{PS}Q_S + a_{PI}Q_I] / (1-a_{PP})\} - \{[a_{PS}C_S + a_{PI}C_I + C_P] / (1-a_{PP})\} \quad (2.B.8)$$

This model indicates there are both direct and indirect military manpower reductions possible with contractor support. Directly, contractor support leads to replacements in organic manpower in the affected organization; *indirectly*, there is a reduction in the personnel support tail. Associated with military personnel billets are support personnel—recruiting, training, personnel, administration of pay, public works, etc.

In particular, there is a “multiplier” of personnel reductions possible with contractor support:

$$dP_O/dC_S = -a_{PS}/(1-a_{PP}), dP_O/dC_I = -a_{PI}/(1-a_{PP}), \text{ and } dP_O/dC_P = -1/(1-a_{PP}). \quad (2.B.9)$$

That is, every direct reduction in military personnel billets results in additional reductions because of decreased personnel support needs. For example, contractor services replacing support activities (C_S) lead to direct replacement of ($a_{PS} C_S$) the number of military billets. At the same time, there is a corresponding reduction in support billets associated with the personnel directly replaced. There is also a reduction in support billets associated with the original support billets reduced, and so on. The multiplier for total personnel reductions vs. direct reductions is $1/(1-a_{PP})$.¹⁰

Certainly, contractor personnel have some sort of support “tail” as well, which includes recruiting, training, human resources services, administration of pay, medical care, etc. These needs are similar to those of military personnel. However, support of contractor personnel is reflected in the contractor’s proposal. It is not readily visible in the contractor support alternative for DoD decision making.

Hence, the military input model above indicates there are real savings in personnel support, above and beyond those not directly involved in the organic support alternative.

¹⁰ Suppose 100 military billets are associated with a set of activities, and that five such billets entail one personnel support billet ($a_{PP} = 0.2$). Thus, 100 military billets entail 20 personnel support billets; those 20 billets, in turn, require 4 billets, and so on:

$$P_O = 100 \sum_{i=1}^{\infty} .2^i = 125 = 100 * \left[\frac{1}{(1-a_{PP})} \right].$$

2C. Transactions Cost Economics

There is a private-sector counterpart to the choice of support-service sourcing with organic assets or contractors. It has become a standard part of economic theory. The seminal work is generally acknowledged as coming from Ronald Coase in 1937. If most productive tasks can be accomplished with greater efficiency elsewhere, then what reason would firms in search of profit have to produce those goods and services within the enterprise boundaries?¹¹ The answer to the question is that going to the market to acquire such goods and services carries with it certain “transactions costs,” which might well turn out to be greater than the added costs associated with production in-house.¹² Thus, study of make-or-buy decisions and similar issues is often called “transactions cost economics.”

More generally, the make-or-buy decision is considered part of the issue of the firm’s “vertical” boundaries. This is a standard topic in economics texts, especially those with a managerial bent.¹³ The productive processes associated with bringing a good to market are viewed as being a chain of activities, or a series of vertical steps. One such representation appears in Besanko (2000, p. 111) and is shown in Table 2.C.1 below.

Table 2.C.1. A Vertical Chain of Production

PRODUCTION PROCESSES	SUPPORT PROCESSES
Raw inputs (e.g., trees, iron, cows)	Accounting
Transportation and Storage	Finance
Intermediate goods producers (e.g., lumber mills, steel manufacturers, metalworking shops, tanneries)	Human Resources Management and Support
Transportation and Storage	Legal Support
Furniture Manufacturers	Marketing
Transportation and Storage	Planning
Retail Outlets	Other Support Activities

Furniture carpentry, for instance, is relatively uncomplicated. It can be represented as a series of steps, or stages, of production. A more complex production process might appear more like a PERT chart. In any case, every firm in this industry must decide how much of those production and support processes will be conducted within the boundaries of the firm, and how much will be performed within other enterprises.

Disadvantages Of Organic Assets

Lost Economies in Production. Firms specialize in certain goods and services because they are particularly good at performing them. (Also, as firms specialize, they increase their

¹¹ In more modern terms, one would expect businesses to restrict production to their core competencies and acquire the other parts of their products from outside suppliers. Thus, one would, for example, expect an automobile manufacturer to accomplish the final assembly of the cars it sells, but acquire tires from outside companies. These seem to be fairly clear-cut decisions. A question with a less obvious answer is the car’s windshield.

¹² To use a physical analog, the market is not a frictionless medium. Operations in the marketplace require expenditure of time, resources, and management attention.

¹³ Besanko and Rubin.

proficiency at certain processes and become even better.) Within a competitive market, firms are highly motivated to operate at the most efficient scale.¹⁴ Furthermore, competitive markets provide powerful incentives for the participating firms to produce a least-cost product mix both to enhance profit and fend off rivals. That is, firms in a competitive market are also motivated to fully realize economies of scope.¹⁵ Finally, such firms are engaged in production continuously (more or less) and are thus well positioned to achieve economies available from learning; they can move down whatever learning curve applies and stay there. Furthermore, outside firms in a competitive market are motivated to pass the savings to their customers. Prices charged in competitive markets are close to marginal costs, which have been driven down as a result of exploiting available economies of scale, scope and learning.¹⁶

Production of such items within the firm is unlikely to be as efficient. In general, rates of production are too small to fully realize available economies of scale. Only by happy coincidence would the firm's demand for goods of a particular type correspond closely with the most efficient scale of production. Likewise, the mix of products needed would correspond with available economies of scope only by coincidence. Finally, in-house production may well operate only intermittently, which means less opportunities to exploit economies from learning by doing.¹⁷

"Agency" Costs. In addition, production in-house means an enterprise (or division) with a protected customer base. There is, accordingly, less incentive to improve product quality or efficiency of production. Basically, the problem is to make sure the in-house operation performs diligently and in ways consistent with the profitability of the larger enterprise.¹⁸ While management oversight can address these problems, it carries a cost. Oversight requires time, effort and, therefore, commitment of resources. Yet, outsourcing part of the production chain accordingly avoids agency costs.

"Influence" Costs. Production in-house also generally entails the corresponding division of the enterprise having a seat at the table for corporate decisions and strategy. In all likelihood, the division will espouse policies and resource commitments that enhance its position and capabilities, and will likely oppose those which call for its dissolution. The possible distortions of corporate decision-making (and attendant losses of competitiveness and profits) can be regarded as influence costs, and are worth consideration in organizing productive processes.

¹⁴ Firms in perfectly competitive markets will move toward the lowest point of their average cost curve in pursuit of profit. That is, these firms can be expected to take full advantage of economies of scale.

¹⁵ If two products can be produced together more cheaply than they can be produced separately, then there are economies of scope. Opportunities for economies of scale and scope pretty much define the firm's natural "horizontal boundaries."

¹⁶ The difference between marginal cost and price varies inversely with the price elasticity of demand for the vendor's product. An inherent feature of competitive markets is the availability of a large number of close substitutes for any firm's product. Therefore, price elasticities of demand are quite high, and the difference between marginal cost and price are correspondingly quite small. (In the limiting case of perfect competition, price elasticity of demand for any firm's product is infinite, and price is equal to marginal cost.)

¹⁷ With extended production runs, firms become more proficient with the processes involved, and therefore able to achieve lower cost. As Besanko (2000, p. 91) puts it, "cost advantages ... Flow from accumulating experience and know-how."

¹⁸ This is frequently referred to as the "principal-agent problem." Methods to address it are sometimes grouped as "agency theory." See Kreps, Besanko.

Disadvantages Of Outsourcing

Coordination Difficulties. Efficient production requires extensive synchronization of a number of complex activities. This is especially true in the practice of “lean” production, featuring “just-in-time” deliveries with attendant reduction in inventory costs. Coordination with an outside enterprise may well prove more difficult than with an in-house division. There is likely to be more commonality of objectives between two divisions of the same enterprise than with an outside firm. Also, any disagreements about deliveries, schedules and similar issues are generally settled more quickly and in ways suitable to the enterprise if it has authority over all parties. (One way to have that authority is to own all the divisions, i.e., to produce in-house.)

Loss of Sensitive Information. Enterprise operations involve information, some of which is proprietary, classified or otherwise sensitive. Close coordination with an outside supplier of goods or services involves the exchange of information, some of which is sensitive. Passing this information outside corporate boundaries accordingly lessens ability to control its dissemination. Thus, involving outside suppliers involves risks of compromising corporate (or government) secrets.

Transactions Costs. Outsourcing important parts of one’s business means depending on the chosen supplier. This dependence may be of trivial importance. For example, purchase of paper clips involves a one-time transaction for office supplies.¹⁹ If a paper clip source proves unsatisfactory for some reason, it’s readily possible to find another supplier. On the other hand, outsourcing a major management information system involves a long-term, highly-complicated relationship. During the process of executing the agreement, the supplier acquires expertise in this particular system, which confers a market niche. At some point, the relationship progresses from a customer entering a competitive marketplace with a number of suppliers to a relationship with one buyer and one qualified seller. Thus, close-in bilateral bargaining replaces the impersonal (arms-length) arrangements of the competitive marketplace. Outsourcing relationships of this nature entail a basic transformation from competitive bidder (prior to source selection) to monopolistic supplier (after source selection).

Having one supplier with unique expertise provides monopoly power; there are no close substitutes for this particular contractor’s services. Accordingly, the firm is now vulnerable to “opportunistic behavior”²⁰ from the contractor. Unforeseen circumstances may prompt large charges for special services for which there are no readily available substitutes.²¹

The supplier may, in fact, exploit its power in the relationship to renegotiate the basic agreement to its disadvantage, threatening to dissolve the agreement. In the Transactions Cost Economics literature, this is called a “holdup.”²²

Relationship-Specific Investments

¹⁹ Actually, a series of one-time purchases of paper clips.

²⁰ Williamson defines “opportunism” as “self-interest seeking with guile...”

²¹ Besanko and others have labeled the transition from one prospective buyer and many sellers to one buyer and one seller, from competitive market to a one-on-one relationship as the “fundamental transformation.” This transformation occurs, at least to a certain extent, after the completion of every source selection process.

²² An even worse case is the possibility that a holdup might be unilaterally executed. According to Besanko, “a holdup problem arises when a party in a contractual arrangement exploits the other party’s vulnerability due to relationship-specific assets.”

Frequently, an outsourcing arrangement involves enhancing or changing the capacity of the supplier to more effectively meet customer needs. Investments can take on relation-specific qualities from some combination of characteristics, including the following:

location: e.g., the supplier's production facility is located close to its customer;

physical assets: e.g., the supplier's plant is specialized for the customer's needs, and much less profitable if serving other customers;

human assets: the supplier's work force skill set is oriented toward the primary customer's needs and is much less productive when dealing with other customers.

Relation-specific investments facilitate economies in production because of the specialized capabilities involved. They also increase risks to both parties. The specialized supplier is more efficient in providing the outsourced component, and thus can potentially raise its price—and still remain the least-costly supplier. At the same time, the supplier's specialization makes it more vulnerable to its one customer. The customer can potentially exploit the supplier's dependence by lowering the price of the outsourced component. That is, relation-specific investments increase the total gains from the outsourcing arrangement, but also increase risks of both parties to a holdup or to opportunistic behavior by their partners.

Relation-Specific Investment And Potential For Holdup: A Hypothetical Example²³

Boutique Motor Corporation (BMC) features highly decorative cup holders in its automobiles. General-purpose plastics suppliers can provide those unique cup holders for \$4 per unit. BMC, however, forms a long-term relationship with Mom & Pop Plastic Fabricators (M&P) to get those cup holders at a cheaper price, say \$3 per unit for 500,000 cup holders per year. As part of its part of the relationship, M&P modifies (and specializes) its plastic molding machinery to make the distinctive BMC cup holder more efficiently. M&P invests \$1 million in the modifications, and can then produce each unit for \$1 each.²⁴ M&P's modified plant can still produce general-purpose cup holders, but average variable cost goes up to \$2.90 per unit with the special-purpose machinery. The prevailing market price for general-purpose cup holders is \$3 per unit.

In this simple example, M&P's costs are as follows:

$$\text{Total Cost} = \$140,000 + \$1 * Q,$$

where Q is annual production (500,000 for BMC), and annual payments of \$140K will retire a debt of \$1 million at 6.64% (APR) over ten years. If M&P produces only for BMC, then total cost is \$640,000. Revenues from BMC are \$1.5 million (500,000*3).

Thus, M&P earns profits of \$0.86 million per year as a result of the relationship with BMC; it would absorb losses of 90K per year if it diverted its production capacity to 500,000 general-purpose cup holders.²⁵ Likewise, BMC adds \$0.5 million to its profits since it pays \$3

²³ Besanko has a similar example on page 153.

²⁴ Marginal Cost = Average Variable Cost = \$1.

²⁵ Before making its relationship-specific investment (or prior to the transformation), M&P reckons its advantage as \$0.86 million per year minus its profits as a general-purpose supplier. After the investment, M&P's benefit from the

per unit for its cup holders, instead of \$4 ($500,000 \times [4 - 3]$). In short, the agreement provides significant benefits to both parties. The total benefit (or “surplus”) is \$1.45 million ($.86 + .09 + .50$) after the relationship between the two companies is formed.

However, this total surplus can be contested. Suppose BMC demands M&P lower its price to \$2. If that happens, then M&P’s profits decrease to \$0.36 million ($500,000 \times 2 - 640,000$), and BMC’s profits increase by \$0.50 million. At the same time, M&P may insist on a price increase to \$3.50 per unit. If that happens, then M&P’s profit increases to \$1.11 million, and BMC’s benefit declines to \$0.25 million.²⁶ In short, BMC and M&P can dispute shares of the total benefit from the relationship.²⁷ As indicated, the standard term for such attempts to alter the relationship is “holdup.”

Addressing the “Holdup” Problem

While corporate partnerships and relation-specific investments increase the benefits to both parties, they make both vulnerable to opportunistic behavior, or a holdup, by the other party. Vulnerability to these events can be significantly decreased through well-crafted contracts. However, contracting (a) involves expenditure of resources, and (b) cannot completely eliminate risks associated with opportunistic behavior from partners.²⁸

The process of contracting includes drafting the relevant documents, negotiating the version of the contract that is signed, taking actions to enforce that contract, and renegotiating when needed. These tasks entail, at minimum, the services of skilled people who develop local knowledge of the specific business relationship. There may also be costs associated with litigation, to include both direct (e.g., monetary) and indirect (e.g., time delay) components. Furthermore, the basic contract may well need considerable administrative and management attention throughout its life, even if full-scale renegotiation is not undertaken. Accomplishing these tasks satisfactorily involves expenditure of resources and management attention. These “transactions” costs can negate a significant portion of the savings involved with outsourced production.

The future is not amenable to perfect prediction—a well-known fact of life. The obvious implication is that a contract cannot foresee all possible contingencies throughout the period of its execution. That’s true regardless of the skill of the legal staff, and the expertise of the contracting personnel.²⁹ In some cases, this is not worrisome, as, say, for the one-time purchase of paper clips. However, in long-term, complex outsourcing relationships, this may prove very costly during the execution of the contract.

relationship with BMC is \$.95 million per year with production of 500,000 per year. (If M&P were to produce those cup holders at variable costs of \$2.90 per unit and sell them at \$3.00, it would incur a loss of \$90K per year [revenue = \$1.50 million; cost = \$1.59 million]).

²⁶ It’s unlikely that a holdup by either party would be presented this crudely. BMC might plead hard times and assert the need to negotiate lower prices from suppliers. M&P might point to increases in input costs, and assert the need for a higher price in order to remain in its relationship with BMC.

²⁷ There are obvious limits to this behavior. If M&P demands more than \$4 for each cup holder, then BMC would find it advantageous to buy its cup holders from other sources (at \$4). Likewise, if BMC forces the price below \$1.10, then M&P would choose to make general purpose cup holders and sell them for \$3 per unit (at a unit cost of \$2.90).

²⁸ Costs associated with contracting, and the holdup risks remaining are major components of what are generally termed “transactions costs.”

²⁹ This is a manifestation of what’s sometimes called “bounded rationality.”



This problem can be further complicated by asymmetric information. Suppose that during contract negotiations between BMC and M&P, BMC is aware of a contingency in the execution of the contract that will give it scope for opportunistic behavior. Suppose also that M&P is not aware of this. BMC is unlikely to disclose this contingency during contract negotiations.³⁰ Also, enforcement of clearly-written contracts may be problematic. It may be difficult to specify, measure and demonstrate material breach of contract. Furthermore, it is impossible to foresee all situations in which a contracting party might wish to demonstrate that breach.

Because contracts cannot completely hedge against risks of opportunistic behavior, other risk reduction measures may prove advantageous. The enterprise that's outsourcing may retain some in-house (perhaps standby) capability to provide the good or service in question.³¹ This, and similar measures, could enhance bargaining position in the event of renegotiation or contract-enforcement actions. Changing the ownership of assets associated with relation-specific investments could reduce the scope for opportunistic behavior; this may take the form of government-furnished equipment in federal transactions. However, hedging measures also entail costs, and can likewise dissipate the potential gains from outsourcing.

The Standard Bottom Line

The conventional wisdom in the transactions costs literature is that the decision to outsource should not be taken lightly. While the potential production-cost savings may well be tempting, there are associated costs and risks, albeit less obvious. They are less important (and might be negligible) for simple, one-time transactions where alternate suppliers are readily available. They can be critically important when the outsourcing arrangement is such that there is only one supplier readily available in a complex and lengthy relationship.

Hence, the decision to outsource must weigh production cost savings against the costs and risks associated with a critical source of supply being outside the firm's control. Those are generally referred to as the transactions cost of the outsourcing relationship. Thus, outsourcing is preferred only if the total costs are less than the costs of production with the firm's (in-house, organic) assets. That is, a firm should outsource only if the following is true:

$$\text{Cost of in-house production} > \text{Outsourcing} + \text{Transactions Costs.}$$

2.D. Cost-Benefit Analysis (CBA)

Any problem-solving process inevitably involves comparison of alternatives. Sometimes this is easy; one alternative may provide more advantages (benefits or effectiveness) than all the others, while having fewer disadvantages (costs and risks). That alternative is clearly best (being "dominant"). It may also be that a number of alternatives may have equal cost (or effectiveness) with differing effectiveness (or cost). In that case, the alternative with greatest effectiveness (or least cost) is clearly best.

³⁰ BMC may stay mum, intending to force concessions from M&P later. However, BMC may have no intentions of bad faith, but distrusts M&P's intentions. BMC may therefore preserve this option for opportunistic behavior as a hedge against bad behavior on the part of M&P.

³¹ This is sometimes called "tapered integration."

A more difficult case arises when there are alternatives in which attaining higher effectiveness (or lower cost) means finding an alternative with higher cost (or lower effectiveness). Then, the basic assessment question involves a determination of willingness to incur higher costs to achieve higher levels of effectiveness. One way of assessing alternatives based on a willingness to pay is Cost-Benefit Analysis (CBA).

CBA is a well-defined method to “appraise an investment project which includes all social and financial costs and benefits.”³² It is the subject of extensive literature that includes standard textbooks such as Boardman. The basic foundation of standard CBA methods is total willingness to pay. The basic criterion for the assessment is simple (perhaps deceptively so):

$$\text{Net Benefit} = \text{Benefits} - \text{Costs.}^{33}$$

The complicated task is finding all the benefits and costs, which entails a detailed and systematic analysis. One industry standard for the major steps in a well-done CBA comes from Boardman, and is summarized as follows:

1. Specify the set of alternative projects.
2. Decide whose costs and benefits count. Who has “standing,” or is a legitimate stakeholder?
3. Catalog impacts, and select metrics.
4. Predict the impacts over the life of the project.
5. Attach monetary values to all impacts.
6. Discount benefits and costs for each alternative to Present Values (PV).
7. Calculate the Net Present Value (NPV) for each alternative.
8. Perform an appropriate sensitivity analysis.
9. Make a best-value recommendation based on the NPV and the sensitivity analysis.

CBAs can be performed on both projects and alternatives (bundles of projects) when formulating investment strategies (including Product Support Strategies).³⁴

Completed CBAs can then support decisions, using the following general rules:

1. A project is worth doing (valid) if its net benefits are positive: i.e., benefits exceed costs.
2. A project that can be undertaken at various levels should be expanded as long as incremental benefits cover incremental costs.
3. The alternative (or strategy) with highest net benefit offers best value and is, therefore, preferred.

³² From a dictionary of economics compiled by Bannock, et al.

³³ One immediate complication is that subtracting costs from benefits in any meaningful sense means that the two terms are stated in common units. The main task in conducting a CBA is putting all the dimensions of cost and benefit into monetary units.

³⁴ A short digression on terminology: In CBA terminology, a group of projects constitutes an alternative. In Business Cost Analysis (BCA) terminology, a portfolio of initiatives constitutes an alternative—“initiative” being a reasonable analog of “project.”

While all the above is fairly straightforward, there are many devils in the details. As Boardman (among others) points out, a CBA can cost one million dollars and take one year. Thus, a large-scale CBA should be undertaken only if the value of the information expected can outweigh the associated cost and potential delays.

CHAPTER 3. PRACTICAL FOUNDATIONS

3A. Business Case Analysis

As part of making DOD decisions more efficient, the art of Business Case Analysis (BCA) has become a major, and required, part of systems-acquisition and systems-management processes. As one OSD source puts it, “a properly prepared business case represents an effective tool to improve the decision making process and foster timely and accurate decisions” (DUSD [Logistics]).

BCAs are regarded as a major, and necessary, tool for program managers. For example, OSD directs a Product Support Strategy (PSS) prior to Milestone B for any ACAT1 program. The PSS is, in turn, the foundation for a BCA to be completed by Milestone C (Wynne). Some extant OSD guidance goes further, and describes the BCA as “an integral part of every competent manager’s decision process” (DUSD [Logistics]).

Business Case Analyses are also useful outside DoD and the Executive Branch. To quote a recent report from the Legislative Branch concerning the F/A-22: “GAO recommends that DoD complete a new *business case* that determines the continued need for the F/A-22 and the number of aircraft required for its air-to-air and air-to-ground roles based on capabilities, need, alternatives, and constraints of future defense spending department wide” (GAO, emphasis added).

There is considerable help in the form of BCA templates and examples available both in the DoD and the commercial sector. There is, moreover, much in common among these sources. One of these guides provides the following template for constructing a BCA: Executive Summary, Boundaries of the Case, Discussion of Alternatives, Comparison of Alternatives, Conclusions, Recommendations & Issues (DUSD[Logistics]). A more detailed template follows in Table 3A1 below—which is a recommended table of contents for a BCA report.

TABLE 3.A.1. A BCA Template

CHAPTER	SECTION	SUBSECTION
1. Executive Summary		
2. Boundaries Of The Business Case		
	2.1. Goals and Vision	
	2.2. Context & Perspective	
	2.3. Functional Performance & Metrics	
	2.4. Initiatives Considered	
	2.5. Alternatives Considered	
	2.6. Key Assumptions	
	2.7. Status Quo Activity Model	
3. Discussion Of Alternatives		
	3.1. Alternative 1	
		3.1.1. Functional Performance Description
		3.1.2. Performance Impact & Metrics
		3.1.3. Technical Architecture
		3.1.4. Cost Projections
		3.1.5. Risk Assessment
	3.2. Alternative 2 ...	
4. Comparison Of Alternatives		
	4.1. Functional	
	4.2. Performance	
	4.3. Cost	
5. Conclusions, Recommendations & Issues		

What They Are Intended to Do

As current guidance makes plain, BCAs should provide a systematic analysis of management alternatives which is clearly communicated to the relevant stakeholders and decision-makers. Fundamentally, therefore, the BCA is a method for structuring and solving problems. BCAs are considered especially useful for formulation of change and modification strategies, as well for life-cycle management in general.

The nature and intention of BCA methodology is, in fact, simpler than the currently-fashionable mystique about its usefulness suggests. BCAs are, quite simply, a method for structuring and solving problems—no more and certainly no less. The BCA template in Table 3.A.1 above integrates well into the problem-solving outline provided in Section 2A above. This is indicated in Figure 3.A.1.



BCA As Problem Solving Method

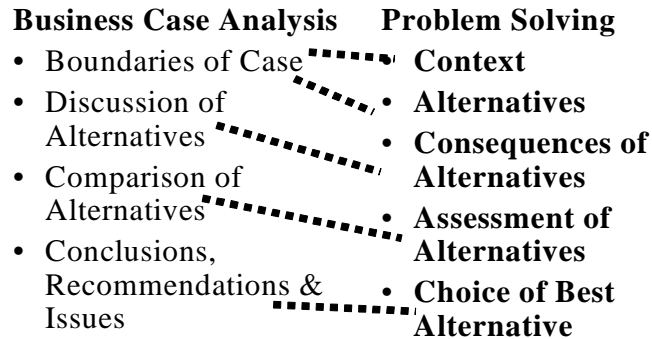


Figure 3.A.1. Business Case Analysis Correspondence with Other Problem-Solving Methods.
Sources: DUSD (Logistics) and Stokey.

As such valuable problem-solving techniques, high-quality BCAs can provide program managers with the following advantages:

4. credible assessment of alternative strategies,
5. clear rationale for decisions,
6. valid, transparent and persuasive analysis for reviewing agencies.

However, realization of that potential is much more likely with tools of analysis suitable for practical Business Case Analyses. It appears to this observer that Program Managers have much more guidance about BCA reports as *documents* than they have about BCAs as *analyses*. While it's easy to mandate BCAs and call for sound analyses, the task of developing the analytical foundations is explicitly left to the services (Wynne). This has the virtue of not requiring one analytical form to suit all users. But requiring BCAs without an assurance of sound analytical foundations poses the danger of BCAs that have the same depth as PowerPoint slides.

In short, Program Managers can consider BCAs as documents to be a settled matter. Moreover, the standard Table of Contents integrates nicely into the analytical processes needed to underpin a useful BCA. Guidance for doing the foundational analysis is much less complete. Therefore, Program Managers may well find it useful to devote significant attention to the analytical methods behind the submitted BCA report and the associated briefing charts. Chapter 2 discussed major theoretical foundations. The remainder of this chapter considers some of the practical foundations of the BCA as analysis.

3B. Input-Output Methods in DOD

3.B.1. DRM (QuickCost)

One method of tracing relationships of various programs within the defense budget is the QUICK COST Defense Force Cost Model, based on the Defense Resource Management Model

maintained by the Congressional Budget Office. QUICK COST features aggregated Budget Authority based on the budget projections. Actual budget details are kept in the Program Elements (PEs), which are classified. QUICK COST details are found in Aggregated Elements (AEs), which are unclassified aggregations of the PEs. This information is, however, still quite detailed.

The QUICK COST model directly estimates Operations and Support (O&S) costs associated with a given force structure. It does not provide direct estimates of changes in research and development, procurement and construction, or other funding not directly linked to force structure. However, the model's data base provides historical data for items in these categories.

The model's structure is based on Primary, Related and Support AEs. The model begins with the Primary AEs, which are directly associated with combat forces. Related AEs, in turn, are linked to associated Primary AEs. Support AEs are basically infrastructure, such as base operating support, central training activities, and logistics activities. The Support AEs (as the name implies) support the Primary and Related AEs within the model's hierarchy. Taken as an input-output model, QUICK COST involves "shipments" from Related AEs to Primary, and from Support AEs to Related and Direct.

The QUICKCOST scheme is summarized in the following table, readily seen as a simplified version of the military input-output model discussed above. The *P*, *R* and *S* subscripts represent the Primary, Related and Support classes, respectively, and the term *Operational Capability* replaces *Final Demand*.

Table 3.B.1. Notional Quick Cost Input-Output Table

AE Class	Primary	Related	Support	Operational Capability	Total Output
Primary	0	0	0	F_P	Q_P
Related	a_{RP}	a_{RR}	0	0	Q_R
Support	a_{SP}	a_{SR}	a_{SS}	0	Q_S

An important feature of the model is treatment of fixed and variable costs. Primary AEs vary directly with their associated forces, with all costs thus variable. Related and Support AEs are tied to the Primary AEs through proxy variables; changes in military pay within Primary AEs are taken to represent the change in the overall level of activities. For the Related and Support AEs, the Model contains (a) fixed and variable costs based on "historical" experience and (b) all costs variable.³⁵ The historical fixed/variable factors are (not surprisingly) based on past experience—with changes in forces being, for the most part, relatively small in any given year and gradual over time. The all-costs-variable approach assumes all Related and Support AEs vary directly with associated combat forces. For purposes of Business Case Analysis of organic

³⁵ One simple, but useful, explanation of variable and fixed costs is that there are (a) overhead costs associated with these AEs, and (b) resources associated directly with those AEs' "outputs." Thus, for example, a small change in end-strength would result in a change in training requirements. However, it would not result in a change in the base structure of the training commands. Therefore, it's reasonable to believe there are substantial overhead costs not affected by small changes in end-strength. However, if there are large percentage changes in end-strength, one would expect significant changes in the size of the training establishment and other personnel support commands.

vs. contractor support, historical factors seem best. Such decisions taken individually will have only minor impacts on overall force and personnel structure.

There is difficulty in using this model directly for BCAs that assess organic vs. contractor support, however. The DRM model is designed to relate support and infrastructure expenditures to operational forces. That is, it's well structured to give reasonable estimates of the budgetary and manpower implications of changes in force structure. However, it's not well structured to consider the changes associated with substituting contractor for organic support. One of the major problems is insufficient "granularity" of the data structure.

In terms of providing insights into the issue at hand, QUICKCOST seems something of a dead end. This model generally lacks the precision ("granularity") to credibly capture the indirect savings from outsourcing support activities. It does, however, illustrate the feasibility of constructing a large-scale model of resource flows within DoD based on input-output principles.

3.B.2. Manpower Calculations

The Navy's manpower requirements system is laid out in OPNAV INST 1000.16J and related publications. Conceptually, this document looks quite similar to an input-output approach. The Instruction discusses the manpower requirements and authorization system, providing "guidance and procedures to develop, review, approve, and implement total force manpower requirements and authorizations for naval activities" (para. 1.a.).³⁶

Manpower requirements for individual units (or activities) are based on the minimum manpower needed to satisfactorily perform the tasks required to accomplish the unit mission. Manpower requirements are stated in both quantitative and qualitative terms. The nature of the tasks determines manpower *quality*, generally specified in terms such as ratings, grades, subspecialties and classification codes. The nature of the tasks to be performed is determined by the unit's Missions, Functions and Tasks (MFT) or the Required Operational Capability/Projected Operational Environment (ROC/POE). The scale of those tasks (workload) determines the *quantity* of manpower required.

Workload determinations are based on Industrial Engineering methods, or some other "justifiable" technique (para. 4.a.). With each task is associated a justifiable number of work hours. With each type of unit is associated a standard work week (Appendix C). For example, a shore activity generally has a standard work week of 40 hours; standard work week for ships at sea (in the Instruction's specified conditions) is 81 hours. The standard "productive" work week ashore is 33.38 hours for planning purposes—the remaining 6.62 hours being assigned to training, service "diversion," leave and holidays. Suppose a shore activity must, for some reason, maintain a watch of three persons continuously (168 hours per week). The manpower required to accomplish this task is 15.10 ($168 \div 33.38 = 15.10$).

Thus, the manpower requirements of a naval activity are pieced together from a number of these building blocks. The activity's manpower requirement is recorded in the appropriate Activity Manpower Document (AMD), which is the sole authority for such requirements.³⁷ A change in a unit's workload or nature of tasks (among other things) necessitates determining

³⁶ What follows is a somewhat oversimplified characterization of a complex process.

³⁷ Source documents for the AMD, in turn, include the SMD, SQMD, FMD and SMR, as appropriate. These acronyms are defined in App. A to Encl. 1 of the Instruction.

the appropriate changes in the AMD (para. 5.b.) Total force requirements are tracked using the Total Force Manpower Management System (TFMMS), which is the “single, authoritative data base” for manpower requirements (para. 5.a.) The authorization process is done bottom-up (zero based), and the process is specifically untied from resource constraints—including end-strengths.

While the requirements process is relatively well specified, the authorization process is necessarily less so. Authorizations are specifically balanced against end-strength constraints (both quantitative and qualitative). Authorizations are also tracked with AMDs and the TFMMS. Having a validated manpower requirement is a necessary, but not sufficient, condition for a corresponding authorization. Thus, the requirements total constitutes an upper boundary for an activity’s authorized total. Manpower authorizations, among other things, provide the foundation for personnel assignment. Therefore, as a practical matter, a manpower authorization is a necessary, but not a sufficient, condition for someone being assigned. Thus, authorized personnel is an upper boundary for assigned personnel; assigned personnel (except in unusual or temporary circumstances) cannot exceed authorized personnel

Conceptually, the manpower requirements process looks very much like the input-output perspective discussed in Section 2B above—especially in the quantitative dimension. Some activities’ missions are directly related to providing operational capability (a good analog of “final demand”). Other activities support the operational units. A portion of that support overall is related more or less directly to the operational units’ mission; depot-level maintenance is one example. Another portion involves support of the personnel assigned to the operational unit. Suppose, for example, an F-18 squadron changes the number of aircraft assigned.³⁸ As a result, the AMD would be recalculated, based (in all likelihood) on the change in the scale of tasks to be performed. At the same time, the supporting units would recalculate their AMDs, since the scale of tasks in the operational unit (quite likely) changes the scale of tasks for all the supporting units. If, as is generally the case, those supporting units are, in turn, supported by other units, then still more units would recalculate. (This is the “multiplier” property of input-output models discussed in 2B above.)

Likewise, if that same F-18 squadron were to outsource some of its functions to contractor personnel, then manpower requirements for the squadron would be recalculated for the AMD. For supporting units, tasks directly associated with the squadron’s operational tasks would remain the same. However, supporting activities’ tasks associated with the F-18 military personnel levels would be recalculated. Thus, the military manpower reductions associated with outsourced support functions are not limited to the unit in question.

It is possible to visualize a version of TFMMS (tied to AMDs) that allow such calculations to be done quickly, cheaply and accurately. However, it is unlikely that the manpower data bases can provide such services. The extent to which the AMDs of operational units are explicitly tied to the AMDs of their supporting units is not clear. Likewise, it is not clear the extent to which changes in AMDs are explicitly tied to the TFMMS. (Determining the current state of such linkages would be an interesting topic for further research, but is beyond the scope of this particular project.) Moreover, data bases as MIS support tools are no better than the raw data given them. Unless capabilities are exercised, it is likely the necessary information is

³⁸ Some suspension of disbelief is requested. It’s unlikely that current Navy policies or existing legislation would permit outsourcing in this form. The example is chosen for expository clarity. It’s possible to choose an example further from the tip of the proverbial spear and make the same point, but with perhaps less clarity.

either inaccurate (not having been checked through actual use) or simply missing. An expert source characterizes this process as a sort of “trickle down” effect from one activity to another, even with major changes, and a process that does not take place automatically.³⁹

What is clear is that the TFMMS, AMDs and related data sources are not intended for the purpose of “what if” excursions based on changes in the scale of unit missions. As the Instruction makes clear, they are specifically designed to track unit manpower requirements bottom-up; they are also intended to reflect the top-down allocation of resource constraints (such as end-strengths) against those requirements. As such, they are well designed for purposes such as supporting inputs to resource allocation processes (in the case of PPBES) and providing data for reports requested by the Congress.

3C. Outsourcing Methods

3C.1. A-76 Process

OMB Circular A-76 documents policies of the US Government for the “performance of commercial activities.”⁴⁰ It requires activities which government personnel perform to be classified as “commercial” or “inherently-governmental.” All activities in the latter category are to be performed with government personnel (organic assets). Activities in the former category are “subject to the forces of competition.”

A sorting between the commercial and inherently-governmental activities is detailed in Attachment A (Inventory Process). Attachment B specifies (to a fair level of detail) the process for competition (Public-Private Competition).⁴¹ Attachment C contains rules and procedures for calculating costs (Calculating Public-Private Competition Costs).

The Process in Brief

The standard competition process consists of a number of stages, which can be summarized as the following:⁴²

7. Inventory agency activities, classify them as commercial or governmental, and determine how the competition(s) are organized (“bundled”).
8. Announce intention to undertake an outsourcing study, both to the affected government work force and to potential commercial sources.
9. Develop and announce the terms of the competition to include expectations (Performance Work Statement, PWS), various study teams, and a quality assurance plan (QASP). Criteria for source selection are also specified.
10. Issue a solicitation, or Request for Proposal, seeking bids from the commercial sector.

³⁹ Based on conversations with CDR William Hatch, USN (now retired).

⁴⁰ This discussion borrows heavily from the Circular, version of 29 May 2003, and the Powell thesis.

⁴¹ Actually, at least two competition processes—the streamlined process is discussed in Attachment B, Section C; the standard process in Section D.

⁴² Stated in A-76, Attachment B, displayed visually in Figure B2. Stevens provides an excellent comparison of the current version of A-76 with its predecessors.



11. Develop the in-house alternative (Most Efficient Organization). This consists of a management plan, cost estimate, performance plan, and transition plan. This alternative is one of the finalists.
12. Compare the Most Efficient Organization (in-house) with the qualified commercial proposals (outsourced) generally in terms of cost of meeting the terms of the PWS.⁴³ (However, the contractor's proposal must meet a minimum cost differential: 10 percent or \$10 million (whichever is less).)
13. Award the contract (issuing agreement), after appeal if applicable.
14. Transition to the in-house organization (if applicable) or to the winning commercial source.
15. Conduct post-award contract administration (if applicable) and quality assurance.

The Essentials of the Process

The provisions of A-76 are not formulated with organic vs. contractor support of new systems in mind. However, the essentials of the process provide useful benchmarks, regardless of the outsourcing decision at hand. These essentials are listed below:

16. Fully understand the context of the decision. The performance of the activity in question affects capability (perhaps directly) and the performance of other organizations. Performance categories and impacts of that performance should be carefully and specifically noted. In the A-76 process, this is embodied in the Performance Work Statement.
17. Fully develop the relevant alternatives.
18. Specify the consequences of selecting each of them. In particular, A-76 provides guidance for determining full costs of the alternatives.
19. Assess the consequences. The A-76 base case for comparison and assessment is cost of meeting the standards of the PWS.
20. Make a decision and implement it. This phase includes awarding the contract or issuing an agreement. It also includes any appeals, and actions associated with executing the PWS with the chosen provider.

3C.2. An Outsourcing Risk Assessment Method

The Powell thesis proposes a method for managers to assess the risks associated with a proposed outsourcing action. Basically, aspects of the new relationship are related with a stoplight scheme. For example, if there is a high degree of asset specificity involved, there would be a red light in that category, and a higher degree of risk is indicated. Powell intended the light scheme to increase visibility of areas where management attention is important, and where managers ought to focus their risk-reduction efforts.

That application is certainly valid, but there's another wrinkle. The study of Transactions Cost Economics indicates that risk-reduction measures (even if highly effective) are not risk-

⁴³ There are provisions in A-76 for possibly not selecting the lowest-cost alternative ("tradeoff" source selection). This section is based on discussions in the Circular, and the Powell thesis.

elimination panaceas. Accordingly, one can expect an overall outsourcing action with a large number of assessed red and yellow lights will be more costly and risky during its execution, even with due diligence in risk reduction.

What follows is a variation of Powell's stoplight scheme.

a. ***Asset Specificity.***

RED. Source becomes specialized, with no close substitutes or competitors readily available. Example: only qualified supplier for a specific, highly-specialized task—such as suppliers of spare parts for aging weapon systems.

GREEN. Routine (non-specialized) goods or tasks; competitors or close substitutes readily available. Example: purchase of standard commercial items, such as paper clips and other office supplies.

b. ***Complexity.***

RED. A large-scale task covering a large geographic area. Complexity of task severely limits qualified bidders. Example: large-scale, complex IT support; such as NMCI.

GREEN. A simple, routine task or standard product. A large number of qualified bidders. Example: office supplies.

c. ***Length of Relationship.***

RED. A long-term relationship, which strains ability to foresee problems during original contract negotiations. Complexity and asset specificity exacerbate this problem. Example: IT support, such as NMCI.

GREEN. Outsourcing is a one-time transaction, or can be structured as a series of one-time transactions. Example: purchase of office supplies.

d. ***Frequency.***

RED. Specialized, complex task or service from which there is significant learning-by-doing. Incumbent contractor has significant competitive advantage over potential competitors. Example: contract maintenance for specialized aircraft, such as E-4s.

GREEN. Routine, standard task, service or product, in which a number of firms have significant expertise. Example: copy machine repair.

e. ***Time Sensitivity.*** (added)

RED. Quick performance of task or delivery of product is essential for satisfactory performance. Example: repair of combat aircraft, or warship subsystems.

GREEN. Quick delivery of products or accomplishment of task is not essential for satisfactory performance. Satisfactory performance can include some delays. Example: copy machine repairs.



f. ***Operational Significance.*** (added)

RED. Unsatisfactory performance significantly degrades operational capability or compromises safety. Example: repair of combat aircraft or warship subsystems.

GREEN. Unsatisfactory performance involves, at most, administrative inconvenience and longer time to accomplish routine tasks. No compromise of operational readiness or safety. Examples: delays in copy machine repairs and temporary lack of office supplies.

CHAPTER 4. RECOMMENDATIONS FOR PROGRAM MANAGERS

As noted, one significant problem facing the Services and Program Managers is the mandate to develop analytical methodology for Business Case Analyses. This essay has discussed some of those foundations—starting with theoretical methods and proceeding to the practical manifestations in a defense environment.

Overall, the analytical tool box is certainly not empty. However, it's also not full and probably not stocked to minimum essential levels. Basically, it appears theoretical methods have not yet been translated into practical methods suitable for defense managers and the acquisition work force. There is good reason to believe that fulfilling the analytical methods mandate will entail additional work.

Interim Thoughts on Assessing Organic vs. Contractor Support

Waiting for analytical study completion can result in long program delays. Waiting for a fully-satisfactory analytical foundation for those studies can similarly result in eternal program delays. This report, therefore, offers some recommendations for BCAs done in the interim.

A useful starting point for assessing contractor vs. organic support alternatives is the framework contained in OMB Circular A-76. A-76 and supplementing directives arguably do not apply to development of Product Support Strategies.⁴⁴ However, they do contain a useful framework for this particular variation of the outsourcing decision. That is, even if A-76 is not an applicable directive for Product Support Strategies, Product Managers can likely profit from considering the provisions of A-76 as a source of advice. Accordingly, the following suggestions are offered.

1. Get the objectives straight. If in doubt, over-invest in the Performance Work Statement, or whatever analog is used.⁴⁵
2. Thoroughly develop the alternatives. This includes careful consideration of the following questions:
 - a. What's the best process for developing a contractor-based support function?
 - b. Will the organic alternative be based on business-as-usual, perhaps using existing manpower requirements? Or will it be some variation of the Most Efficient Organization?

⁴⁴ To quote an old saying, however, determination is above this observer's pay grade.

⁴⁵ Term from A-76.



3. Carefully assess the alternatives. For organic vs. contractor support, this includes the following considerations:
 - a. How will the manpower effects for activities supporting the outsourced functions be considered? It appears the current manpower data system is not designed to compute these “what if” estimates in reasonable amounts of time or at reasonable degrees of accuracy. It’s recommended instead that BCAs include some rule of thumb, such as a 15% overhead rule.⁴⁶
 - b. In assessing organic manpower costs, what percentage of manpower requirements will be supported with an authorization?⁴⁷ If there’s no authorization, there’s no fill and no expenditure of resources.
 - c. Be sure to consider transactions costs and risks associated with the contractor-support alternative. One reasonable approach to assessing both costs and risks is using Powell’s stoplight scheme.

Proposal for Consideration

As stated above, there’s considerable reason to believe the analytical framework for BCAs is incomplete, due more to the availability of practical rather than theoretical foundations for that analysis. Therefore, the following proposal is worth some consideration.

First, assemble an interdisciplinary team with knowledge of underlying theoretical foundations, DoD institutions, and Navy needs. Obvious places to look for such individuals include AFIT, CNA, IDA, LMI, NPS and RAND. Second, involve these researchers as consultants in actual BCAs in order to improve the BCAs themselves, but also to advance needs analyses for the analytical foundation. Third, assemble a case study and lessons-learned literature based on this experience. Fourth, identify and fund research into applications of basic theory to BCAs, with a view to developing analytical templates. Finally, translate those templates into practical instructions for acquisition professionals.⁴⁸

⁴⁶ From discussions with Commander Hatch.

⁴⁷ For example, about 93% of at-sea surface warfare requirements are supported with authorizations. There’s a seemingly separate, but related, issue for outsourcing actions that affect at-sea military personnel authorizations. What happens to the associated shore authorizations maintained to provide a rotation base? Should their functions also be outsourced?

⁴⁸ The Powell thesis discussed in Chapter 3 above is one useful example of translating theory into a significant part of a template useful for outsourcing and PSS decisions.



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A Framework for Calculating Indirect Costs and Earned Value for IT Infrastructure Modernization Programs

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ABSTRACT

Earned Value (EV) supports proactive project management by comparing work accomplished over time against the cost and schedule of work authorized. This comparison is essential to a range of tasks such as performance-based acquisition and budgeting. However, the utility of EV as a planning and management tool depends on the accuracy of Planned Value (PV) estimates. For Information Technology (IT) infrastructure modernization projects, those estimates are dominated by difficult-to-calculate indirect costs—for the effort consumed in communication, control, and coordination activities. While the DoD 5000 recognizes and recommends including indirect costs in Earned-Value computation, it does not provide guidance on how to do so. However, a conceptual framework built around the notion of communications efficiency can be constructed and evaluated using the information resident in artifacts such as Enterprise Architecture products, organizational capability and maturity assessments, and repositories of project data; each of these provide a basis for developing (parametric) bounds on indirect costs and, in some instances, direct estimates. These methods can be built into an Earned-Value Management (EVM) system.

KEY TERMS: Activity Base Costing (ABC), Capability Maturity Models, CMMI, Indirect-Cost Estimation, Infrastructure Technology (IT) Modernization, Earned Value, Enterprise Architecture, Entropy, Markov Models, Perron-Frobenius Theorem

1. INTRODUCTION: THE PROBLEM CONTEXT

For knowledge-intensive enterprises such as complex COTS acquisition/integration projects, indirect-cost estimation depends on the capability to understand, manage and control information dependencies. Absence of that capability would create unpredictable consequences to budgets, schedule, risk, and to the performance of acquisition and IT infrastructure modernization programs. Indeed, inaccurate estimates have long plagued these programs. For example, KPMG determined that for 48% of project overruns the root cause was poor planning and estimating (Software Productivity Center). The Standish Group (1995) found the probability of a software project being cancelled increased to over 50% as a direct function of project size, (as measured in function points). In another survey of 8,000 projects in 1995, the Group found that the average project exceeded its planned budget by 90% and its schedule by 120% (Standish Group 1995a; 1995b). In general, the risk of failure for large software projects is significantly greater than for small projects (Humphrey, 2004, p. 25).

But, where disciplined processes are in place, these risks are significantly reduced while productivity is increased. For example, several recent studies of Team Software Process (TSP) showed significant gains in productivity due to tracking of team and individual activity time (e.g., for reviews, code development, meetings, defect removal, etc.). This data-driven tracking



enabled the identification of activities that added value and of those that did not (Team Software Process (TSP), 2005, 8). It also provides the means to acquire indirect-cost data that is essential to Earned-Value calculations and to Activity-Based Costing (ABC). However, this “bottom-up” approach requires a detailed understanding of organizational activities, resources, and time that may not always be available. In particular, ABC estimates depend heavily on labor-intensive data acquisition (e.g., observing myriad activities, constructing analyses, etc.) which limits the estimates’ suitability to projects of limited duration (such as IT modernization). While TSP may be suitable to software development where the key personnel constitute a limited group with strong technical skills, the same cannot be said for complex COTS applications that often involve a wide range of stakeholders.

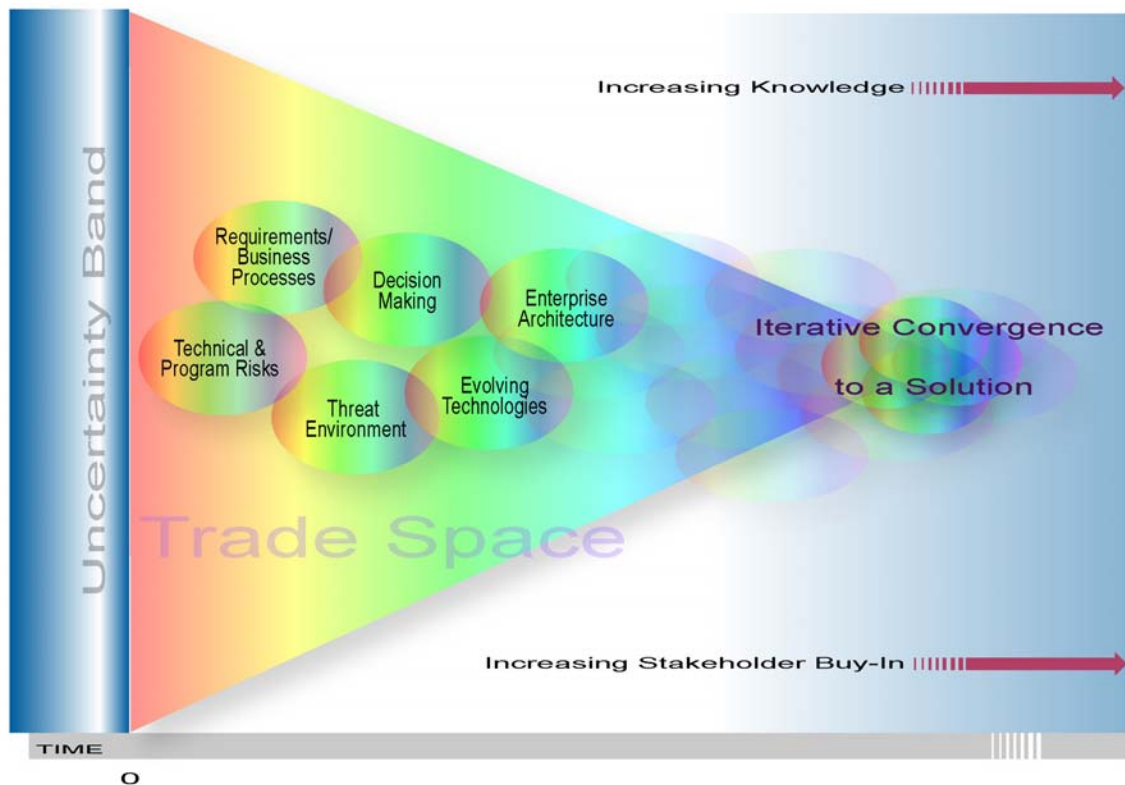
Where a “bottom-up” approach is not feasible, parametric (e.g., statistical) cost estimation can be developed by exploiting artifacts that “should be” available in an IT project environment—such as Enterprise Architecture (e.g., DoDAF) products and data from project repositories. Whatever the approach taken to Earned Value (EV), success depends on effective management control, communications, and coordination. Lacking that basis, EV estimates invariably will be overly optimistic as compared to the actual costs incurred because there is minimal capability to assess “true” project scope. Increases in project size, complexity, scope, volatility, stringent performance requirements (e.g., achieving minimal response latency in networks) all amplify the potential for the distortion of estimates.

The factors influencing indirect costs are myriad, and have differing degrees of volatility and impact over time. These factors include:

Economies of scale, learning, capacity utilization, system linkages, coordination and control, integration, timing, discretionary policies, location, institutional factors, process maturity levels, learning, geographical dispersion, and team experience.

Various weighting schemes can be developed and applied to these parameters for various classes of models, as will be discussed in Sections 3 and 4, below. Conceptually, Figure 1, below, illustrates the interplay of the factors driving the multi-dimensional complexity facing IT project management.

Figure 1. Program Technology Integration Management



2. BACKGROUND: EARNED VALUE (EV) AND EARNED-VALUE MANAGEMENT (EVM)

EVM is a methodology for assessing project performance in terms of cost and schedule variance over time. It measures work actually accomplished against a schedule for contracted tasks at discrete points in time. By systematically integrating the measurement of cost, schedule, and technical accomplishment EVM, promotes realistic cost-schedule estimates throughout the project's development cycle. Specifically, it integrates three data sources:

- (1) Planned Value (PV = BCWS) of work scheduled which defines what is to be accomplished (funding authorized). The challenge is to identify and to measure the indirect costs which consume the vast majority of IT project funds.
- (2) Actual Cost of Work Scheduled (ACWS) which defines what is spent—that is, whether anything was accomplished, or not.
- (3) Earned Value (EV = BCWP) which measures what was accomplished within the time allowed.

Thus, work packages accepted as satisfactory “earn” the cost of the resources consumed to complete them. The progress of a project can be determined by computing:

- ▶ $SV = EV - PV$
- ▶ $CV = EV - AC$

From these basic relationships, a range of other "dashboard" metrics can be determined as well, such as Estimated Time to Complete (ETC) and Estimate at Completion (EAC).

By determining EV at specific points in time, a project can be assessed against its schedule to determine whether it is "slipping" or not. By capturing the *time value* of information, EV provides Decision Makers with the *predictive capability* that enables flexible response to opportunities afforded by new technologies, evolving conditions, and to joint collaboration requirements—rather than simply reacting to them post facto. That flexibility strengthens overall program/project/portfolio integration and alignment with Agency mission.

3. THE CHALLENGE: COMPUTING INDIRECT COSTS

The *management of information* results in the creation of intangible goods and services (e.g., technical advice, activity coordination, stakeholder engagement, training, etc.) that enable a project to converge to a solution, as illustrated in Figure 1. The efficiency of information management governs the rate of convergence to a solution and is influenced by the volatility of factors such as:

- ▶ Stake-holder preferences
- ▶ Coordination of trade-offs
- ▶ Timing of design decisions
- ▶ Schedule sensitivity
- ▶ Unforeseen side effects of decisions
- ▶ Technical and integration complexity
- ▶ Architectural insight
- ▶ Regulation and policy constraints

How quickly that volatility damps-out depends on factors such as:

- Organizational process maturity (e.g., strong configuration control)
- Ability to manage customer expectations (e.g., proactive stakeholder engagement)
- Overall project-management capability (e.g., as measured by the CMMI, OPM3, 6-Sigma, etc.)

Projects with limited capabilities and processes have difficulty managing this volatility due to:

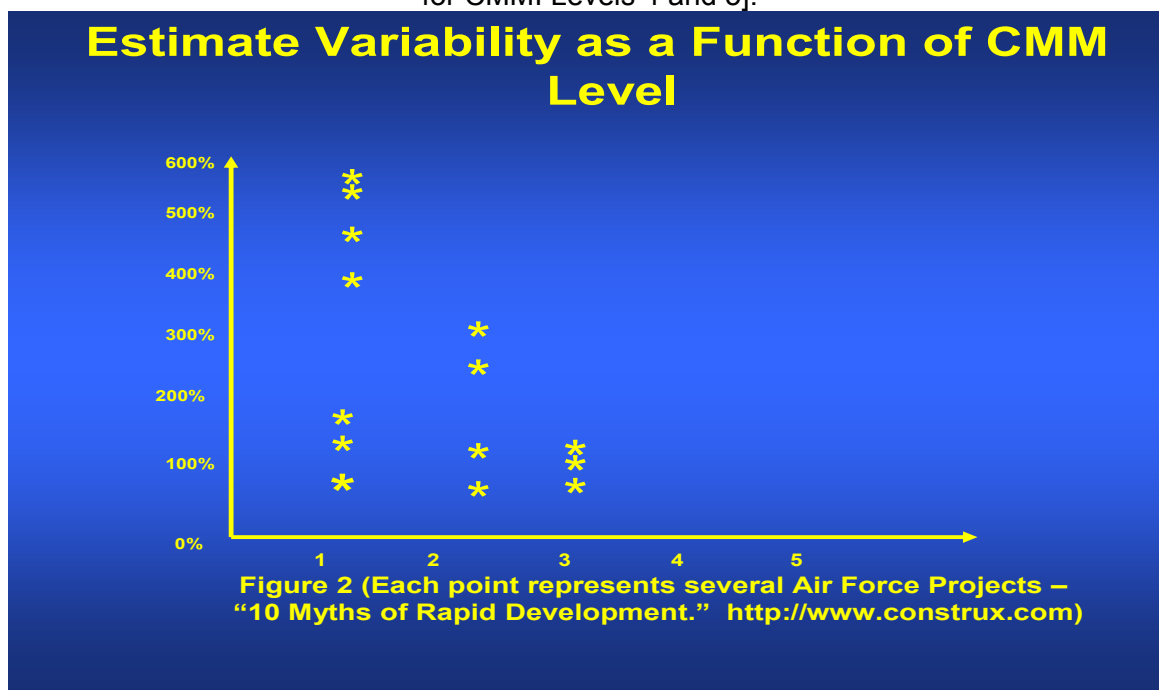
- ▶ Limited coordination and control
- ▶ Communications with:
 - ✓ Low information content
 - ✓ Limited accuracy & timeliness
 - ✓ High distortion & error rates

These factors are unlikely to improve over the project life-cycle without changes to overall process and management capability; this unlikelihood is one reason why Fred Brooks observed that “adding resources late to a project makes it later” (1995). There is an important caveat, however; small-scale projects provide environments where face-to-face communications are sufficient for most management, control, and coordination tasks. These conditions make *Agile Methods* feasible for software development. Unfortunately, these agile methods do not appear to scale-up to larger projects with complex integration, change control, program management and coordination requirements.

An abstract representation of key explanatory variables underlying communications efficiency can provide important insight into Planned-Value estimation calculations, thereby contributing to the construction of indirect-cost estimates. In the physical sciences and Information Theory, the measure of communications efficiency is called “Entropy.” It is used, for example, to determine how many distinct symbols are required to accurately represent the content of a message. The question before us, however, is not the number of distinct symbols required, but rather the type and extent of processes that must be in place to deliver a required level of communications accuracy (e.g., signal-to-noise ratio gain). In effect, the processes providing these capabilities can be interpreted as “invariants” in a dynamic system. (Without going into detail, entropy serves as a measure of “invariants” in a number of fields, a discussion of which can be found in Lind, D., Marcus, B. (1995). *Symbolic Dynamics and Coding Theory*, Boston: Cambridge University Press). The process invariants of concern to us are provided by process management and improvement methods such as the CMMI, OPM3, 6-Sigma, or their equivalents. As Figure 2 indicates, at least one determinant of estimate variability for IT projects is capability level—this determinant can be used to define worst-case bounds (or confidence intervals) on the accuracy of direct- and indirect-cost estimates.

Figure 2. Estimate Variability as a Function of CMMI Level

[Insufficient data was available at the time of the study to make valid determinations for CMMI Levels 4 and 5].



3.1. Earned Value Dilemmas—For Software Intensive Systems

As Figure 2 suggests, low capability projects are least likely to develop valid estimates. Because they typically have no improvement capabilities, they are unlikely to acquire estimation skills. The problem is compounded by the fact that for IT modernization projects, Planned-Value (PV) estimates are most unreliable early in the project development cycle—when they could provide the greatest benefit—due to factors such as initial instability and uncertainty concerning project scope, requirements, and complexity, and schedule. At the onset of the project development cycle, these factors also will render bottom-up, and labor intensive methods of indirect cost estimation, such as ABC, which are difficult to apply regardless of project maturity level. (The possible exception is organizations with sufficient capability and resources to implement TSP. Of course, the programs resulting from such projects, once deployed of course, could benefit greatly from the application of methods such as ABC.)

However, the Software Engineering Laboratory (SEL) at the NASA Goddard facility has computed cost-estimate variability bounds for CMMI Level-3 projects, the estimated growth in cost projections, and the accuracy of those projects as a function of the project-development cycle. As illustrated in Figure 3, their findings suggest that:

- (1) Organizations with at least CMMI level-3 capability can (reasonably) project a 40% growth from an initial (under) estimate.
- (2) Projects with mature processes can realize significant reductions in estimate uncertainty over the development cycle—increasing confidence in their estimates.

Thus, even though projects may start with similar levels of size, complexity, uncertainty and volatility, those with greater CMMI or similar capabilities can more effectively utilize the information resources at their disposal to drive down estimate variability. Yet, projects with less-mature processes are unlikely to do so, regardless of the methodology employed.

Therefore, whether (and to what extent) a costing method can be effectively employed depends on conditions such as:

- ▶ A disciplined process-improvement capability
- ▶ Automated Data Acquisition
- ▶ Statistical Process Control (SPC)
- ▶ A map of information assets (typically provided by an Enterprise Architecture)

These are characteristics of projects with mature process and management capabilities. Figure 3, below, indicates that CMMI level-3 organizations improve their estimates over a project lifecycle by managing their information resources and communications to "learn" throughout the development cycle; in this way, they systematically reduce the uncertainty surrounding virtually all decision variables, including cost estimates.

Figure 3. Cost Estimate Uncertainty Reduction as a Function of Project Life Cycle and Process Maturity Level

Cost Estimate Uncertainty Reduction as a Function of Project Life Cycle & Process Maturity Level

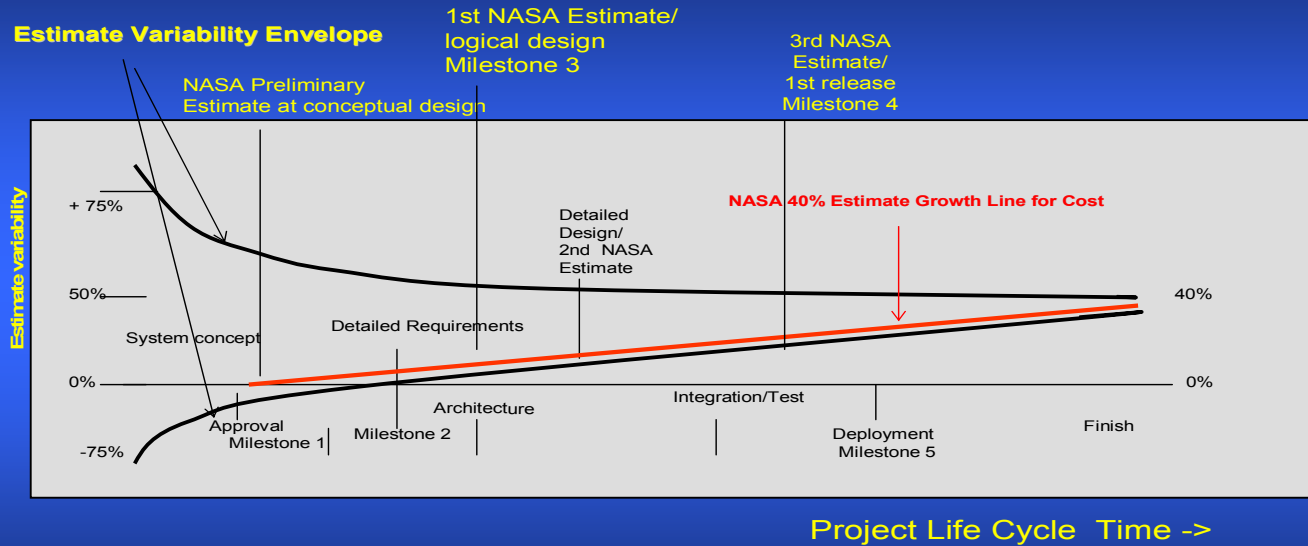


Figure 3: CMM Level 3 Projects at NASA - Software Engineering Laboratory (SEL) (<http://www.nasa.goddard.gov>)

4. PARAMETRIC MODELING OF INDIRECT COSTS

Figures 2 and 3 indicate that the ability to reduce the uncertainty envelope is a function of project communications efficiency, which is governed by the factors noted above, such as:

- ▶ Project maturity level, complexity, scope, lifecycle stage
- ▶ Geographic dispersion
- ▶ The volatility of project scope, stakeholder preferences and requirements
- ▶ Team experience
- ▶ Enterprise Architecture scope and quality

Project information repositories (i.e., SEL at NASA, Goddard) have data available to assess models that purport to “explain” how these factors act as to drive (down) changes to uncertainty levels. For example, these relationships can be stated more abstractly by letting $E(t)$ represent the level of Entropy as a function of time. Then, these changes can be expressed heuristically as:

[1] $dE(t)/dt = f(\text{CMMI Level, EA quality, SPC, 6-Sigma capability, project complexity/scope...})$

[2] $dE(t)/dt = a_1X_1 + a_2X_2 + a_3X_3 + \dots + a_kX_k + e'$

[3] $\text{Min } E(t) = c_1X_1 + c_2X_2 + c_3X_3 + \dots + c_kX_k + e''$

The term ‘e’ represents measurement errors.

For constant a_k , Eqn [2] indicates a constant rate of change over the project lifecycle governed by the capability factors in place. Thus, if the coefficients a_k represent a probability distribution, then Eqn [2] represents a constant rate over time, but is probabilistically distributed.

Eqn [2] assumes that the minimal Entropy level is a linear function of the activities/resources consumed and the associated costs.

While there can be many reasons for questioning the assumptions underlying [1], [2], [3], they nonetheless represent a point of departure for modeling these processes, and they make subsequent analysis mathematically tractable. But, they could be refined to include, for example, non-linear relationships. While this inclusion might improve explanatory power—at least heuristically—it would risk a decrease in mathematical tractability.

Tractability issues aside, Eqns [2] and [3] form a linear optimization problem that can be used to compute cost/schedule estimates and other dashboard metrics which are subject to constraints defining the structure of the project (as determined by architectural and workflow detail, resource availability, etc.). Eqns [2] and [3] have the effect of directly integrating objectives and constraints; Decision Makers could quantitatively assess the value of the information provided by disciplined processes against a range of “what-if” scenarios of scope, cost, performance, schedule and risk trade-offs over a project’s lifecycle by utilizing these equations. Other possibilities for extension and refinement include introducing time as a variable, which would transform Eqns [2] and [3] into a control-theory problem.

These simple models provide qualitative insight into organizational processes, information dependencies and their impact on overall estimation capability. For example, Figures 2 and 3 qualitatively suggest that:

- Declining rates of estimate variability and uncertainty decrease entropy for high capability organizations (CMMI, OMP3, 6-Sigma, etc.). That is,

$$[2] \quad dE(t)/dt < 0$$

- Constant or increasing estimate variability for less capable organizations. That is,

$$[2] \quad dE(t)/dt \geq 0$$

4.1. The Perron-Frobenius Theorem

If the transition matrix P is irreducible, and a-periodic, then P^k converges (element-wise) to a matrix in which each column vector is the unique stationary distribution π' , independent of the initial distribution π^0 .

$$[4] \quad \lim_{t \rightarrow \infty} \pi' = \pi^0 * P$$

Where:

Irreducible means that all elements of the matrix are non-negative.

A-periodic means no looping among states (system movement among states does not result in a periodic sequence such as: 1-2-5... 8-20 ... 1-2-5 ...).

Ergodic means that for an irreducible Markov Chain, a limit exists and is independent of “k” (some initial state for the system).

$$[4'] \lim p_{kj}(n) = \pi_j, \quad n = 0, 1, 2, 3, \dots \quad (\text{discrete time intervals})$$

That is to say, after a large number of transitions, the probability of the transition from state “k” to state “j” is independent of “k”, where these states could represent different values of a performance metric. In a project context, the states could represent the number of open-action items, the processing time required to complete a transaction, etc. Thus, the long-run rate of improvement π_j could be computed from time-series data, and could be interpreted as the ‘ a_k ’ of Eqn [2]; this, in conjunction with Eqn [3], could be used to determine a range of risk values subject to a set of constraints—for example, on scope, cost, schedule, resources, etc.

If the convergence process of Eqn [4] is Markovian, the value of the current state of a system at time “n” is dependent only on the state of the system at time “n-1,” and on no prior states “n-2,” “n-3,” etc. Thus, if the variable of concern is estimate accuracy, then its value (state) depends only on the accuracy of the estimate in the preceding time period. Of course, by the time a limiting value is reached, a project could be long since completed, have incurred multiple changes in scope, etc.

Nonetheless, Eqn [4] is significant because it quantitatively integrates project scope, complexity and other key parameters in the matrix **P**, with the capabilities and controls available to management in the vector **π** . Those capabilities are largely a function of its maturity/capability level, as measured by standards such as the CMMI, OMP3, 6-Sigma, etc. Those capabilities are relatively stable overtime, thus giving rise to the (relatively) constant rates for the vector **π** . The product of the interactions of **P** and **π** can be used to estimate a range of factors of interest to Decision Makers—assuming, of course, that valid data is available.

The matrix **P** can be interpreted as a matrix of probabilities describing the likelihood of a project being in a state defined by values for project scope, complexity, technical challenge, team geographic dispersion, work flow and sequencing dependencies, training levels, etc. In principle, this information is available from sources such as Balanced Score Cards, Enterprise Architectures, Work Breakdown structures, Subject Matter Expert opinion, various assessment and analyses, project data repositories, etc.

Per Eqn [4], the different capability levels represented in **π** will produce different rates of convergence for the bounds on the uncertainty surrounding parameters such as the reliability of cost or schedule estimates. Per Eqn [2], Figures 2 and 3, project with low capability levels are unlikely to drive down the level of uncertainty, while more mature projects will do so- and overtime improve their estimation capabilities - in no small part as a consequence for their underlying communications efficiency.

5. CHANGE EFFECTS AND INDIRECT COST ESTIMATION

The larger the amount of new technology to be integrated and/or modified, the larger the risk of schedule and cost creep due to factors such as rework and overall under-estimation of the complexity. These considerations are particularly important for estimating the level of effort and costs associated with the integration of, or modification to, large-scale legacy systems and COTS applications. The following diagram illustrates these considerations.



Figure 4: “As-Is” Financial Architecture of a Major Government Agency

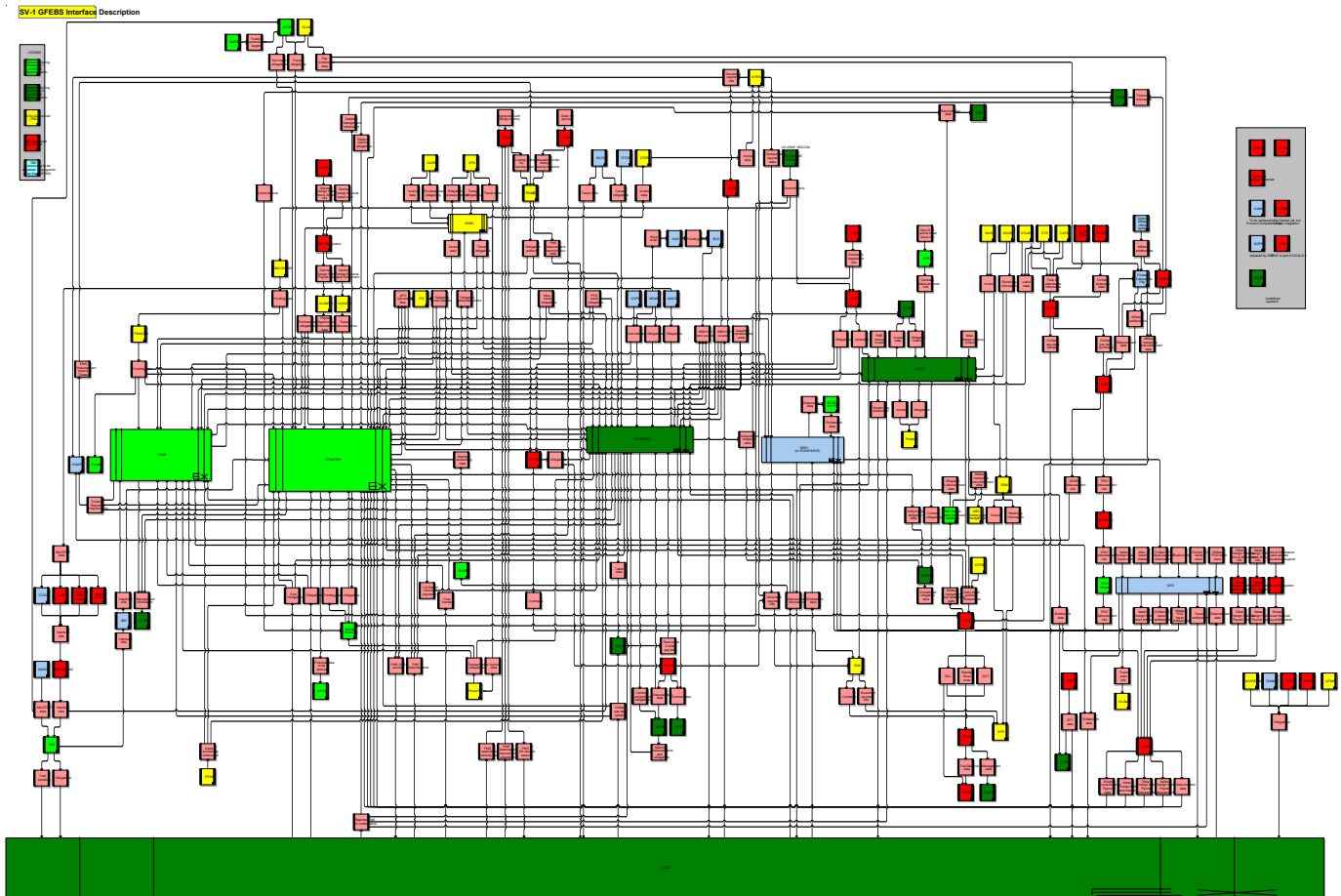


Figure 4 illustrates how cost under-estimation can occur, especially in organizations with low communications efficiency (e.g., the capability to systematically engage stakeholders, technical staff, users, etc.) and minimal architectural insight (e.g., the capability to construct a system-connectivity map such as Figure 4). It also illustrates why life-cycle maintenance costs can be far higher than in the initial development cost. Without these capabilities, the risk of unforeseen and expensive side effects is high. However, with improved capability levels, the ability to acquire and to use a range of information sources—and, thus, the ability to identify the scope of secondary effects, the associated cost, schedule, and scope impacts—improves. The information and data acquired could be applied using Eqn [4], the output of which could then be used to develop the constrained optimization formulation of Eqns [2] and [3] for assessing risk, technical and programmatic performance resulting from investments in various capabilities across a range of “what-if” planning scenarios.

5.1. Applications to System Test Coverage

These models could also be used to help quantify the scope and cost of testing for IT modernization programs. Those costs are always major portions of an IT budget, and there is no satisfactory means to answer the question “how much is enough?” Without going to detail, these equations could be used to estimate test coverage requirements such as:

- The number of modules requiring modifications

- The complexities of the modules requiring modifications
- The availability, accuracy, completeness of the specifications of the modules requiring modification
- The degree to which modifications in a module cause modifications in other modules (i.e., secondary ripple effects that can have significant cost or schedule impact as is illustrated below)
- The impact to the reliability of the System

For example, an estimate of the impact of changes to systems with (probable) dependencies on other systems comprising an application and the Total Expected Number of Changes (**T**) can be computed using:

$$[5] \quad \mathbf{T} = \mathbf{A} * (\mathbf{I} - \mathbf{P})^{-1}$$

(A discussion of Eqn [5] and its relationship to the previous equations can be found in any standard text on Stochastic Processes or Operations Research.)

I is the identity matrix

A is a matrix of initially planned changes

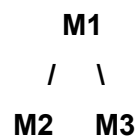
P is the matrix of probabilities of changes that will impact additional systems. These changes will arise from a range of project-specific structural factors as well as technical and programmatic dependencies that can be determined from sources such as DoDAF Enterprise Architecture products:

- OV-3 Operational-Information Exchange Matrix
- SV-1 System-Interface Description
- SV-6 System Data-Exchange Matrix

These artifacts enable the determination of the location and structure of dependencies that create high coupling (e.g. lots of poorly documented, ad hoc interfaces) and low cohesion (software functionality not organized for efficient utilization or maintenance) which are typical of (patchwork) legacy systems.

5.2 Modeling Change Propagation Effects—A Simple (Hypothetical) Example

- Make two changes to module M1 and one change to module M3.
- The question is how many secondary changes will be generated before the ripple effect dies out.



Assumptions:

- For any change to a module, there is a 10% chance of having to make another change to the same module.
- For a change Module M1, there is a 20% chance of having to make changes to modules M2 and M3.
- Changes to M2, M3 do not affect other modules.

Table 1. Initial Change Matrix for a (Hypothetical) Simple System

A =

Module	# of Changes
M1	2
M2	0
M3	1

Table 2. Probability Connection Matrix

P =

	M1	M2	M3
M1	.1	.2	.2
M2	0	.1	0
M3	0	0	.1

Total Expected Number of Changes (T)

$$[4'] T = A*(I - P)^{-1} = 4.31$$

So, the 3 initial changes result in somewhat over 4 changes being made before the ripple effect dies out.

5.3 - Modeling Change Propagation Effects—A More Complex Example

What would happen if we applied the above model to a system such as presented in Figure 4?

As the following Table illustrates, the result can be significant.

Table 3. Change Probabilities—A More Complex (Hypothetical) Example

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0.2	0.1	0	0	0	0.1	0	0.1	0	0.1	0.1	0.1	0	0	0	0.1	0	0
2	0	0.2	0	0	0.1	0.1	0.1	0	0	0	0	0	0.1	0.1	0.1	0	0.1	0
3	0	0	0.1	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0
4	0	0.1	0	0.2	0	0.1	0.1	0.1	0	0	0	0	0	0	0.1	0	0.1	0
5	0.1	0	0	0	0.4	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0.1	0
6	0.1	0	0	0	0	0.3	0.1	0	0	0.1	0	0	0	0.1	0	0.1	0.1	0
7	0.1	0	0	0.1	0.2	0.1	0.3	0.1	0	0.1	0	0	0	0.1	0	0	0.1	0
8	0.1	0.1	0	0.1	0.2	0	0.1	0.4	0	0.1	0	0	0	0.1	0	0	0	0.1
9	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
10	0.1	0	0	0	0	0.1	0.1	0.1	0	0.4	0.2	0.1	0	0.1	0.1	0.1	0.1	0.1
11	0.1	0	0	0.1	0	0	0	0	0	0.2	0.3	0.1	0.2	0	0	0	0	0
12	0.2	0	0	0	0	0.1	0	0	0	0	0.2	0.3	0	0	0.1	0.1	0	0.1
13	0.1	0.1	0	0	0	0.1	0.1	0.1	0	0.2	0.1	0	0	0.2	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.2	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18	0	0	0	0	0.1	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0.3

Table 4. The Change Propagation Impact in a More Complex System

Module #	A	Initial change	Total Change
		$T = A \cdot (I - P)^{-1}$	
1	2	242	
2	8	101	
3	8	4	
5	28	249	
6	12	230	
7	8	229	
8	28	257	
9	4	4	
10	8	319	
11	40	239	
12	12	131	
13	16	128	
14	12	157	
15	296	2961	
16	28	150	
17	28	188	
18	40	139	
Total	296	2961	

5.4- Discussion

Table 3 shows that for a 296 initial changes, there is a *ten-fold increase* in the total number of changes to the system which, if not accounted for, will derail resource planning, cost and schedule estimates. The probabilities in the above Table are conservative. For poorly documented legacy systems, the probability dependencies could be much more numerous and more likely. Such effects can be expected for poorly documented/engineered legacy systems that accumulate a large number of patches over the years and which result in a much larger-than-anticipated number of (costly) ripple effects. Improvements that benefit estimation also benefit many other project components. Accordingly, low maturity/capability projects lack the structural pre-requisites for efficient/timely communication; they cannot marshal relevant information and resources to identify or to manage these effects. Thus, estimates are typically off by orders-of-magnitude.

6. CONCLUSION AND NEXT STEPS

For large scale (DoD) projects with hundreds of stakeholders, hundreds or thousands of (sub) systems, users and stakeholders deployed globally at a large number of different sites, the risks of under estimation are correspondingly greater. Mitigating those risks depends on the efficiency of project/program communications, which is closely related to overall project maturity level.

The framework outlined here proposes to use the equations such as [1] - [5] outlined above to measure the outcomes of project-management/organizational effectiveness as a consequence of the interactions between the capabilities provided at different maturity levels and project characteristics such as scope and complexity. To make these equations useful estimation tools, project data repositories such as those of NASA/SEL, NIST, and others, will be investigated to develop “realistic” parameter values, model relationships, and confidence levels.

Once validated, the models can be used to:

- ▶ Calculate indirect costs for inclusion in EV calculation, with confidence-interval estimates defined in terms of the interactions between project complexity and capability levels
- ▶ Add the dimension of project communications efficiency to risk management
- ▶ Use the models, in conjunction with “what-if” scenario-capable Enterprise Architecture tools (such as Metis) to provide both qualitative and quantitative insight into the effects of trade-offs, mitigation strategies, and project-improvement initiatives
- ▶ Provide conceptual insight into the communications efficiency of various organizational models
- ▶ Embed the models in a larger Planning Programming Budgeting Execution (PPBE) and Portfolio Management framework and apply to tasks such as understanding the cost, scheduling implications project/program alignment with Agency mission, prioritizing, stabilizing, and managing joint requirements, stakeholder preferences, and assessing the effectiveness of “horizontal integration” initiatives.



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Navy Acquisition via Leasing: Policy, Politics, and Polemics with the Maritime Propositioned Ships

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ABSTRACT

In recent months, leasing has been prominent in the press in connection with the Air Force's ill-fated attempt to obtain the use of Boeing re-fueling tankers without buying them. Gone from memory is the early 1980's controversial Navy leasing program of Maritime Prepositioned Ships that had a different result. This paper presents an analysis of the various issues and parties to the very creative and innovative financing on behalf of the Navy's Military Sealift Command. Still in existence today, the 1983 contracts for thirteen TAKX ships were valued at approximately \$2.6 billion. While the decision is often framed as a "lease versus purchase" choice, the facts indicate that the option to purchase was not seen as viable at the time. In hindsight, the TAKX leasing program was successful and cost effective, despite the whirlwind of political commentary and intrigue and the dueling quantitative analyses surrounding it. However, as an unintended (or, perhaps, intended) consequence, laws and policies have since been changed so that leasing is no longer viable for financing military assets. The case presented here considers altering existing laws and regulations to once again permit leasing of military resources.

KEYWORDS: Leasing, Tankers, Financial Analysis, Present Value, Acquisition Alternatives

INTRODUCTION

On January 25 and February 7, 2005, *The Wall Street Journal* confirmed a widely reported major shift in Department of Defense (DoD) weapons acquisition policy over the next decade.¹ The articles cite retired VADM Arthur Cebrowski, head of the Pentagon's Office of

¹ Jaffe, G. & Karp, J. (2005, January 25). Military faces even deeper cuts. *Wall Street Journal*. See also Pasztor, A. (2005, February 7). Army program could boost defense spending. *Wall Street Journal*.



Force Transformation, who sees an increasingly significant shift away from capital-intensive weapons towards the more labor-intensive systems used in guerilla wars.

Notwithstanding this transformative agenda, the Navy's FY2006/FY2007 President's Budget still makes a strong case for a steadily growing capital investment budget between 2005 and 2011. The budget proposal submitted on February 23, 2005, by RADM Bruce Engelhardt, Director of the Office of Budget in the Office of the Assistant Secretary of the Navy (Financial Management and Controller), shows proposed growth in annual weapons investments from \$26 billion in 2004 to \$42 billion in 2011.² The key components of this budget include the new Joint Strike Fighters, DD(X) destroyers, Virginia-class nuclear submarines, and MMA aircraft to replace the aging P3 Fleet, among many other programs. Not mentioned explicitly in RADM Engelhardt's report is the question of how to replace thirteen currently leased Maritime Prepositioned Ships (MPS) which support the readiness of three Marine Expeditionary Brigades. The use of these ships was arranged in the early 1980's through 25-year leases (five renewable periods of five years each), which will expire between 2009 and 2011.

This paper reviews the history of the MPS program to try to assess the lessons for current Navy acquisition policy. In 2005, we believe there is a strong disposition against leasing as a financing strategy for the US military. As just one piece of evidence, consider the recent firestorm of criticism which met the Air Force's attempt in 2002 to lease, instead of buy, replacements for 100 aging KC135E refueling tankers.³ We believe a dispassionate evaluation of the MPS history can contribute significantly to an assessment of the efficacy of leasing as a component of future acquisition policy.

SOME HISTORY ON THE POLICY PERSPECTIVE

The Navy has a long history of leasing ships to augment military capability in times of war.⁴ Over 450 supply ships, using merchant marine crews, were leased and deployed during World War II. During the Korean War, over 200 leased ships were deployed. More recently, during the Vietnam War in 1972, the Navy entered into a lease agreement to charter nine new T-2 fuel tankers to replace 14 worn out WWII-vintage tankers. Originally, appropriated funds were earmarked to build these new tankers. However, when acquisition proved infeasible because of budget limitations, the DoD opted to approve a long-term lease instead. There is no indication that this transaction encountered substantial resistance within the military or in Congress.

The Navy also has a long history of leasing several categories of what might be called "off the shelf" auxiliary support equipment. For example, even up to the present time, leasing (rather than buying) is the financing mechanism of choice for such items as power storage batteries on nuclear submarines, reduction gears on surface warfare ships, and medical equipment in Navy hospitals. Again, none of these policy choices seem to engender significant political controversy, even in peace time.

² Engelhardt, B. RADM USN. (2005, February 23). *Department of the Navy FY2006/FY2007 President's Budget*. Washington DC: Office of Budget, Office of the Assistant Secretary of the Navy (Financial Management and Comptroller).

³ Furber, D. & Jaeger, H. (2004, June). An examination of the United States Air Force proposed lease of refueling tankers. [MBA Professional Report]. Monterey, CA: Naval Postgraduate School.

⁴ Peters, M. A. (1979). Is leasing by the Federal Government a good thing for the American taxpayer? The GAO tanker report—A case study. [PhD Dissertation]. San Francisco: Golden Gate University.



In spite of this historical context, the MPS program did generate substantial controversy and political conflict between 1981 and 1983. It was the first peace-time attempt to use leasing to acquire a multi-billion dollar pool of specially designed military equipment—thirteen ships, each valued at more than \$182 million. But, the program was not originally intended to bypass normal acquisition and appropriation review channels.

The MPS program grew out of the successful “Prepositioned Force” (deployed in the late 1970’s at Diego Garcia in the Indian Ocean) which was made up of older cargo vessels. Between 1977 and 1979, this idea was expanded to a proposed fleet of 13 specially designed cargo ships with sufficient Lift-off/Lift-on (LO-LO) and Roll-on/Roll-off (RO-RO) capabilities to support the equipment and supplies necessary for a rapid deployment of three Marine Expeditionary Brigades for thirty days of combat. Depending on the technical characteristics, three or four ships were required for each Brigade. This so-called TAKX Program was officially authorized by the Naval Sea Systems Command (NAVSEA) in 1979.

Between 1979 and 1981, NAVSEA struggled to find a way to fit TAKX into the Navy’s procurement backlog. The “good news” was that 1981 saw the beginnings of President Reagan’s program to vigorously rebuild US military forces, including the vision of a “600-ship Navy” and increasing amphibious capabilities for the marines. The “bad news” was that so many programs involving high-priority combat systems were simultaneously under consideration that requesting Congress to appropriate funds for non-combat support ships was not seen as justifiable.

Yet, the Navy and the Pentagon felt strongly that the TAKX Program was indeed a high priority. Updating the Military Sealift Command (MSC) was an essential component of the overall expansion program dictated by the threat of Soviet military power in the post-Vietnam stage of the Cold War. MSC operates a Combat Prepositioned Force for the Marine Corps and a Logistics Prepositioned Force for the Navy, Air Force, and Defense Logistics Agency (DLA), as well as the Maritime Prepositioned Ships; but only the MPS Program’s ships are leased.

It is worth repeating, in this context, that the MPS leases were not seen primarily as a financing device for the TAKX Program. The choice was not seen as “lease versus purchase,” but rather as “lease versus do-without.” As we move on to analyze the MPS Program in more detail, it is important to keep in mind this distinction as to whether leasing is a financing option for assets whose acquisition has already been approved, or a mechanism to avoid deleting assets from the overall acquisition program.

A SYNOPSIS OF THE POLICY DILEMMA

There is no question that the legislative, regulatory, and political context in 2005 is structured such that leasing is virtually infeasible for billion-dollar military programs. If leasing is, in fact, a “bad idea” for US military acquisitions, the current structure is appropriate. But, *is* leasing a “bad idea”?

The MPS Program, in retrospect, is seen as a significant success. In 2004, Bailey & Escoe and Haslam, et al. documented many important uses of the ships between 1985 and 2005, including their crucial role in Operation Desert Storm in 1991.⁵ Without the leasing option,

⁵ Bailey, J. & Escoe, M. (2004, December). Innovations in funding the maritime prepositioning ships program—A case analysis of the how and why the lease option was successful. [MBA Professional Report] Monterey, CA: Naval Postgraduate School. See also: Haslam, P., Koenig, R. & Mitchell, S. (2004, December). An examination of the



the Navy would not have been able to acquire the TAKX ships. Thus, leasing can be seen as one of the crucial elements in the success of Desert Storm.

Even if one were to grant the proposition that leasing is only an acceptable extension of acquisition policy under the exigencies of wartime, it is possible to counter that the events of September 11, 2001, mean the US is “at war,” and will be for the foreseeable future. In that context, one can question whether it is appropriate to take leasing off the table in 2005 as an option to finance the on-going “Global War on Terror (GWOT).” Should not leasing be considered very carefully, prospectively, as a mechanism to augment defense capabilities without forcing cut backs in acquisition planning for other programs?

That is, should not leasing be carefully evaluated, on its merits, as a way to expand defense capabilities beyond what can be paid for in the context of the year-by-year acquisition process?

THE STRUCTURE OF THE MPS DEAL

In October 1981, NAVSEA issued the Request for Proposal (RFP) which sought bids to supply thirteen ships for the MPS Program. This was the largest single ship financing program ever undertaken by the Navy, representing \$2.65 billion. Because of the tremendous scope and complexity of this program, the Navy also issued a RFP for consulting services. Argent Group, Ltd. (AGL), a small investment banking firm specializing in leveraged-lease financing, was engaged.

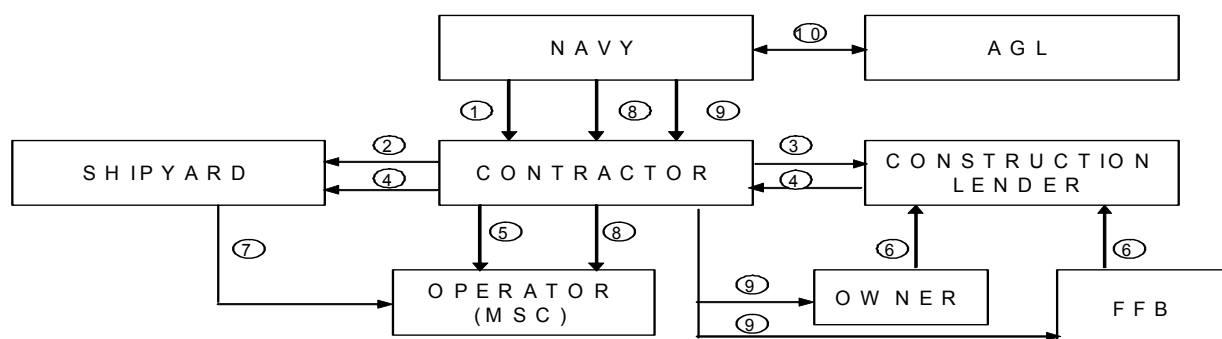
Although the ships involved thirteen separate contracts, the structure of each contract was the same and all were implemented at the same time. The Deal consisted of six principal participants: the Owner/Lessor, Federal Financing Bank, Shipyard, Contractor, Operator (MSC), and the Navy.

Figure 1 summarizes the legal relationships in the Deal, and Figure 2 summarizes the financial flows and business relationships.

Figure 1. The Legal Relationships

<u>Contractor</u> <u>Special Purpose Entity</u>	<u>Award</u>	<u>Private Investor/Owner</u>	<u>Shipyard</u>
General Dynamics Corp.	5 TAKX Ships	Salomon Brothers, Inc.	General Dynamics Corp.
Maersk Line, Limited	5 TAKX Ships	Morgan Guaranty Trust Co. of NY	Bethlehem Steel Corp.
Waterman Steamship Corp.	3 TAKX Ships	Citibank, N.A., and Manufacturers Hanover Leasing Corporation, acting jointly	National Steel and Shipbuilding Co.

Figure 2. Business Relationships During Construction and Subsequently during Operation (See numerical key below)



Construction Period

- (1) Agreement to Charter, after construction
- (2) Construction Contract
- (3) Construction Loan Agreement
- (4) Construction Progress Payments
- (5) Construction Supervision Payments

Operating Period

- (6) Repay Construction Loans (30% Owner/70% FFB)
- (7) Delivery, subject to terms of construction contract
- (8) Operating Hire Payments
- (9) Capital Hire Payments
- (10) Ongoing Consulting Fees

There were four elements of the Deal for each ship: construction, financing, delivery and time charter arrangements. Following is a discussion of each element.

Construction:

- The Contractor negotiated a fixed-price construction contract with the shipyard and provided progress payments during construction.
- The Contractor arranged interim loans to finance the construction. The Contractor assumed all risk associated with the loans until an acceptable ship was delivered to the Navy.
- The Contractor was responsible for supervising the construction to ensure the ship was completed according to the specifications and plans, including the Navy's operational and technical requirements. The Contractor paid a supervisory fee to the Operator (MSC) to supervise construction.
- The Navy retained the right to inspect the construction, but it could not deal directly with the shipyard, nor did it have any supervisory obligations, unilateral design change rights, or liability to the shipyard in the event of cost overruns.

- The ships were constructed using current commercial specifications, known as American Bureau of Shipping (ABS) standards.

Financing:

- Prior to delivery, the Contractor arranged permanent financing for the ship, consisting of equity from private investors (30%) and debt from the FFB (70%).
- The private investors assumed ownership upon delivery of the ship. They were eligible, under existing legislation, to receive accelerated depreciation tax benefits associated with ownership.
- The debt was in the form of 25-year bonds purchased by the FFB which held a mortgage on each ship to secure the debt.

Delivery:

- When the shipyard completed the vessel, it was delivered to the owner who simultaneously delivered it to the Contractor under a “bareboat charter.” The proceeds of the debt and equity financing were used to pay off the interim construction loans.
- The Contractor turned the ship over to the MSC under an operating contract. The ship was chartered to the Navy under the Time Charter provisions.
- Upon delivery, the construction cost of each ship was adjusted to reflect actual interest rates paid during construction on the interim construction loans.

Time Charter:

- The Navy began its charter hire payments (comprising both the capital hire and operating hire payments) upon delivery and acceptance of each ship.
- The semi-annual capital hire payments were made on a “hell or high water” basis. Upon delivery, the capital hire rates were adjusted to reflect the actual debt and equity financing rates. Once adjusted, the Navy’s capital hire rates were fixed for the entire charter period.
- Each Time Charter was an initial five-year contract with four renewal periods, for a total of 25 years. If the Navy failed to exercise renewal options or terminated for convenience after the initial period, the vessel would be sold, and the Navy would pay the difference between the selling price and the contractual termination value—which was designed to repay the debt and give the owners their agreed-upon return on investment. However, the Navy held an option to purchase the ships at the higher of the termination fee or ship’s market value.
- The operating hire component was paid to the Contractor, who in turn paid the MSC. It includes operating expenses and a margin as agreed to in the contract. The Contractor assumed the risk for all off-hire provisions and ship non-performance. The Time Charter also contained inflation provisions to compensate for increases in crew wages, stores and subsistence, maintenance, and insurance. Provision for loss of the ship was also included.

THE POLITICS AND POLEMICS OF THE MPS DEAL

From its formal authorization by the Secretary of Defense in August 1979, to its approval by the Office of Management and Budget (OMB) in December 1981 (to be included in the 1983 Budget), the TAKX Program moved along without any significant challenges or controversy. It was first authorized by Congress in September 1980. The tax aspects of the lease contract were reviewed with the Internal Revenue Service (IRS) in November 1981. The Navy



commissioned a study by the international CPA firm Coopers and Lybrand (C&L) in February 1982. C&L concluded that the lease agreement was substantially cheaper for the government than purchasing the ships, when considering the net present value of all payments over the term of the lease, based on existing laws and tax regulations. In response to the RFP, several bids were received in March 1982. In April 1982, AGL began its work to help the Navy zero-in on the best bids and begin signing contracts.

However, as the cherry trees started to bloom in Washington that spring, Congressional interest in the TAKX Program also began to blossom. The honeymoon was over. In early May, the Secretary of the Navy, John F. Lehman, received inquiries from Congress as to whether the TAKX Program complied with federal standards in support of the American Merchant Marine and the American shipbuilding industry. Senator Howard Metzenbaum of Ohio was concerned that no shipbuilding involved his state. Secretary Lehman responded by letter in late May to the House Appropriations Committee, assuring them that all federal standards were being fully met.

A letter from the Chairman of the Defense Subcommittee of the House Appropriations Committee to Secretary Lehman, dated July 20, 1982, noted that the 1980 authorization by Congress presumed procurement of the MPS through normal appropriations channels. Congressman Joseph Addabbo directed the Navy not to enter into any contractual agreements until a Surveys and Investigations (S&I) report could be commissioned and completed. Secretary Lehman agreed to this request on July 30.

On August 17, the Senate Armed Forces Committee and the House Appropriations Committee notified the Navy that they were undertaking a review of the TAKX lease contracts under Section 303 of the FY1983 Authorization Act. Section 303 required a 30-day review period for Congress to determine that leasing was preferable to purchasing through normal appropriations channels before lease contracts could be signed.

By mid-August, AGL's own financial analysis of the lease program confirmed C&L's favorable conclusion. Based on a firm belief that the Deal was "cost-effective," the Navy awarded contracts for 6 TAKX ships on August 17, 1982, with the option for 7 additional ships during the 1983 fiscal year. These contracts were publicly announced on August 18. The next day, AGL released its conclusion that the net present value of each lease was \$140.6 million versus a net purchase cost of \$184.0 million per ship.

One major component of the attractiveness of the leases to private owners was tax savings from the use of accelerated depreciation. Under applicable laws in 1981, the owners of the TAKX ships could use a five-year life and the Accelerated Cost Recovery System (ACRS) rates. In 1982, there was significant public indignation about the drain on the US Treasury from these generous tax "write offs" (which Congress had enacted in 1981) for wealthy private investors. Many in Congress were sympathetic to this criticism of "special tax deals." In 1982, Congress passed the Tax Equity and Fiscal Responsibility Act (TEFRA), which substantially eliminated special tax benefits due to short tax lives and accelerated depreciation for assets used by non-profit entities. The TEFRA provision would have reduced the present value of the depreciation tax benefits on each TAKX ship by \$8.3 million, but TEFRA did not become effective until December 1983, by which time all the TAKX ships were already under construction.

Another component of the tax incentive to the lessor/owners was the Investment Tax Credit (ITC). If the leases were deemed "qualified" for ITC under the tax laws, ten percent of the cost of the ships was available to the owner as an immediate tax credit upon purchase of the ship. Both C&L and AGL argued that the leases would qualify for ITC. However, many observers questioned whether the credit should be available to the owners since the Navy retained "significant risks of ownership." The ITC was also seen as an unwarranted drain on the



US Treasury for the benefit of “special interest” wealthy investors. A ruling by the IRS on December 10, 1984, did, in fact, disallow the ITC for the TAKX ships. This ruling resulted in an upward adjustment of the annual lease payment to make up for the lost tax benefits to the owners. But, by December of 1984, the TAKX Program was a “done deal.”

On September 1, 1982, the S&I Report commissioned by Congress to review the MPS was released. It confirmed the cost advantage of leasing over purchasing for any applicable discount rate up to 19%. The report also confirmed the appropriateness of the 10% interest rate used in the AGL analysis under applicable OMB and DoD regulations.

The S&I Report did, however, raise a major red flag about the TAKX Program concerning encumbrances to the Navy Industrial Fund (NIF). The TAKX leases presumed that, year by year, only the annual lease payments would be charged against the NIF. The S&I Report noted, instead, that the present value of all future lease commitments and potential termination penalties would need to be encumbered in the NIF as a matter of law. This could be a major problem, since the full present value of over \$2.6 billion was more than the current unencumbered balance of about \$2.2 billion in the NIF.

In spite of this potential concern, both the Senate Armed Forces Committee and the House Appropriations Defense Subcommittee notified the Navy on September 16 (one day before their 30-day deadline) that the provisions of Article 303 of the 1983 Authorization Act were successfully met, and the lease contracts could proceed. So far, so good.

But, on September 17, 1982, the House Subcommittee on Readiness held a hearing on the TAKX Program. Chairman Dan Daniel expressed serious dissatisfaction with the leases, which he said inappropriately circumvented the Congressional authorization/appropriations process and thus impeded effective legislative review. He noted that the leases obligated the Government to 25 years of lease payments or to substantial termination penalties if the leases were canceled. He concluded that although the TAKX leases were already approved, he would do his utmost to see that appropriate action was taken to prevent a recurrence of this “side-stepping” of Congressional authority.

On December 2, 1982, the Comptroller of the Navy requested the US General Accounting Office (GAO) to clarify the issue regarding the encumbrance to the NIF. The GAO report was released on January 28, 1983. It said that the Navy must encumber the NIF for five years of lease payments (the initial guarantee period) plus the full termination payments that would be due in five years if the leases were cancelled. This requirement ran the very real risk of overencumbering the NIF. That would be a very serious violation of the Anti-Deficiency Act. The GAO posed no legal objection to the Deal, as long as the NIF had sufficient available unencumbered funds. The GAO suggested that the Navy seek explicit legislative relief to cover this issue.

The Supplemental Appropriations Act of 1983 (P.L. 95-63) did grant the Navy the authority to proceed with the TAKX Program in the absence of an appropriation covering the total termination liability under the leases. This legislation was a necessary stop gap action to keep the program on track. But it was not a clear, definite response to the NIF encumbrance issue.

On February 15, 1983, the Joint Committee on Taxation (JCT) issued a lengthy and comprehensive analysis of the TAKX leases which contradicted the AGL conclusion that leasing was more cost effective than purchasing. The JCT’s overriding premise was very simple: leasing can only be cheaper if the borrowing cost of the lessor is lower than the borrowing cost of the lessee. Since the Federal Government has the lowest borrowing cost in the world, the TAKX leases involve compensating the lessor for financing costs that must be higher than the



Government would have borne to borrow money and buy the ships. The JCT report also challenged many of the assumptions and calculations in the AGL report with detailed alternative calculations. The JCT concluded that leasing each ship was \$9.7 million more expensive than purchasing. The difference between the AGL and JCT positions will be summarized in a later section of this paper. Suffice it to say here; as the TAKX Program was moving ahead, the release of a report by a respected Congressional unit that was negative toward the cost-benefit argument presented by the Navy was very embarrassing.

On February 23, 1983, Senator Metzenbaum wrote to the Secretary of the Treasury to describe parts of the TAKX leases as an “outrageous” subsidization by the Navy of a legal case against the IRS. The TAKX leases included a provision that the lease rates would increase if the IRS were to reject any of the tax benefits assumed in the contract. Senator Metzenbaum argued, very publicly, that this amounted to the Navy paying the legal costs of investors seeking to overrule the IRS.

Interestingly, an article in *The Washington Post* on February 25, 1983, reiterated Senator Metzenbaum’s charges under a rather inflammatory headline: “Navy Promises Suppliers Tax Breaks.”⁶ The Navy’s response was that the contracts constituted very normal business practice regarding issues of the tax impact of leveraged-lease deals. *The Post* likened these “tax breaks” to the buying and selling of tax advantages by wealthy investors that were targeted by Congress in the pending TEFRA legislation. Previously, on January 31, 1983, another *Washington Post* article entitled, “Rent-a-Navy,” concluded that the TAKX Program should be terminated because the bulk of its cost was hidden forever from public scrutiny in lost tax revenue to the Treasury.⁷ The leases, it argued, should be prohibited as a blatant “evasion of budgetary limits.”

It is not clear how *The Washington Post* came to see the TAKX leases as such bad public policy. But TAKX’s opponents in Congress clearly were more successful in influencing the public media than they were in influencing the House and Senate leadership. The Congressional political game continued.

On February 28, 1983, Chairman Charles Rangel of the Subcommittee on Oversight of the House Ways and Means Committee held hearings which continued to question the Navy’s judgment to lease the TAKX ships and, thereby, circumvent Congressional review and oversight of the Deal. Rangel’s Committee was not particularly impressed by the assertion by the Principal Deputy Assistant Secretary of the Navy (Shipbuilding and Logistics) that the use of “commercial standards” versus “military standards” saved the Navy \$35 million per ship. Normal “military standards” were not necessary for a cargo ship, she argued; but, normal appropriations law would have required their use anyway. Chairman Rangel followed up the hearings with more questions for the Secretary of the Navy in a public letter dated March 18, 1983. Secretary Lehman responded to Congressman Rangel’s concerns by reiterating the terms of the leases. The Oversight Subcommittee subsequently acknowledged they had no continuing objections to the TAKX Program.

On March 25, 1983, AGL issued a comprehensive rebuttal to the JCT report in which they systematically challenged each of the bases for the JCT opinion that leasing was not cost effective. The original AGL report, the JCT rebuttal, and the AGL response are all very lengthy, complex, and technical documents which require very careful study and very deep awareness of difficult business concepts to understand completely. In the authors’ opinion, no more than a

⁶ Navy promises suppliers tax breaks. (1983, February 25). *The Washington Post*.

⁷ Rent-a-Navy. (1983, January 31). *Washington Post*.



few people outside of AGL or the JCT staff probably fully understood the complex arguments being made or rebutted. However, the political significance of the three documents does not really hinge on a widespread understanding of any of the technical arguments being made.

The August 1982 AGL report served its purpose as a careful report from a credible professional source that reaffirmed the superiority of leasing over buying. One did not have to be able to digest the report fully in order to accept its significance. The JCT rebuttal of February 1983 served its political purpose in challenging the superiority of leasing, from a credible, professional source, whether or not one could fully comprehend its technical arguments. The AGL response in March 1983 served its purpose of reasserting the superiority of leasing by carefully rebutting all of the challenges raised by the JCT.

Whether or not one understood or agreed with the complex present-value arithmetic arguments, the point stood that the Navy was still convinced that leasing was cost effective, in spite of arcane intellectual attacks by opponents of the program. As far as the authors can tell, there was no public criticism of the AGL rejoinder by the JCT or by anyone in Congress.

In the authors' view, these dueling analyses are representative of the role that complex intellectual analysis often plays in policy debates. It is important to present an analytic base for one's policy positions, just as it is important to present an analytic base when challenging a policy. But the success of the policy initiative is much more dependent on the political acumen and political skill of the proponents and opponents than it is on the "intellectual truth content" of the analytical position papers. "Truth" is always ephemeral, and intellectual analysis is often subject to the political interests of the analyst. Credibility is always as much dependent on the "plausibility of denial of subjective bias" as it is on the "truth content" of complex logical arguments.

We consider this resort to complex intellectual arguments and counterarguments regarding the cost-effectiveness of the TAKX leases as a "polemic" (an argument designed more to influence policy than to advance understanding). The arguments play a role in understanding the political success of the program. They also play a role in understanding the success of the program's opponents in stopping any repetition. But the role they play is largely unrelated to the supporting analysis. We try to unravel the competing claims and counterclaims later in the paper, so that we can defuse the cost-effectiveness "polemic" in considering future policy directions. Regardless of the specific arguments, the analytic dimension of the TAKX debate in 1982-1983 was effectively neutralized by the AGL rejoinder report.

Although the Congressional and public media challenges to the TAKX Program were largely finished by June 1983, a new round of congressional actions began. If the TAKX opponents could not derail that program, they seemed willing to do everything they could to see that similar deals would never be repeated.

THE POLITICAL RESPONSE TO THE APPROVAL OF THE TAKX PROGRAM

Cementing the legality of the TAKX Program was a specific provision of the Appropriations Act of 1985 (P.L. 98-473), which required the Navy each year to encumber the NIF for only that year's lease payments and 10 percent of the possible termination fees. Without this special legislation, the TAKX leases would have over-encumbered the NIF.

The MPS were not even out of their shipyards before three legislative actions were enacted which were clearly intended to ensure that the TAKX Program would never be repeated. In June 1983, the GAO issued an analytic report on the use of leasing by the DoD in which it recommended legislation that would prevent any future long-term leases without Congressional analysis and authorization. It was not clear what such Congressional oversight



might entail until the Defense Authorization Act of 1984 (P.L. 98-94) spelled out these conditions:

- All DoD long-term leases must be specially authorized by law.
- A notice of intent to solicit such leases must be given to the appropriate committees in both houses of Congress.
- A detailed justification for lease versus purchase must be submitted to Congress and that justification must be approved by the OMB and Treasury.
- The OMB and Treasury must jointly issue guidelines as to when leasing may be appropriate.

Clarification of just how restrictive these conditions would be was quick to follow. The required joint OMB/Treasury guidelines were published in 1984 and dictated that any special tax incentives for ship owners (such as accelerated depreciation) be disregarded in any lease versus purchase analysis for DoD leases. The Deficit Reduction Act of 1984 (P.L. 98-369) disallowed accelerated depreciation to the owners of all assets leased to Government entities. The Balanced Budget and Emergency Deficit Control Act of 1985 (P.L. 99-177) further restricted leasing by requiring full, up-front budgetary authority for the estimated present value of all anticipated obligations over the life of any lease.

Finally, OMB Circular A-94, dated October 29, 1992, requires that any “lease versus purchase” analysis must exclude consideration of any tax revenues to the Treasury from lease payments received by the lessor; further, the analysis, must use the Treasury’s borrowing cost as the discount rate.

Congress, GAO, OMB, and the Treasury Department have spoken—no more long-term leases.

UNRAVELING THE PRESENT-VALUE POLEMIC

As noted earlier, AGL originally concluded that leasing was \$43.4 million cheaper per ship, while the JCT concluded that leasing was \$9.7 million more expensive. AGL’s rebuttal to the JCT showed leasing as still \$34.2 million cheaper than purchase. The differences lie primarily in the impact of the tax aspects of the deal on Treasury revenues. The leasing advantage depends on the tax benefits to investors from the depreciation deductions. Without the depreciation deductions, the lease payments would have to be \$72.4 million higher in present-value terms to give the same return to investors. This would negate the leasing advantage.

In Figure 3, the authors summarize the key differences between the AGL and JCT positions in one page. We also include our own conclusions about the key differences. In our view, one page and four footnotes is all that is required to isolate the key issues. Whether or not leasing is cheaper than purchasing hinges on three subjective judgments about the impact of the Deal on Treasury revenues. In other words, the “polemic value” of long and complex reports largely disappears.

We believe our interpretation of these three judgments is sound when one is not trying to choose answers that support political conclusions. We conclude that leasing was substantially more cost-effective than purchase—\$64.4 million per ship. By our calculations, leasing would even be cost-effective at the prevailing rate in 2005—5%. We leave the readers to judge whether the “polemic” can be thus unraveled or not.



Figure 3. Comparing Purchase to Three Different Viewpoints on the Net Total Cost to the Government from Leasing (5% semiannual discounting=10.25% per year) (in millions)

	<u>AGL</u>	<u>JCT</u>	<u>SSS</u>
<u>Ship Cost if Purchased</u>	(182.4)	(178.2) ⁸	(182.4)
Tax revenue from interest on Treasury Bonds Issued to finance the purchase			2.5 ⁹
<u>Leasing</u>	<u>(182.4)</u>	<u>(178.2)</u>	<u>(179.9)</u>
Present value of 25 years of capital hire payments by the Navy	(135.1)	(135.1)	(135.1)
Residual value payments by the Navy at termination, net of tax	(1.7)	(1.7)	(1.7)
Lost tax revenue from the amortization deduction	(.7)	(.7)	(.7)
Tax payments by the lessor on capital hire payments received (46% tax rate)			
Return of capital component	22.0	22.0	22.0
Interest component ¹⁰	39.7	-	-
Lost tax revenue from depreciation deductions ¹¹	(72.4)	(72.4)	-
Total PV with Leasing	<u>(148.2)</u>	<u>(187.9)</u>	<u>(115.5)</u>
Leasing benefit versus purchase	34.2	(9.7)	64.4

⁸ The JCT report excludes from the purchase cost \$4.2 million in base-year legal costs paid to arrange the purchase contracts. AGL and the authors treat the \$182.4 purchase price as given.

⁹ The authors do not believe it is appropriate to assume that the purchase would be fully funded out of tax revenues (as AGL originally did) or fully funded by Treasury borrowing (as JCT did). We assume the purchase is financed by a mix of tax revenues and government borrowing that reflects the overall percentage of deficit financing in the federal budget that year (21% deficit financing via Treasury borrowing). We also assume the purchasers' of Treasury Bonds were, on average, in a 13.5% tax bracket because many investors pay no US tax at all (foreign investor and tax exempt organizations). Thus, the government will receive only 6.2% as much tax revenue as if the purchase price were all borrowed from investors who were in the normal 46% tax bracket $[.21 \times .135 / .46 = .062]$. The \$2.5 million offset to the purchase price is 6.2% of the multiyear present value of the full tax revenue from interest under the lease option (\$39.7 million).

¹⁰ AGL counts the present value of the tax payments by the lessor on the interest component of the capital hire payments as revenue to the government and, thus, as an offset to the Navy cost. The JCT report argued that the investors would receive taxable interest income and pay tax on it regardless of whether they invest in the TAKX leases or not. The item is, therefore, not incremental to the TAKX deal and should not be offset against the lease cost. AGL argued that investors would put their money in tax exempt investments if the TAKX leases were not available. Thus, the tax revenue is incremental to the TAKX deal. The authors believe the JCT is correct—investors would earn taxable interest, whether or not they invested in the TAKX leases. We thus do not count this offset as incremental to the TAKX leases.

¹¹ This item is the present value of the depreciation deductions available to the shipowners. AGL and the JCT argue that this item represents lost tax revenue to the government and, thus, is considered an additional cost of the TAKX leases. The authors believe, as AGL argued elsewhere in their report, that there is a finite pool of leveraged lease investments, based on the pool of investors sophisticated enough to understand such deals and act on them. The TAKX deal does not change the total pool; it only allocates a portion of it to the government because of the favorable risk/return profile (an 11.745% after-tax return on a "hell or high water" basis with the federal government). The leveraged-lease investors will gain these tax deductions, whether or not the TAKX leases exist. Thus, the lost tax revenue is not incremental to the TAKX Program and should not be considered an additional cost of the deal.

THE DESIRABILITY OF LEASING: A 2005 PERSPECTIVE

Lost in the political backlash against the TAKX leases was the significance of the fact that leasing can reduce the acquisition process from 5 to 7 years to about 2 years, and that use of commercial shipbuilding standards reduced the cost of each TAKX ship by \$35 million (\$182 million versus \$217 million). Actually, the thirteen MPS were built for an average cost of \$177.9 million. The prevailing wisdom in Washington was that conventional appropriations review is worth the cost and should not be circumvented by leases financed through operations and maintenance budgets. The authors believe there are conditions under which leasing should not be viewed so unfavorably.

When Support Equipment is Mission Critical and Funding Is Not Available:

Since the end of the cold war, the military has consistently experienced tight budget constraints. During any budget year, there are always programs that go unfunded. The question that should be asked is, "How critical is the requirement for national security?" If there is a requirement that is mission-critical, then perhaps capital leasing is a viable option. Capital leasing allows the Government to receive and use assets immediately and spread the cash outlays over the lease period rather than front-loading 100 percent of the cost. Thus, leasing can provide the Government with an extremely powerful tool to provide financing alternatives that normally would not be available.

When Leasing Provides Advantages over Procurement:

In the normal military procurement process, the requirements document spells out in great detail the operating characteristics and military specifications for any piece of military equipment. This step normally happens even before Congress approves or appropriates procurement funds. The military specifications found in the requirements document generally require higher standards than commercially built items, and almost always cost more due to their unique features and requirements. In the case of military assets which normally operate in harm's way, building to military specifications ensures survivability.

The mission objective for MPS vessels was to operate in a peaceful environment with only a remote possibility of going in harm's way. Thus, it was not deemed necessary to build the ships to military specifications. But, whether needed or not, appropriations policy would dictate military specifications as the standard. By building the ships to ABS, or commercial, standards, cost savings of \$35 million per ship were passed to the Government.

Leasing can also provide another advantage besides reduced cost. Since commercial shipyards built the ships, the Navy was not allowed to intervene in the construction process. Each shipyard was under a tight contract where delays and design changes were not allowed. In fact, severe penalties were imposed for late delivery of any ship. These factors motivated the shipbuilder to stay on schedule and ensured on-time delivery. The ships were in use within about 24 months.

In situations where commercial design can be adequate, construction under private ownership can avoid the delays and changes common in military-initiated construction. Such changes often place the project over-budget, which increases Congressional oversight. The ability to avoid all these problems through leasing (when the assets do not require special design to military specifications) may be extremely beneficial in terms of delivery and mission.



Leasing should be considered a viable option when the requirement can be filled with a “commercial off-the-shelf” (COTS) application such as computers, medical equipment, standard industrial components, or general-purpose supply equipment. Since the COTS application has already been designed and built, the lengthy procurement process does not add value.

When Timing is Critical:

It might also be advantageous to lease when a requirement is mission-essential and there is not sufficient time for the full procurement process. Shortly after 9-11, for example, there were a multitude of immediate security requirements. One viable option for fulfilling some of these requirements could have been capital leases. Arguably, this context would have applied to the refueling tankers which the Air Force wanted to lease from Boeing in 2002. By leasing, the Government could have fulfilled its requirements in a much shorter time and at greatly reduced up-front outlays.

The Cost Advantage:

If one accepts the authors’ conclusion that leasing can also be more cost effective than purchase, the reduced present value of outflows can also be an additional inducement for leasing when the conditions cited here do prevail.

THE CURRENT LEGISLATIVE CONTEXT

In 2005, leasing as a part of acquisition strategy is effectively prohibited by the three pieces of legislation passed in 1983, 1984 and 1985, which were discussed earlier. Re-opening the leasing option would require re-evaluating all three of these consciously constructed impediments.

Tax Deductibility of Depreciation Expense:

The Economic Recovery Act of 1981 allowed companies to realize accelerated depreciation tax benefits over a very short time period. Under this Act, the ACRS allowed the owners of the MPS vessels to depreciate their ships using accelerated rates over a five-year period, even though the lease terms were 25 years. The present value of this depreciation tax shelter to the owners was over \$72 million per ship, a major component of the economic return.

In 1984, the Deficit Reduction Act (P.L. 98-369) modified tax laws to disallow owners the use of ACRS for assets leased to tax-exempt entities, including the Government. The Legislation also reduced the impact of the tax benefits by lengthening the tax life for depreciation to a period equal to 125 percent of the lease term. While this Legislation was not retroactive, if the MPS vessels had been built after 1984, depreciation lives would have been 31.25 years.

This 1984 Act discouraged leasing by reducing the tax benefits. But, the bigger blow was disallowing all depreciation deductions for leases to the Government. If the military hopes to foster an environment where owners desire to lease to the military, Congress needs to re-institute the ability of lessors to take depreciation deductions—at least on a straight-line basis over the ACRS life of the assets.



NIF Encumbrance:

The Balanced Budget and Emergency Deficit Control Act of 1985 (P.L. 99-177) required all DoD agencies to request up-front budget authority for the estimated full present value of all capital lease payments and termination provisions. One of the benefits of leasing in the commercial world is the ability to spread payments over the useful life. If a private-sector user of equipment were required to pay 100 percent of the lease before the equipment is used, there would be no reason to lease. The same concept applies to the Government.

If the Government requires its agencies to obligate the sum of total payments for the first option period plus the termination value (which virtually equals the cost of the total lease) then it will never make financial sense to lease. In order to make leasing a viable option for the Government, special legislation needs to be passed that frames leasing as an annual obligation, which does not encumber the NIF beyond one year.

Prior Approval:

The *1984 Department of Defense Authorization Act* (P.L. 98-94) further restricted Government leasing by requiring all long-term leases with substantial termination values to be specifically authorized by law. It further required Congressional notification prior to issuing a solicitation for leasing. Finally, the Act required a present-value cost comparison be submitted to Congress after OMB and Treasury Department review and evaluation. Given the known aversion to leasing in OMB and Treasury, this law effectively eliminates serious consideration of leasing.

In essence, these three laws make it nearly impossible for leasing to be an effective alternative to purchasing. This forces DoD agencies to use the full procurement process for all asset acquisition.

CONCLUSION

With a different legislative context and regulatory climate, leasing could be made potentially viable again. Whether such action is desirable depends on one's view of the current environment that effectively precludes leasing. This paper was intended to review the Navy's experience with the TAKX Program to frame a discussion of the prospective efficacy of such programs in 2005.



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Panel—Performance Measurement

Thursday, May 19, 2005	Working with Contractors
10:45 a.m. – 12:15 p.m.	<p>Chair: Jeffrey Parsons, Army Materiel Command</p> <p>Papers:</p> <p><i>“Commodity Sourcing Strategies: Supply Management in Action”</i> Rene Rendon, Naval Postgraduate School</p> <p><i>“Best Practice in Technology Acquisition: Early Licensing of Technology before or during Prove-out Phase”</i> Kenyon Potter, University of California Office of the President</p> <p><i>“Contractor Past Performance Information (PPI) In Source Selection: A comparison Study of Public and Private Sector”</i> Commander Roger Lord, US Navy, Naval Postgraduate School</p>

Chair: Jeffrey Parsons—is the Director of Contracting, Office of Command Contracting, Headquarters, US Army Materiel Command, Fort Belvoir, Virginia. He is the principal advisor to the Commanding General and members of his staff on all contracting matters. Mr. Parsons works with the Deputy Assistant Secretary of the Army (Policy and Procurement) and the US Army Materiel Command Principal Assistants Responsible for Contracting to efficiently and effectively accomplish the AMC Contracting mission. He is the AMC Career Program Manager for the Contracting and Acquisition Career Program, and as such, is responsible for the recruitment, training, education, and professional development of the contracting professionals who are part of the acquisition workforce. Mr. Parsons was appointed to the Senior Executive Service on December 15, 2003.

Prior to his current appointment, Mr. Parsons was the Director of Contracting, Headquarters, US Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio, where he retired from active duty as an Air Force Colonel after 26 years of service. He was responsible for developing and implementing contracting policies and processes to annually acquire \$34 billion in research and development, production, test, and logistics support for Air Force weapon systems. He was directly responsible for the training, organizing, and equipping of more than 3,000 contracting professionals.

Mr. Parsons' contracting career began in 1977 as a base procurement officer supporting the 90th Strategic Missile Wing at F. E. Warren Air Force Base, Wyoming. He held a variety of positions as a contracting officer with a wide range of experience touching on all aspects of systems, logistics, and operational contracting. He was the Director of Contracting for a multi-billion dollar classified satellite program operated by the National Reconnaissance Office and served twice as a plant commander in the Defense Contract Management Agency. Mr. Parsons also held several key staff positions at Headquarters, US Air Force, the Air Force Secretariat, and with the Office of the Secretary of Defense, in which he was responsible for the development, implementation, and management of integrated, coordinated, and uniform policies and programs to govern DoD procurement world-wide.

Mr. Parsons received his Bachelor's Degree in Psychology from St. Joseph's University, Philadelphia, Pennsylvania, and holds two Master's degrees—one in Administration with a concentration in Procurement and Contracting from George Washington University, Washington, DC, and the other in National Resource Strategy from the National Defense University. He is a graduate of the Industrial College of the Armed Forces and the Defense Systems Management College Executive Program



Management Course. Mr. Parsons holds the Acquisition Professional Development Program's highest certifications in contracting and program management. He also is a Certified Professional Contracts Manager, National Contract Management Association.



Commodity Sourcing Strategies: Supply Management in Action

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ABSTRACT: This research report discusses the transformation occurring in the procurement and purchasing function, specifically as it applies to developing procurement strategies and the implementation of commodity strategies as an application of strategic sourcing. The literature review presents the theoretical framework surrounding the transformation of purchasing to supply management along with its major developments such as integrated supplier relationships, total ownership costs, cross-functional teams, supply chains, e-procurement systems, and strategic sourcing strategies. Strategic sourcing and developing sourcing strategies are discussed and include the Kraljic model for determining the best type of procurement strategy for specific products or services. Commodity sourcing strategies are discussed in conjunction with Lasseter's seven-step process for developing commodity sourcing strategies. The application of strategic sourcing in the commercial sector is discussed using examples from industry, along with applications within the Department of Defense. Some



challenges to strategic sourcing identified in the report include access to the required spend data, highly fragmented supply base, and government procurement goals. The report also identifies best practices such as establishing common processes and tools, using cross-functional teams, ensuring adequate team sponsorship and authority, and aggressively managing purchasing requirements. The report concludes that strategic sourcing initiatives have resulted in significant cost reductions, increases in productivity, quality improvement, and return on investment. The DoD's strategic sourcing initiatives have also resulted in significant savings, albeit with some obstacles and barriers yet to overcome.

KEY WORDS: Purchasing, Supply Management, Procurement, Sourcing, Commodity Strategies.

INTRODUCTION

Organizations are operating in an environment characterized by countless economic and political disruptions to their sources of supplies and services. In order to survive in this turbulent marketplace, these organizations must continually monitor their competitive position as well as their internally controllable processes—especially the procurement process. The Department of Defense is no exception. The DoD annually procures billions of dollars worth of systems, supplies, and services in support of the national military strategy. The Fiscal Year 2005 proposed budget included \$143.8 billion for RDT&E (research, development, test and evaluation) and procurement of defense-related supplies and services (Cahlink, 2004). Faced with the challenges of the Global War on Terrorism and the fiscal battles of budget cuts and resource constraints, the DoD must monitor its procurement process to ensure a continuous flow of critical supplies and services. The DoD procurement process will continue to increase in importance as it acquires mission-critical and complex supplies and services.

As part of its “Procurement Transformation initiative,” the DoD's procurement process is currently undergoing a transformation similar to the transformation being experienced by the commercial sector. This transformation is changing the way DoD manages its procurement function—to include its people, processes, practices, and policies. The DoD's procurement function is currently transforming from a transaction-oriented perspective to a strategic-oriented enterprise.

No longer viewed as a tactical, clerical, or administrative function, the procurement function is gaining enhanced status and importance as leading organizations, including the DoD, understand and realize procurement's importance in achieving organizational strategic objectives and procurement's impact on competitive advantage. Furthermore, organizations are including procurement objectives in the development of corporate strategy and have placed great emphasis on developing corporate procurement strategies.

This research report will discuss the transformation occurring in the procurement and purchasing function, specifically as it applies to developing procurement strategies and the implementation of commodity strategies as an application of strategic sourcing. First, the theoretical framework surrounding the transformation of procurement will be discussed, along with its major developments. Second, corporate procurement strategy and procurement strategy development methods will be discussed. Finally, the use of commodity strategies and commodity teams as methods for implementing focused procurement strategies will also be discussed; this discussion will then identify lessons learned, best practices implemented, and recommendations for the Department of Defense.



FROM PURCHASING TO SUPPLY MANAGEMENT

The transformation of the purchasing and procurement function from a passive, administrative, and reactive process to a proactive, strategic, boundary-spanning function was predicted back in the early sixties' purchasing literature when Henderson stated that the procurement function would gain increased importance in corporate management (1975, p. 44). As we begin the fifth year into this new millennium, the purchasing and procurement transformation continues to build up steam and reap benefits for leading-edge organizations. The procurement transformation reflects a new approach to purchasing and procurement that embraces the other supply chain management functions of materials management, logistics, and physical distribution—this new approach has been labeled "supply management" by many organizations and industries (Bhote, 1989). In fact, the premiere professional association for the purchasing profession officially changed its name from the National Association of Purchasing Management (NAPM) to the Institute for Supply Management (ISM) in 2002 to reflect the changing nature of the profession. Additionally, many of the leading purchasing textbooks have changed their focus, and of course their titles, to reflect the broader focus of supply management (Burt, Dobler, & Starling, 2003).

This supply management focus requires organizations to adopt a strategic orientation to their procurement function and to look more at the total supply chain management process and its effect on the organization's competitive strategy. More specifically, the supply management focus involves linking the organization's procurement, or sourcing, strategy with its corporate competitive strategy. This requires supply managers to become active participants in developing their organization's strategic business plan, which now includes the integration of supply, marketing, finance, and conversion strategies (Burt et al., 2003).

Supply management has been described as a new management concept that integrates the company's purchasing, engineering, and quality assurance functions with the supplier, working together as one team early in the procurement process to further mutual goals (Bhote, 1989). Of course, the supply function has always existed in all organizations ensuring that all needs are met in terms of quality, quantity, delivery, cost, service, and continuity. However, the traditional view of supply focused more on the function's operational or "trouble avoidance" contribution to organizational objectives. The new concept described focuses on supply management's strategic contributions to organizational objectives, such as the opportunistic or profit-maximizing aspects. In addition, this concept of strategic supply management differs from the traditional approach in the fact that the organization becomes integrated with selected suppliers, working as one team toward mutual goals. This concept also differs significantly from the traditional adversarial approach to supply management in which suppliers were kept at an arms-length distance from the organization. Traditionally, purchasing managers' performance was measured based on their ability to reduce the purchased price of supplies and services, their ability to keep the production line running, and their ability to reduce the cost of the purchasing department. With the new supply management focus, organizations are looking to the supply management function to focus on value-adding outputs such as quality, total ownership cost, time to market, technology, and continuity of supply. Other major developments in the transformation of purchasing to supply management include the breaking down of functional walls with the use of cross-functional teams, the development and management of supply chains and supply alliances, the use of electronic procurement systems, and the adoption of strategic sourcing approaches (Burt et al., 2003). The next section of this research will focus on strategic sourcing as implemented by supply management and the integration of procurement strategy with corporate strategy.



STRATEGIC SOURCING

Strategic sourcing is probably the most significant aspect characterizing an organization's transformation to supply management. It is also this aspect of supply management which provides some of the most value-added benefits to the organization. Sourcing, one of the major steps in the procurement process involves the identification and selection of the supplier whose costs, qualities, technologies, timeliness, dependability, and service best meet the organization's needs (Burt et al., 2003).

Strategic sourcing involves taking a strategic approach to the selection of suppliers—an approach that is more aligned with the organization's competitive strategy. Strategic sourcing reflects the integration of procurement or sourcing strategy with corporate strategy. The integration of procurement and corporate strategy is reflective of the transformation of purchasing to supply management. The next section of this research report will review the literature on strategic sourcing.

Initially, the concept of integrating procurement with corporate strategy formulation was neglected within procurement research circles. It was not until the early 1980s that the subject began to receive increased attention. In his article "Corporate Long-Range Planning Must Include Procurement," Adamson summarizes various ideas on how to integrate procurement with corporate strategy formulation (1980). These ideas include Rasmussen's linear programming theory, Loughridge's dynamic programming techniques, Wheelwright's rate priority values, Ramsey's objectives flowdown system, and Kiser and Rimmer's product lifecycle approach. Adamson recommends the development of a contingency approach for choosing procurement strategies and integrating procurement with corporate strategy (Adamson, 1980).

Speckman expands on Adamson's discussion by presenting a general model illustrating the integration of procurement-related information with the corporate planning process (1988). His premise is that the procurement manager must identify strategic contingencies and incorporate these factors into the sourcing process before a competitive strategy can be responsive to the procurement function. Thus, the procurement manager must develop a strategic orientation to the procurement process and identify the internal and external factors that can affect the firm's ability to gain a competitive edge in the marketplace. Internal factors are those factors within the buying organization that affect the choice of sourcing strategy; these include the strategic importance of procurement in terms of value-added by product line, quality, the need for material control, and cost containment objectives. External factors are those outside the buying organization that will affect the sourcing strategy—such as complexity of the supply market, the amount of vertical integration within the industry, scarcity of supply, and the technology involved (Raedels, 2000).

Adamson's recommended approach for determining procurement strategies emphasizes the incorporation of these factors into the strategy formulation process (1980). The fact that procurement strategies should be tailored to the specific situation was stressed by Corey in his text on procurement management. Corey stated that procurement strategies vary from one purchasing situation to another because of each situation's uniqueness. Every strategy should be tailored to the type of product being purchased, the stage of the procurement cycle, the past purchasing history, the nature of the supply environment, and the buying company itself (Corey, 1978). The next section of this research report will focus on the development of strategic sourcing strategies.

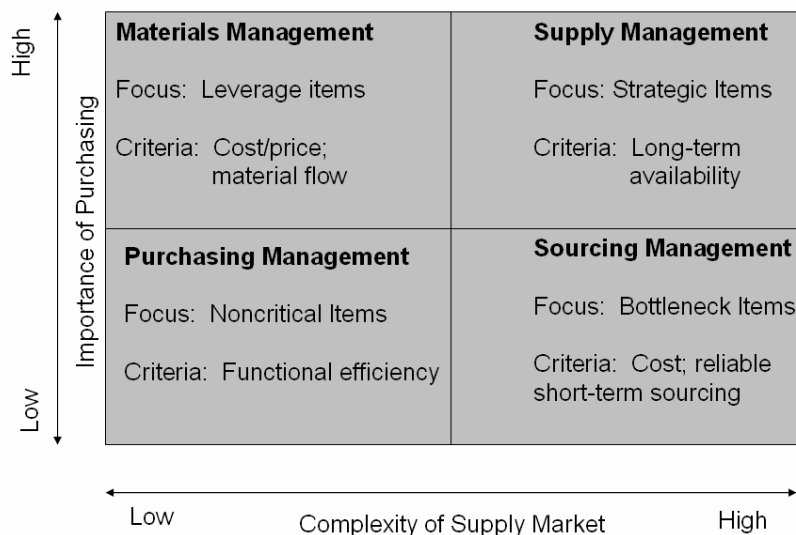


DEVELOPING SOURCING STRATEGIES

Focusing on the specific internal factor of strategic importance of purchasing and the external factor of complexity of the supply market, Kraljic developed a practical and applications-oriented model for developing procurement strategies for individual items and materials (1983). Kraljic's approach provides a systematic framework for incorporating environmental and other strategic factors into corporate procurement strategy formulation for purchased products and material. The use of the Kraljic approach results in a contingency-based model for formulating the appropriate procurement strategy for specific products. The Kraljic model is based on the foundation that a company's supply focus for purchasing specific products/services is dependent on two factors: (1) the strategic importance of the product line for the company, and (2) the complexity of the market for the product. The criteria for determining purchasing importance include value added by the product line, percentage of product in total costs, and the product's impact on the company's profitability. Supply market complexity can be determined by supply scarcity, current advances in technology, availability of substitute products, logistics requirements, and ease of market entry for suppliers.

The use of the model requires the classification of the company's purchased product groups in terms of the two criteria mentioned above: importance of purchasing and supply market complexity. Kraljic's classifications for purchased product groups in reference to the two criteria are illustrated in Figure 1.

Figure 1. Kraljic Purchasing Model



(Adapted from Kraljic, *Purchasing Must Become Supply Management*, Harvard Business Review, Sep/Oct 1983)

Products that are rated as high purchasing importance/high supply market complexity are classified as Strategic items; products rated as high purchasing importance/low supply market complexity are classified as Leverage items; products rated as low purchasing importance/high supply market complexity are classified as Bottleneck items; and products rated as low purchase importance/low supply market complexity are classified as Noncritical items. The major premise of the classification process focuses on the implication that each of

the four categories of product groups requires a distinctive procurement strategy, depending on the product group's strategic importance.

Strategic items require extensive market and vendor analysis, accurate product forecasting, and the establishment of long-term supplier partnerships. The procurement strategy for these items may also include a supplier certification process for controlling supplier's performance and monitoring continuous improvements.

Bottleneck items require a strategy focused on insurance of product delivery, contract management to monitor vendor production, and adequate product inventory.

Procurement strategies for Leverage items should take advantage of the buying company's purchasing power to negotiate desirable contract terms and conditions with suppliers. This strategy involves spreading the purchase quantities over a variety of qualified suppliers, staying in touch with new suppliers in the market, pressing for price reductions and greater discounts during negotiations, and insisting on low or zero inventories. The strategy should also include spot purchases from a variety of qualified suppliers for ensuring an adequate supply of products.

Non-critical items will require procurement strategies based on inventory optimization models, product standardization programs, and efficient purchase order processing.

Thus, the use of the Kraljic approach provides a practical tool for determining the type of procurement strategy for specific products/services. It should be noted that changes in market conditions, such as new suppliers entering the market, the availability of new products or substitute products, and changes in the company's market focus will change the classification, and the resulting procurement strategy, of products. Therefore, the use of the Kraljic model demands continuous monitoring and updating to continue its effectiveness.

As can be seen from Kraljic's model for developing sourcing strategies, certain supplies or services, based on importance of purchasing and criticality of the marketplace, require a specific sourcing strategy to ensure the organization's procurement strategy is integrated with its competitive strategy. An example from Kraljic's model is the procurement strategy for Leveraged items (high importance of purchasing/low complexity of supply market). The Leveraged items require a sourcing strategy based on leveraging the buying organization's procurement power to negotiate desirable contract terms and conditions, as well as to consolidate requirements and reduce the supplier base for that specific commodity or category of supplies/services. The implementation of this type of sourcing strategy can be seen in the use of commodity strategies and commodity teams, which will be discussed in the next section of this research report.

COMMODITY STRATEGIES

The commodity sourcing strategy focuses on developing a specific sourcing strategy for a category or group of supplies or services. This is just one application of strategic sourcing: the development and application of a carefully crafted strategy for the procurement of quality supplies and services at the lowest cost (Gabbard, 2004). It should be noted that the term "commodity" should not be associated with traditional commodities such as copper, ore, cotton, or barley, nor should it be associated with non-complex supplies or services. The term "commodity" is used solely to refer to categories or groups of supplies or services. The success of commodity strategies is based on maximizing the cost-reduction advantages of leveraging

combined buying power for volume discounts, utilizing market experts to formulate a sourcing strategy, and finally, forming strong relationships with preferred suppliers (Reed, Bowman, & Knipper, 2005).

Commodity sourcing strategies require a distinct strategy planning process developed for that specific group of supplies or services. Lasseter's Balanced Sourcing Model reflects a generic commodity strategy planning process involving the following seven activities: (1) Spend analysis, (2) Industry analysis, (3) Cost/performance analysis, (4) Supplier role analysis, (5) Business process reintegration, (6) Savings quantification, and (7) Implementation (Lasseter, 1998). The remainder of this section will briefly highlight each of these seven activities.

Spend Analysis

The spend analysis is the first step toward integrating an organization's sourcing strategy with its competitive strategy. It is this critical step that forces an organization to analyze all the goods and services that are purchased and are forecasted to be purchased in the future by the organization (Carter, 2000, pp. 85-86). This involves aggregating total purchases across all organizational divisions both for supplies and services and by supplier. Additionally, the spend analysis should also reflect the total cost of ownership, not just the purchase price of the supply or service, as well as the various end-users throughout the organization (Lasseter, 1998). The output of the spend analysis is a complete, documented understanding of the organization's past and future purchases for supplies and services, segregated by users and suppliers.

Industry Analysis

The second step of the commodity strategy process is an examination of the supply industry to determine the major suppliers of the specific supply or service by market share and geographical region (Lasseter, 1998). The industry analysis should also consider the various competition dynamics using Porter's Five Forces of Competition—customer power, supplier power, inter-company competition, threat of substitution, and new market entrants (Porter, 1998). The result of the industry analysis should reflect a diagram of the supply industry for that specific supply or service, highlighting the flow of product from key suppliers to major customers, as well as the different roles each company plays, such as assembler, manufacturer, or distributor (Lasseter, 1998).

Cost/Performance Analysis

Identifying and documenting cost and performance drivers is the third step in the commodity strategy process. The buying organization must have a thorough understanding of the cost drivers and other important performance metrics such as quality, level of technology, flexibility, and timeliness. A suggested approach for implementing this step is to map the manufacturing process and document the technology options at each stage to get further insight into the cost and performance drivers for the specific supply or service (Lasseter, 1998).

Supplier Role Analysis

This phase of the commodity strategy process entails segmenting the supplies or services across a set of differentiated supplier roles. The purpose of this phase is for the buying organization to determine the type of suppliers needed and the roles the suppliers should play in terms of supply management. This may involve thinking in terms of sub-commodities or end-



users, or by stages of the product lifecycle. Whichever method is used, the important point is to segment the spending by suppliers to reflect the cost drivers identified in the previous phase. The different cost drivers, sub-commodities or lifecycle may indicate the need for a separate sourcing strategy for each sub-commodity or lifecycle segment (Lasseter, 1998).

Business Process Reintegration

When the supply/service cost drivers and performance metrics are identified, and the supplier types and roles have been determined, the next step is to confirm whether the buying organization's business processes are properly aligned, prioritized, and integrated. The focus here is to use the analysis of cost drivers and supplier roles to realign business-process priorities to reflect the desired degree of integration with selected suppliers. The result of this phase is a determination of which business processes should be realigned to achieve better integration with suppliers, thus committing to a cooperative relationship and creating a competitive advantage (Lasseter, 1998).

Savings Quantification

This critical phase of the commodity strategy planning process ensures that the resulting commodity strategy results in measurable savings, and uses those saving targets as a metric for not only measuring the process of the strategy, but also for "selling" the resulting commodity strategy to senior organizational management.

Implementation

The final step in developing the commodity strategy is to implement the plan. This entails translating the planned strategy into a set of tasks that will result in the targeted savings. The tasks should reflect activities, resources, and milestones for achieving the savings targets. Various project management tools such as work breakdown structures (WBS), Gantt charts, network diagrams, and critical paths are useful tools for implementing the plan and monitoring its progress.

Once the commodity strategy plan is in place, the organization must continually monitor its progress to ensure the strategy remains effective and responsive to the changes in the internal and external environment. This continual monitoring should include identifying supplies or services that are (or will be) strategic in the future and identifying changes in the supply environment threats and opportunities. In addition, the organization must also continually monitor critical and current technologies that must be pursued, as well as take action to minimize the possibility of supply disruptions and price increases (Burt et al., 2003).

Lasseter's commodity strategy planning process provides an effective template for developing a commodity sourcing strategy for a specific group of supplies or services. The next section of this research report will discuss the application of strategic sourcing and commodity strategies in the commercial industry.

COMMERCIAL APPLICATIONS

The development and implementation of commodity strategies as part of strategic sourcing has been considered a future trend and purchasing best practice of leading organizations. A 1998 research study conducted by the Center for Advanced Purchasing Studies (CAPS) identified strategic sourcing as one of eighteen trends that will influence the



purchasing function within the next ten years (CAPS, 1998). Specifically concerning strategic sourcing, the CAPS study indicated that:

Strategic sourcing will drive supply-chain management initiatives. Comments from the focus group participants indicate that there are two related but distinct trends occurring. First, supplier assessment metrics will become more detailed and precise as purchasing spends more and more time examining finer and finer levels of detail in performance. Second, the metrics will become more individualized as companies specialize the metrics for individual supplier performance. Companies will create supply strategies to achieve cost and technology advantages. These two trends will increase the level of complexity involved in managing supplier evaluation and assessment systems. Over the next 10 years, there will be an intellectual fight over designing metrics that are very specific for particular chains. However, the metrics cannot be so complex that they are difficult to manage on a corporate level. There is no strong trend occurring to reduce complexity and standardize as much as possible by applying one metric throughout a supply chain. (1998, p. 28)

Additionally, the CAPS research also identified purchasing strategy development—the linking of procurement strategy with corporate strategy—as another trend influencing the transformation of the purchasing function. The CAPS study indicated that:

It is likely that there will be increasing linkages between supply chain and business unit/companywide strategy as supply chain strategies become more focused and formalized, and as firms look for innovative sources of competitive advantage. As supply chain management becomes more advanced, cost, technology, quality, and time drivers throughout the supply chain will become better identified. Performance of the supply chain will be measured more effectively, and executive performance will be linked to both internal and external supply chain performance. (1998, p. 30)

Furthermore, in a 2001 purchasing study, the researchers identified twenty purchasing best practices which have been successfully adopted by leading purchasing organizations. Two best practices include having a written sourcing strategy for every supplier and every part/commodity and implementing strategic planning and administration (Nelson, Moody, & Stegner, 2001). According to the research study, the commodity strategy best practice has been implemented by Honda, Toyota, EMC, and Sun Microsystems. These companies have dedicated commodity teams that watch market trends and develop reaction scenarios to take advantage of those market changes. Leading organizations that have implemented strategic planning and administration include Harley-Davidson, Honda, John Deere, and SmithKline Beecham. These organizations have increased the role purchasing plays in strategic planning by developing a strategy for each supplier and for each commodity. In these organizations, commodity team members are continuously gathering commodity information and technology capabilities three to five years into the future.

A review of the top purchasing organizations indicate that strategic sourcing and, specifically, commodity strategies are elements of a total purchasing transformation effort that has laid the groundwork for tremendous cost reductions, increases in productivity, quality improvement, and return on investment. Because of their great strides toward integrated supply management, IBM, Deere, Lucent Technologies, Cessna Aircraft, and Hewlett-Packard have all been awarded the Purchasing Magazine Medal of Professional Excellence. This coveted honor is awarded to organizations that epitomize the best in purchasing excellence and



professionalism (Morgan, 2004). The following discussion summarizes these companies' implementation of strategic sourcing and commodity strategies.

IBM

IBM significantly turned its purchasing operation upside down in the mid 1990s when it transformed from a tactical purchasing focus to a strategic focus—where procurement is now mission critical. IBM's implementation of strategic sourcing included centralizing its purchasing function and creating 17 commodity councils as a method for leveraging its corporate buying power. These commodity councils combined the requirements (such as drums, microprocessors, monitors, and electronic cards) of all of IBM's divisions and negotiated long-term contracts with suppliers, resulting in lower prices. These commodity councils also resulted in a major reduction in IBM's supplier base with related cost savings. In 1993, IBM had about 4,900 production suppliers, in 1999; about 85% of IBM's \$17.1 billion production buy was with only 50 suppliers. IBM's procurement transformation saved the company hundreds of millions of dollars during the mid-1990s and was instrumental in helping IBM return to profitability (Carbone, 1999; Reed et al., 2005).

Deere & Co.

Deere & Co., the world's famous equipment manufacturer, implemented strategic sourcing and commodity councils by developing procurement strategies for four materials classifications: unique products, critical products, generics, and commodities. The four categories represented 49 direct materials and 15 indirect materials. These best practices have allowed Deere to reduce the number of MRO suppliers from 1675 to 20, and cut costs by 13% (Smock, 2001).

Lucent Technologies

Lucent Technologies implemented strategic sourcing by developing and implementing sourcing strategies for about 70 different commodities ranging from metals to memory chips. By taking a commodity approach to sourcing, each commodity team identified the top suppliers, looking at each of their financials, global capacity, location, and technology advantage as well as their competitors'. Lucent was able to reduce its number of suppliers from over 3,000 in 2000, to fewer than 1500 in 2002. About 60 suppliers now account for over 80% of Lucent's spend. This is a drastic change from 1999 when more than 1,000 suppliers accounted for less than 40% of the spend. Furthermore, Lucent has experienced significant improvement on component prices, and in some commodities, Lucent has been able to reduce prices by 50% (Carbone, 2002).

Cessna Aircraft Co.

Cessna Aircraft Co. has also implemented strategic sourcing by creating long-range strategic plans and cross-functional commodity teams that have worked to rationalize the company's supplier base. These commodity teams are made up of representatives from supply chain, manufacturing engineering, quality engineering, product design, reliability engineering, product support and finance departments. These teams are responsible for developing commodity strategies that directly support the corporate strategic objectives. Based on its strategic sourcing efforts, Cessna has realized an 86% improvement in supply chain quality, 28% improvement in material availability, 113% improvement in production inventory turns, and a significant cost takeout throughout the supply chain (Avery, 2003).



Hewlett-Packard

Hewlett-Packard's (H-P) strategic sourcing initiatives have resulted in savings of \$1 billion in materials costs. Through its extensive spend-analysis program and its database of spend data, information can be sliced and diced by commodity, supplier, region, and by business unit. With all of the H-P buyers having access to this information through a secure website, they can have the advantage of negotiating better prices or better terms and conditions on all commodity procurements. Furthermore, H-P uses commodity teams—consisting of procurement engineers, product marketing, and research & development specialists—to focus on new-product introduction and on how new products and suppliers are performing. These commodity teams are responsible for sharing product plans with suppliers, determining which supplier has the technology and products that will be needed and then formulating sourcing strategies for these products. H-P's commodity teams have been instrumental in reducing its supply chain costs as a percentage of revenue by 22%, cutting inventory by 21%, and reducing H-P's logistics cost per box by 11% in 2004. Finally, H-P's strategic sourcing programs have resulted in more collaborative and less transactional relationships with suppliers (Carbone, 2004).

Each of these world-class purchasing organizations has successfully implemented strategic sourcing and commodity procurement strategies and has reaped the benefits of transforming its purchasing function to a strategic integrated supply-chain process. Based on these successes, many government agencies are now beginning to implement and adopt strategic purchasing best practices. The next section will discuss initiatives within the Department of Defense to implement strategic sourcing, and specifically, commodity strategies.

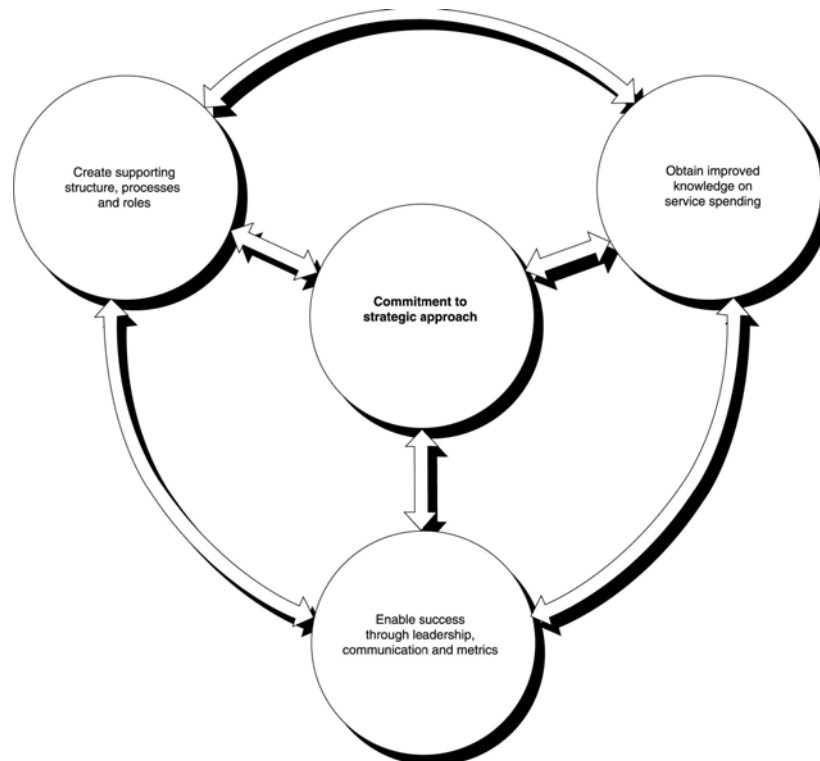
DEPARTMENT OF DEFENSE INITIATIVES

As discussed at the beginning of this research report, the DoD's procurement process is currently undergoing a transformation similar to the procurement transformation being experienced by the commercial sector. This transformation includes changes to DoD's procurement processes, policies and practices. The strategic sourcing initiatives, and specifically the commodity strategy processes, successfully implemented by the commercial sector are now being considered and implemented by the DoD.

Many of these transformation initiatives were previously recommended by the Government Accountability Office (GAO). Recent reports by the GAO have recommended the strategic approach to procurement taken by the leading companies could serve as a general framework to guide DoD's services contracting initiatives (GAO-02-230, 2002). In addition, the GAO also recommended that the DoD adopt the spend analysis best practices successfully implemented by the commercial sector, and use the resulting information as one of the key elements of implementing a strategic approach to procurement (GAO 03-661, 2003). The GAO also identified key elements of the strategic sourcing approach taken by leading companies, which are illustrated in Figure 2 (GAO-02-230, 2002). Finally, the GAO recommended that the DoD establish a management structure that adequately promotes a strategic orientation across the departments by setting performance goals, including savings goals, and ensuring accountability for achieving them (GAO-03-935, 2003).



Figure 2. Key Elements of Strategic Approach Taken by Leading Companies



Source: GAO Report GAO-02-230 (2002, January).

The DoD has taken action to implement the GAO's recommendations of taking a strategic approach to its procurement function. In February 2003, Michael W. Wynne, Principal Deputy Under Secretary for Acquisition, Technology, and Logistics (USD/AT&L), stated:

I am challenging DoD's acquisition community...to take advantage of this opportunity to initiate dramatic improvements to the procurement process...I request you establish a concurrent effort in your respective organizations and interact with our task force as we generate value-added changes to the rules and our processes. (DoD Procurement Conference, May 27, 2004, p. 36)

Additionally, at the biennial Department of Defense Procurement Conference held in May 2004, Deidre Lee, Director of Defense Procurement and Acquisition Policy, identified DoD-wide strategic sourcing and commodity councils as procurement processes that are designed so more could be done with less by migrating large contracts to regional centers and consolidating like services (Defense AT&L, Sept-Oct 2004). Thus, the DoD is poised to begin reaping the benefits of transforming its procurement process to reflect an integrated strategic supply management perspective.

DoD's current initiatives are focused on the strategic sourcing of services, and specifically, on the establishment of service commodity teams. Through its DoD-wide Services Sourcing Program (DWSS), the department is trying to achieve the following objectives:

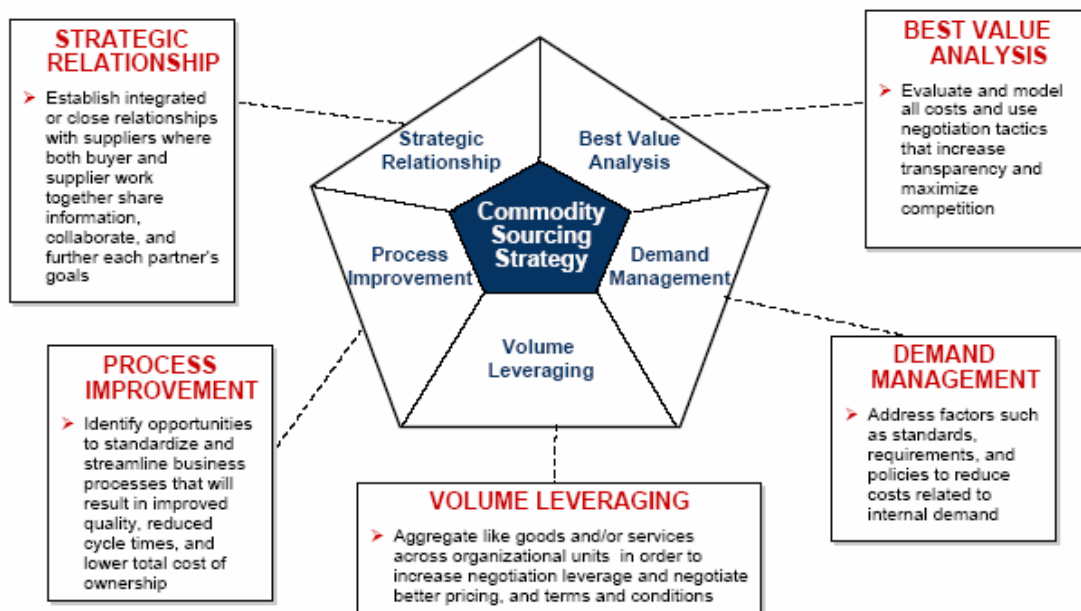
- Develop department-wide cross-functional acquisition strategies in order to improve Total Cost of Ownership for acquired services

- Address improvements in meeting socio-economic goals through the use of strategic sourcing
- Leverage commercial best practices in order to streamline and standardize DoD acquisition business processes
- Improve overall skills of DoD acquisition staff through the utilization of commercial tools and processes

(DoD Procurement Conference, May 27, 2004, p. 6)

Although the heart of DoD's strategic sourcing initiatives are based on commodity sourcing strategies, the other elements supporting strategic sourcing include Strategic Relationships, Process Improvement, Volume Leveraging, Demand Management, and Best Value Analysis, as depicted in Figure 3.

Figure 3. Strategic Sourcing



**Source: Censeo Consulting Group. (2004, May 27).
Strategic Sourcing and Spend Analysis Briefing.**

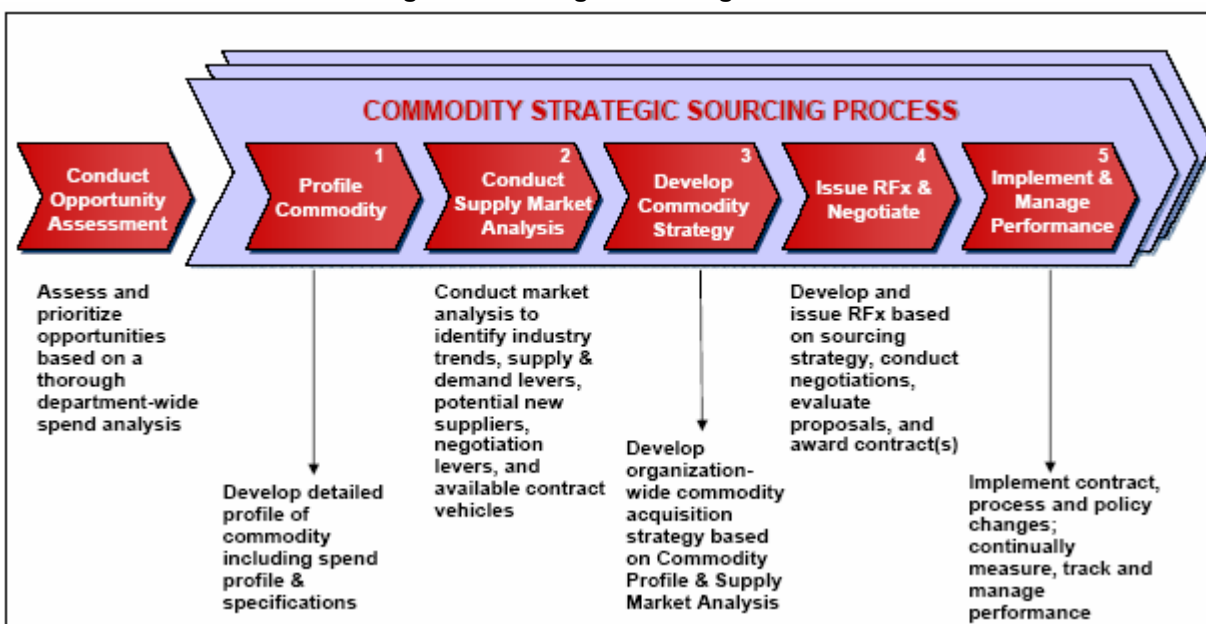
As of May 2004, the DWSS had established the following pilot programs with the services. These programs will initially review the commodity areas of Miscellaneous Professional Services, Management /Advisory Services, and IT services. The following discussion highlights some of the DoD's components' more notable efforts in implementing strategic sourcing and commodity strategies.

Department of the Navy

As part of the DWSS program, the Navy has launched a commodity team for the purchase of administrative support services, which is comprised of support functions such as translation, courier services, and word processing. Using the five-step strategic sourcing process illustrated in Figure 4, the Navy is currently conducting its spend analysis for its

service's spending in order to assess and prioritize opportunities for commodity sourcing strategy.

Figure 4. Strategic Sourcing Process



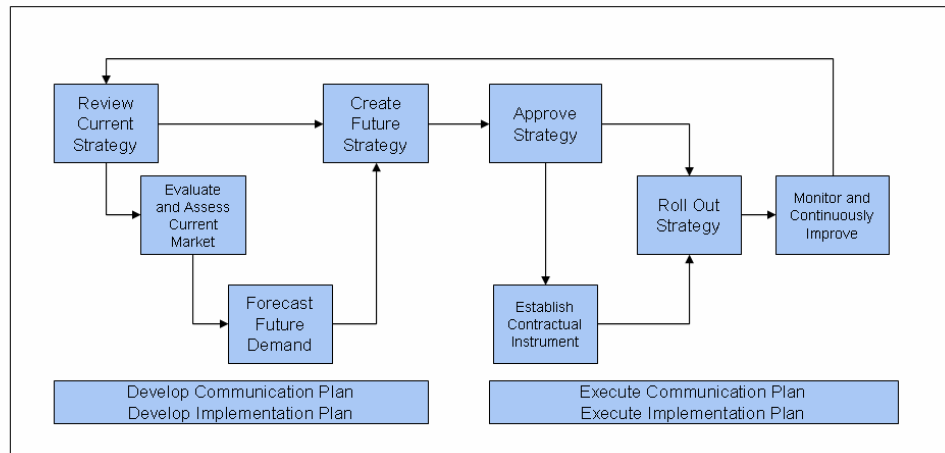
Source: Censeo Consulting Group. (2004, May 27).
Strategic Sourcing and Spend Analysis Briefing.

Department of the Air Force

The Air Force kicked-off its strategic sourcing initiatives in FY 03 with its first commodity council—the Information Technology Commodity Council (ITCC). The Air Force's commodity council process, as illustrated in Figure 5, included an extensive spend analysis which identified the top three configurations for computers—one for desktops and two for laptops. Taking advantage of these configurations throughout the Air Force major commands (MAJCOMS), the Air Force was able to leverage its buy on these standardized computer products. In August 2003, after conducting an initial competition, the Air Force awarded a \$7.5 million contract to Dell for the purchase of 12,500 computers. The savings on this procurement allowed the purchase of an additional 2,500 computers from the original planned procurement (Temin, 2004). In December 2003, the Air Force completed another commodity buy saving over \$4 million, with the purchase of 14,863 desktops and 763 laptops for three different major commands (AFMC Command News Service, 2003, December 9).

Figure 5. Commodity Council Process

AF Commodity Council Operations Process



Source: Informational Guidance, AFFARS 5307.104-93

Based on these recent successes, the IT Commodity Council is developing a commodity strategy for digital printing and imaging products such as printers, scanners, and faxes. Other Air Force commodity councils in development include Air Force Medical Services (professional services, clinical support services, facilities, and maintenance support and contingency services), Force Protection (gate security and vehicle inspection), and Office Supplies. The Air Force is also developing commodity sourcing strategies for aircraft landing gear/tires/breaks, accessories, and support equipment (DoD Procurement Conference, 2004, pp. 46-48).

Defense Logistics Agency

The Defense Logistics Agency (DLA) has also implemented some of these procurement transformation initiatives, specifically strategic sourcing and strategic alliances. Through DLA's Strategic Material Sourcing (SMS) program, a spend and demand analysis was conducted on over 3.4 million hardware items. Currently, 224,000 items are being sourced through long-term contractual arrangements, leveraging DoD's buying power. DoD's objectives in the Strategic Supplier Alliances (SSA) program is to move away from transactional, one-time buys and to establish more long-term contractual arrangements. Through SSAs, DLA has been successful in achieving overall price reductions of 20% for the items under long-term contracts, with initial efficiencies aggregating \$55 million savings from FY 1999 to FY 2003 from one-time inventory reductions (Gottlieb, 2004).

CHALLENGES TO STRATEGIC SOURCING

DoD's procurement transformation initiatives are not without challenges to implementation. Not only do the same barriers that affect the commercial sector also impact

DoD's transformation initiatives, but also some unique Government obstacles affect the transition. These include multiple sources of data, inconsistent or erroneous item identification and supplier identification, and lack of qualified resources (Gabbard, 2004).

A significant obstacle to implementing strategic sourcing activities, specifically commodity councils, is accessibility of the required spend data for a commodity group of supplies or services in order to conduct a valid spend analysis. The DoD currently has limited insight into what it buys and from whom it buys (at the enterprise level), thus resulting in many obstacles. In addition, each military service and agency procures similar supplies and services across the DoD, with little coordination between procurement offices. Furthermore, current existing procurement data resides in numerous disparate applications located throughout the DoD (DoD Procurement Conference, 2004, p. 55).

One obstacle to conducting a spend analysis includes the highly fragmented supply base supporting the DoD, along with the numerous contracting offices throughout the DoD awarding contracts. The DoD has Air Force, Army, and Navy contracting offices scattered all across the globe, each office conducting its own procurement for services and supplies. Having access to the detailed types of information needed to assess its spend data is one area in which the DoD is facing challenges. Another obstacle includes the numerous problems associated with the DoD Form 350—Individual Contracting Action Report. This report, submitted every time a contract is awarded which obligates funds, is used to collect data on contract placement statistics within DoD. The data gathered by means of the DoD 350 are used for reporting the size and distribution of DoD procurement actions, as well as other procurement statistics. The DoD 350 Form has frequently been plagued with coding or data entry errors, insufficient details or incomplete data. These data errors and deficiencies have always existed, but now they are impacting the DoD's ability to access current and accurate procurement data, which is critical for conducting an effective spend analysis. The DoD is responding to the challenge of accessing valid spend data with its Acquisition Spend Analysis Pilot program. This pilot program will develop a net-centric spend analysis capability that can be scalable across the DoD, prove the possibility to reduce the complexity of data integration across the DoD, and demonstrate key net-centric attributes by pulling data from disparate data sources, mapping and transforming the data to a common model, and producing DoD enterprise spend reports. The pilot program will produce the following seven spend analysis reports—total spend, total number of contracts, average dollars per contract, geographical dispersion, supplier concentration, supplier diversity, and total dollars by supplier. The pilot will also produce an ad hoc capability that can be leveraged in strategic sourcing activities (DoD Procurement Conference, 2004).

The fact that DoD's procurement processes are governed by public law and are focused on achieving public goals and objectives results in another category of challenges and obstacles in implementing strategic sourcing and commodity strategies. As stated in the Federal Acquisition Regulation (FAR), the vision of the Federal Acquisition System is to deliver on a timely basis the best value product or service to the customer, while maintaining the public's trust and fulfilling public policy objectives (FAR, 2000). Federal procurement contracts are used as vehicles for implementing social programs that promote dispersion of wealth by providing economic opportunities for small business and disadvantaged business as well as other classes of protected groups (Thai, 2001). Some of these public policy objectives include maximizing competition and providing maximum opportunities for small and disadvantaged businesses. The implementation of strategic sourcing and commodity councils has the potential to restrict competition and limit opportunities for small businesses. Thus, there are multiple stakeholders involved in, and who have an influence on, the DoD procurement process. These multiple stakeholders may eliminate the possibility of an optimized procurement solution—such as a



strategic sourcing strategy that leverages the buying power of the DoD, but may limit or exclude small businesses from the procurement.

Finally, an additional challenge to implementing strategic sourcing is the DoD's ability to evaluate and analyze the return on investment (ROI) of strategic sourcing initiatives. Obviously, the instant savings realized from large-quantity leveraged buys of specific commodities, such as IT products, provide an initial assessment of dollars saved per procurement. However, the long-term implications to lifecycle cost (LCC), also known as Total Cost of Ownership (TCO), have yet to be determined or quantified. The ripple-effect resulting from standardizing the configuration of procured supplies (for example, computer desktops) and procuring in high volume for an increased number of customers, as it relates to system supportability and maintainability, have yet to be balanced with the additional costs of implementing strategic sourcing, such as training and infrastructure costs.

BEST PRACTICES IN STRATEGIC SOURCING

Strategic sourcing, and specifically commodity sourcing strategies, has been successfully implemented by commercial companies as well as by DoD agencies. The best practices and key elements that have proven to be critical success factors in strategic sourcing initiatives are common throughout both sectors. These best practices and critical success factors include the following:

Common Processes and Tools. Since commodity strategies focus on leveraging the purchasing power of the entire organization, with all its various geographically separated sub-units, one best practice involves the development and implementation of common purchasing processes and purchasing tools. The establishment of a standard commodity-strategy process and the implementation of spend-analysis tools to determine the what, who, where, and when of organizational spending is certainly a critical success factor in strategic sourcing (Buckenmayer & Noland, 1998; Reed et al., 2005).

Cross-Functional Teams. The use of cross-functional teams, more specifically: trained and educated purchasing teams, is also considered a critical success factor in implementing commodity strategies. These teams consist of the various functional representatives having a stake in the item or service being procured. These team members are educated and multi-skilled in all aspects of the commodity such as requirements analysis, cost analysis, purchasing and supply chain management, and negotiations. Critical to the establishment of cross-functional teams is the inclusion of end-user customers and technical experts in the decision-making process. Such inclusion would more likely effect successful customer participation and collaboration (Buckenmayer & Noland, 1998; Reed et al., 2005; DoD Procurement Conference, 2004).

Team Sponsorship and Authority. Especially critical to the success of commodity teams and commodity strategies is the sponsorship of the strategic sourcing initiative; likewise, the level of authority given to the sourcing team is vital. The commercial and defense sector's experience indicate that proper governance and strong sponsorship of commodity teams are essential elements to ensuring the success of the commodity strategy. The sponsor's role includes providing goals and resources, as well as being an advocate of the sourcing initiative and knocking down obstacles and barriers. Equally as critical is the authority given to the commodity team. By being held accountable for meeting the sourcing goals, and by being given the authority to make decisions, the team will keep from becoming a "committee reduced to



offering hopeful recommendations” (Buckenmayer & Noland, 1998, p.4; DoD Procurement Conference, 2004).

Requirements Management. Commodity strategies involve consolidating all of an organization’s requirements for a specific supply or service into one or a few standardized configuration requirements. This typically receives negative responses and push-back from end-user customers. This is one area where the team sponsor must take an active role. How an organization manages the specification of the supply or service being procured determines the degree of leverage power that organization has in the marketplace. Successful strategic sourcing will require stern specification management on the part of the commodity team, and full backing by the sponsor, with justice for “maverick spenders” (Buckenmayer & Noland, 1998; DoD Procurement Conference, 2004, p. 9).

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

This research report discussed the procurement transformation within the commercial and DoD sectors, specifically as it applies to developing procurement strategies and the implementation of commodity strategies as an application of strategic sourcing. The theoretical framework surrounding the transformation of procurement was discussed, along with its major developments. Corporate procurement strategy and procurement strategy development methods were then discussed, along with the use of commodity strategies and commodity teams as methods for implementing focused procurement strategies. Commodity sourcing strategy lessons learned, best practices implemented, and recommendations for the Department of Defense were also identified. The implementation of strategic sourcing initiatives within the commercial sector has resulted in significant cost reductions, increases in productivity, quality improvement, and return on investment. The DoD’s strategic sourcing initiatives have also resulted in significant savings, albeit with some obstacles and barriers yet to overcome.

Strategic sourcing in the DoD is still in its infancy and has a way to go before it becomes a mature core competency. As DoD continues to adopt strategic sourcing more adeptly, each military service will successfully be implementing commodity strategies for services and supplies for its specific military department. This will include conducting spend analysis and commodity management within the specific military service’s organizations.

The next step in realizing the full potential of the DoD’s buying power is the implementation of joint strategic sourcing initiatives, including the use of joint commodity councils across the DoD agencies. The DoD’s Services Sourcing Program (DWSS) initiative will be instrumental in developing DoD-wide cross-functional acquisition strategies, thus achieving improved Total Ownership Costs (TOC) for acquired supplies or services. As the DWSS initiative continues, additional research will be needed in the areas of conducting spend analysis for multiple DoD organizations, defining standardized configurations for supplies or services acceptable to DoD-wide customers, and finally, implementing strategic sourcing initiatives which leverage the buying power of the DoD. Furthermore, additional research exploring the implications of the DoD’s strategic sourcing and other procurement transformation initiatives on the Department’s management infrastructure (such as procurement workforce transformation, training and education of commodity teams, and the establishment of commodity team or sourcing program management offices) will be needed.



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Best Practice in Technology Acquisition: Early Licensing of Technology before or during Prove-out Phase

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ABSTRACT: Best Practices in procurement within the defense industry include various strategic practices to assure that supplies are adequate to meet demand and support military readiness. Existing practices in procurement may often be sufficient to assure an adequate supply, but they are not sufficient to assure an adequate supply of technology-based, mass-produced goods. An example of such a technology-based, mass-produced good is body armor. A proposed best practice in technology acquisition is early licensing of technologies underlying such goods. This paper explores the advantages of using early licensing to assure that supplies of technology-based goods are adequate to meet demand.

INTRODUCTION

Best Practices in procurement within the Defense industry include various strategic procedures to ensure supplies are adequate to meet demand. For example, in the context of commodities, such strategies historically included bulk purchasing and warehousing of supplies. In contrast, an example of a more recent strategic practice is supply-chain management; this method includes just-in-time production, which is often appropriate for procurement of complex systems such as aircraft and other vehicles. Yet, neither of these strategies is necessarily appropriate for new technologies that must be mass-produced. First, successful implementation of bulk purchasing and warehousing requires goods which have a long design-life and results in increased warehousing costs and the potential stockpiling of out-dated commodities. Second, just-in-time production depends on stable demand and does not address large fluctuation in demand—e.g., a steep ramp-up. Therefore, another strategy is necessary in order to deliver supplies of such goods adequate to meet demand with neither incurring excessive costs in warehousing nor excessive delays in delivery.

To facilitate such technology acquisition, the author proposes that the prove-out phase should be conducted under a licensing agreement that requires the supplier to license to the Department of Defense [DoD], or its suppliers, the right to manufacture the technology at a predetermined royalty rate on sales—from 3% to 10%—depending on the particular technology.



This paper explores the advantages of using early licensing. By using this approach, the DoD can shorten the technology acquisition process and can utilize multiple suppliers of a technology to ensure continuity in its supply chains in the event that one vendor cannot meet DoD requirements. A similar approach could be used for acquisitions of proven technologies as well.

BACKGROUND

In conjunction with the Department of Defense's strategic realignment of military forces, Rumsfeld (2004) is seeking to make combat troops "lighter, more readily deployable, and more self sufficient" (para. 4). To meet these strategic objectives, the DoD has realigned military acquisitions toward various communications technologies, including networking technologies. Yet, a recent report demonstrated that military planners relied extensively on networking technologies that were not sufficiently robust for reliable use by soldiers on the battlefield (Talbot, 2004). The technology did not meet the specific communication requirements of the field combat soldier; thus, prove-out of the technology failed. This paper will examine the effect of operational objectives on the field combat soldier whose vital importance is recognized in urban settings, especially in view of recent operations in Afghanistan and Iraq. The field combat soldier is expected to function as a "land warrior" and, at times, is also expected to be a "peacekeeper." The role of the field combat soldier is often a subject of debate in the defense community. Notwithstanding the debate, the field soldier must be equipped to meet operational objectives. First, the field soldier is expected to be lighter—which implies less-heavy equipment, but not necessarily less-protective gear—to increase mobility. Second, the field soldier is expected to be more readily deployable; this requirement also implies less-heavy equipment to reduce logistical and transportation effort. Third, the field soldier is expected to be more self-sufficient to decrease required support.

The role of acquisition should be proactive with respect to these strategic objectives in order to insure the field combat soldier is prepared to meet operational mission objectives. To meet such objectives, a field combat soldier requires certain equipment and training to increase survivability and operational effectiveness. A discussion of training is beyond the scope of this paper. Yet, in regard to equipment, a field combat soldier should have appropriate weapons, protective gear, and tools. The appropriateness of specific weapons, protective gear, and tools is often a subject of debate by members of the defense community. The appropriateness of a particular weapon, protective gear, or tool would ideally be determined by operational objectives rather than economics. However, assuming the appropriateness of a particular weapon, protective gear, or tool were determined by operational objectives, the availability of such weapons, protective gear, or tools is controlled by the economics of supply and demand. For example, the availability of one such protective gear (e.g., body armor) was limited by supply despite its appropriateness to operational objectives. In another example, availability of adequate supply of RF receivers used for battlefield communications was limited by the failure of networking technologies. This failure was due in part to placing undue reliance on networking technologies not yet proven effective in the battlefield conditions (Talbot, 2004). Yet, miniature RF receivers could be integrated into helmets—similar to pilots'—to reduce the reliance on networking technologies. In a further example, lightweight portable gates are commercially available that could be configured to make suitable roadway check points. However, availability of portable gates to establish conspicuous roadway check points was limited by operational objectives.

Prove-out of such technologies requires testing in the laboratory setting and in the field environment, e.g., actual combat. Since the field testing is generally superior to laboratory testing to prove-out a particular technology, acquisition and procurement officers typically order



a small quantity of product based on a technology in order to perform field tests to demonstrate its effectiveness on the battlefield. The DoD would place a larger order of the technology only after proof of a technology's robustness. This incremental approach to procurement is a practice called pilot testing. Such a practice may be successful in avoiding the risk of procuring a large quantity of goods that fail to meet requirements. However, after such testing, there remain other risks that are not addressed—including the lack of adequate supplies to meet demand (as demonstrated by the inadequate supply of body armor in Iraq) (Moss, 2005).

RESEARCH METHODOLOGY

This research project examined procurement of technology-based, mass-produced goods rather than complex systems. The research first examined the two traditional approaches to procurement of such goods: “make” vs. “buy” (PMI, 2004). Assuming that the defense sector would normally “buy” such goods from commercial sources rather than “make” such goods, the research examines the traditional approaches to acquisition of goods: “purchase” vs. “lease” (Ammons, 2002). Given the nature of such goods (i.e., consumable), this research project eliminated the alternative of acquisition through a leasing arrangements and focused on the alternative acquisition through purchasing. Yet, acquisition through purchasing does not acquire the rights to underlying technology. Hence, in the context of technology, another approach deserved examination—namely the acquisition of the underlying technology. However, given that many technologies have both military and commercial applications, outright purchase of the rights to the underlying technology is not feasible. Nevertheless, a partial purchase of rights (a.k.a. a “non-exclusive license”) is feasible; this research explored the conditions under which such a license would be exercised. Finally, this research conducted a case study of the body armor.

DISCUSSION

Ertef and Griffin (2002) explain that a supply chain can be dominated by either supplier or buyer; they assert that in recent years certain large buyers have increased dominance over their suppliers. Yet, the DoD has not exerted such dominance over its suppliers. Currently, federal agencies such as NASA and the DoD often demand only a royalty in return for providing research funding. Yet, the Federal Acquisition Regulations [FAR] (Part 27, Subpart 27.3) grant a compulsory, non-exclusive license to the government for technologies invented under government-funded contracts (FAR, 2004). For example, since the DoD controls the funding, the DoD has the leverage to demand superior contract terms from the researchers inventing the technology. A superior contract term would be to obtain a non-exclusive license from the researchers to manufacture goods based on the technology in the event that inventors fail to bring the technology to market within a reasonable time. Similarly, the DoD does not demand the right to assure adequate supply of a particular good in return for placing a large order with a single manufacturer. Even though the compulsory license under the FAR may not apply, the DoD could make such a license an express term or condition of the contract. A superior contract term or condition would be to obtain a license to carry out the manufacture of the good upon either of the following terms:

- With respect to labor-intensive goods, failure of supplier to increase production by 100% upon 30-days notice and by 200% upon 60-days notice (by adding a shift or shifts).



- With respect to capital-intensive goods, failure to expand production capacity by 100% upon 60-days notice and by 200% upon 120-days notice (by adding a production line or lines).

The license would enable the DoD to obtain adequate supplies by ordering from additional suppliers. By exercise of the license, the DoD would pay a royalty at a rate of from 3% to 10% to the supplier if (and only if) the technology the DoD used had been patented or made proprietary by the supplier. The royalty rate would be determined to approximate the typical royalty rate in the industry and not to exceed the audited net profit of the supplier. In this way, the supplier could not use patented or proprietary technology to prevent the mass production of goods at the order of the DoD.

CASE STUDY

In summary, body armor is a consumable good based on the underlying technology of ballistic-resistant panels. The best available commercial technology comprises plates of boron carbide (Bernstein, 2002). To meet demand, body armor must be mass produced. The DoD had a contract with a single manufacturer to deliver body armor containing the boron carbide plates. In response to increased orders from the DoD, the manufacturers increased production to maximum capacity at 25,000 jackets per month (Loeb & Labbé, 2003). Yet, months are still required to produce a supply adequate to meet the demand of more than 80,000 jackets. Although the manufacturers marginally increased production, the DoD lacked sufficient leverage to force manufacturer(s) to dramatically increase production by opening a new production line, let alone building a new production facility. It is noteworthy that demand will continue to outpace supply if all armed military personnel, including reserves and the national guard, are to be issued such body armor. Thus, in this case, early licensing of underlying technology would have been appropriate; it would have enabled the DoD to place orders with other manufacturers if the existing manufacturers could not deliver sufficient supplies to meet the demand.

FUTURE WORK

Many research laboratories in the United States are busy developing technologies with military applications. An example is the human exoskeleton which is currently in laboratory testing and will soon undergo prove-out in the field (Berkeley, 2004). Undoubtedly, a successful prototype of the exoskeleton will involve inventions for which inventors will seek patents. If the DoD pursued enforcement of the compulsory government license pursuant to FAR 27.302(c) for the exoskeleton, the Department could increase production of exoskeletons without the inventors' refusal. Even if a commercial entity further develops the exoskeleton without government funding, and the compulsory license did not apply, the DoD could pursue an early-licensing approach under a contract with that commercial entity when ordering a small quantity of exoskeletons prior to the prove-out phase.

CONCLUSION

Early licensing of technology—prior to the prove-out phase—is a best practice to acquire rights in underlying technology. Such early licensing will be useful when the DoD seeks to rapidly increase supplies of technology-based goods. Simply increasing orders may insufficiently increase supply if a supplier has little incentive to increase production. Moreover, if the goods ordered by the DoD are based on patented or proprietary technology, the DoD may be unable to seek out other suppliers. Thus, use of early licensing of underlying technology



would provide the DoD the leverage to force a supplier to increase production or to split orders among other suppliers.

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Contractor Past Performance Information (PPI) In Source Selection: A comparison Study of Public and Private Sector

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The following executive summary is a collection of excerpts from the Sponsored Series Report NPS-CM-04-019 which numbers 122 pages (including field interview summaries).

EXECUTIVE SUMMARY

The Federal Acquisition Regulation (FAR) mandates the use of contractor past performance information (PPI) as an evaluation factor in all source selections involving negotiated procurements above \$1,000,000. Different agencies within Federal Government have lowered the dollar threshold to as little as \$100,000 depending on the type of contract action. Using PPI as a factor in all source selections was a tactic modeled after industry best practices. The Office of Federal Procurement Policy (OFPP) envisioned that industry PPI collected by Federal agencies would eventually be automated, maintained on secure databases, and available to all Government agencies for source-selection purposes. This practice would eventually lead to efficiencies similar to those in the private sector. However, along the way, Government and private-sector industry have begun to disagree about how PPI is collected and how PPI is used. Industry prefers a passive system of collecting delivery and quality data during contract performance, while Federal government uses both a passive system (similar to industry) as well as an active system of pulling PPI during contract performance. Industry uses PPI to establish and maintain a preferred vendor list from which to solicit bids, quotes or proposals, while government uses PPI to assess risk and establish vendor responsibility in a full and open competition environment. Contract award cycle-time within the Federal Acquisition process is more than double that of the private sector due to an evaluation process that is cumbersome, time-consuming, and lacking the efficiencies enjoyed by private industry. Government (the DoD in particular) has recently become more curious regarding industry best practices and how those practices can be implemented in the government—in particular, as a possibility of diminishing the Government Contracting Officer's and the Source Selection team's added burden. This paper will explore through field research the current PPI collection and evaluation process used by the DoD and by those employed in industry. The



goal behind such research is, again, industry best practices and improving the DoD's use of PPI as a tool in the acquisition processes.

SIGNIFICANT FINDINGS

The most interesting finding discovered by the researcher involved the difference between full and open competition mandated in the public sector and competition encouraged in the private sector. Although there are more similarities between public- and private-sector acquisitions than differences, the researcher has uncovered two fundamental differences which stand out as glaring departures in the typical >\$1,000,000 acquisition system. These differences include 1) Right v. Privilege to bid, and 2) Use of full and open competition.

1. *Right v. Privilege to Bid*

The public sector is mandated by the Federal Acquisition Regulation (FAR) to seek full & open competition.¹ It is the right of every vendor to submit a quote, bid or proposal for equal consideration, regardless of past performance history.² This right is extended to all vendors who have not been suspended or debarred in accordance with FAR Part 9—Contractor Qualifications. Conversely, private sector, too, encourages competition; however, it is only encouraged among their *approved* vendors. It is, therefore, a defacto privilege for a vendor to offer a quote, bid, or proposal within the private sector.³

	Public Sector	Private Sector
Opportunity to offer a bid, quote, or proposal	Right	Privilege
Regulatory Guidance	FAR Part 6— Competition Reqt Mandates competition	UCC Article 2— Sale of Goods is silent

Table 1. Opportunity to Bid

The Issue within the public sector: Disappointed offerors may elect to protest. In 1997, past performance protests constituted only 8% of all protests, and as of June 2000 that percentage had grown to 29%. An upward trend is also evident with the percentage of past performance protests as a percentage of sustained protest. In 1997, sustained past performance protests accounted for only 10% of the overall sustained protests, and by June of 2000 that percentage had risen to 30%.⁴

Interestingly, as government has moved to adopt industry best practices for source selections based on vendor past performance, industry has responded with increased protests.

¹ Federal Acquisition Regulation (FAR) 19.201(a) states: "It is the policy of the Government to provide maximum practical opportunities in its acquisitions to small business, veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns."

² Competition in Contracting Act of 1984 (CICA) Public Law 98-369, sec. 2701, established "full and open" as a requirement in public sector procurements unless certain conditions exist.

³ Uniform Commercial Code (UCC). Copyright 1978, 1987, 1988, 1990, 1991, 1992, 1994, 1995, 1998, 2001 by The American Law Institute and the National Conference of Commissioners on Uniform State Laws: contains no statute or requirement mandating full and open competition.

⁴ Snider, K. & Walkner, M. (2001). Best practices and protests: Toward effective use of past performance as a criterion in source selections. *Journal of Public Procurement*, 1(1), 99 – 101.



This realization that industry suspects unfair source selection practices only reinforces the need for government to maintain a robust PPI collection system for retrieving current and relevant vendor performance history and that government exercise due diligence in their responsibilities as source selection officials to apply evaluation criteria consistently across all vendor bids, quotes or proposals in accordance with evaluation criteria set forth in each solicitation. This also emphasizes the notion that government is indeed different than industry,⁵ further that the right to bid (public sector) versus the privilege to bid (private sector) does not lend to a smooth and seamless adoption of industry best practices under current public laws, statutes, and regulations.

The private sector is guided by the Uniform Commercial Code (UCC) in routine business practices; yet UCC Article 2, “Sale of Goods,” is silent regarding competition when soliciting bid, quotes, or proposals. What is decidedly different is that *the private sector is not mandated to seek full & open competition*. Disappointed vendors have no legal recourse with GAO or the U. S. Court of Federal Claims if they are not asked by a private sector firm to provide a bid, quote, or proposal, or if their bid, quote or proposal was not selected for contract award. The only viable alternative for the disappointed vendor is to call their respective Congressman or Senator. The research data suggests that congressional inquiries are more likely to be directed to larger firms in the private sector than smaller firms. Research interviews conducted as part of this study indicate that answering congressional and senatorial inquiries is taken seriously and handled professionally within the private sector; yet, these inquiries do not have the disruptive nature that a GAO Protest has in the public sector. Hence, it is not likely that a congressional inquest will delay a contract award or halt contract performance in the private sector.⁶

2. Full and Open Competition: a Socioeconomic Process

The other striking difference between public sector and private sector procurement processes deals with full and open competition. Government acquisition is a socio-economic process. Its number-one priority is supporting socioeconomic goals mandated by public law. After priority number one is met, priority number two is the acquisition of supplies, services, construction, R&D, etc. at the right time and at the right price.

Government

Public sector is mandated to compete all requirements using full and open competition procedures whenever feasible.⁷ What is less obvious to an outside observer is the burden of proof placed on the PCO to prove competition does or does not exist OR that it is in the best interest of the government not to complete the requirement.⁸ This public-sector process of bypassing full and open competition requirement is exacting and time consuming. Yet, industry, as discussed previously, has no competition requirement.

Industry

Similar to government, once a requirement and funding is identified by an industry, a solicitation is forwarded to interested vendors; yet, unlike government, the new requirement normally is forwarded to a pre-approved vendor list, or as some industry counterparts call it: an

⁵ See note 4. (Snider & Walkner, 2001, p. 100).

⁶ Northrop Grumman, Lockheed Martin. Interviews conducted Aug and Sep 2004.

⁷ Federal Acquisition Regulation (FAR) Part 6.101—Full and Open Competition Policy.

⁸ Federal Acquisition Regulation (FAR) Part 6.302: 1 through 7.



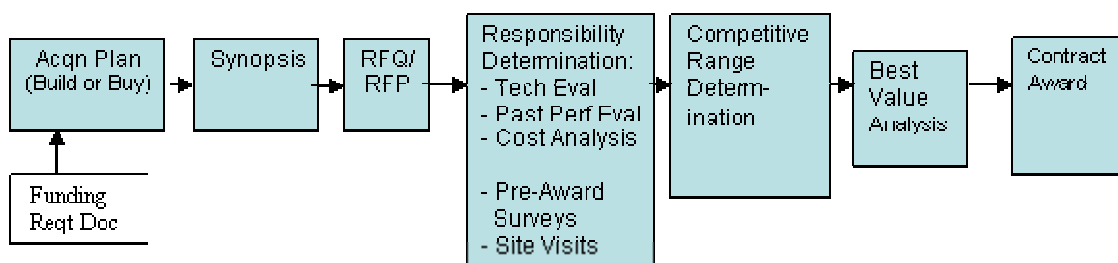
“A Team.” A world-wide search for new vendors is not performed unless it makes sense to do so.⁹ Full and open competition is not normally used.

Perhaps the government contract arrangements closest to these long-term private-sector relationships are Indefinite Delivery Type Contracts and Performance-Based Contract vehicles; these are both only typically re-competed after five years. Although government is headed in the right direction towards improved efficiency, the typical Indefinite-Delivery or Performance-Based Contract vehicle has a relatively short life-span and requires that all like requirements go only to that particular contract awardee.

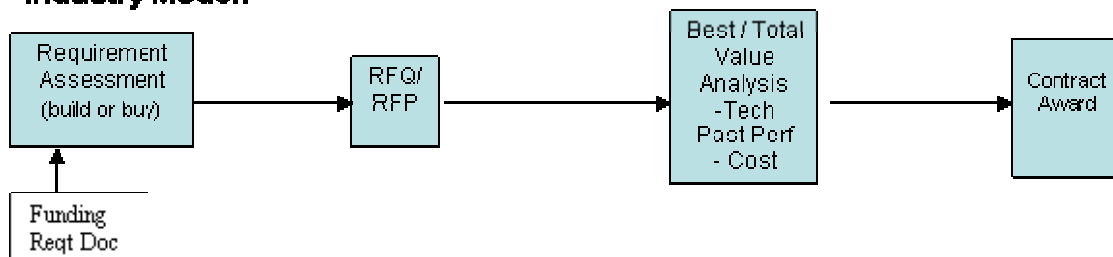
In the government model, a typical requirement, based on the researcher’s experience, could realistically reach a 210-day PALT, as shown in Figure 1.

In the industry procurement model, the following steps or blocks are effectively eliminated: 1) Synopsis, 2) Responsibility Determination, and 3) a separate Best-Value Analysis which is combined into one heading under Total Value or Best Value. The researcher has estimated a PALT from a similar procurement action (based on private-sector interviews) under similar urgency conditions to reach contract award in 75 days, or in about one-third the time of the government model, as shown in Figure 1 below:

Government Model:



Industry Model:



Government timeline:

30 days 15 days 45 days 60 days 30 days 30 days = 210 days

Industry timeline:

15 days 30 days 30 days = 75 days

Figure 1. Government v. Industry Procurement Action Lead Time (PALT) Comparison

⁹ Northrop Grumman. Interview conducted Sep 2004.

It should be noted that industry, similar to government, must occasionally follow the full acquisition process when a new requirement justifies the search for a new supplier(s). The search for new suppliers is seen as rare by industry acquisition specialists and only executed when it makes sense to do so.¹⁰ If government is to continue evolving and incorporating industry best practices, improving PALT by eliminating burdensome acquisition processes is a viable area for consideration. Table 2 provides an illustrative summary of efficiencies realized in the private sector.

Table 2. Responsibility Determination Comparison: Public v. Private Sector

Requirement Identified	Market Research, Responsibility Determination	Competitive Range Determination	Best Value Contract Award
Government	<ul style="list-style-type: none"> • Synopsis world-wide • Pre-Solicitation Conference • Pre-Award Survey • Site visits 	<ul style="list-style-type: none"> • Tech Approach • Past Perf. Eval • Cost Analysis 	Contract Award
Industry (With preferred vendor support)	→	<ul style="list-style-type: none"> • Tech Approach • Past Perf Eval • Cost Analysis 	Contract Award
Industry (Mature vendor relations, Lean, JIT etc.)	→	→	Contract Award

ANALYSIS OF RESEARCH QUESTIONS

The two basic research questions under study were as follows:

1. What are the principal issues involved in using PPI in the source-selection process?

The principle issues uncovered in using past-performance information (PPI) in the source-selection process are as follows:

- a. A robust PPI infrastructure is required to justify source selections to other than the lowest-priced technically acceptable (LPTA) offeror.
- b. PPI is generally used as a *risk assessment* and to separate the good proposal writers from the good vendors.
- c. PPI is typically never used as a stand-alone factor for non-contract award in a full and open competition environment (Govt) or when using a preferred vendor list (Industry).
- d. PPI can only be defensible if made quantifiable.

¹⁰ Northrop Grumman. Interview conducted Sep 2004.

e. An active (or passive) PPI collection system continues to be burdensome, yet useful in the public sector.

2. How might an assessment of industry models of past-performance evaluation assist in improving the DoD's use of past performance as an evaluation criterion?

Although government activities fell in line with one another regarding acquisition processes and procedures, industries varied somewhat in their acquisition process methodology and their methodology for collecting and evaluating vendor past performance. Therefore, the following tables represent an aggregate list of findings and do not reflect any one particular government activity or industry firm.

PPI Collection:	Government Model	Industry Model
PPI Collection Sys.	PPIRS/CPARS (Active)	SCORECARD (Passive)
	- Quality	- Quality
	- Delivery	- Delivery
	- Cost Control	Manual sys for tracking Cost
	- Business Relations	Manual system for tracking Business relations
	PPIRS/RYG (Passive)	
	- Quality	
	- Delivery	
Class of Collection Sys.	Active	Passive
	Prgm Mgrs actively engaged in grading interim and final vendor performance	Vendor performance is monitored by a shipping/receiving system and QC personnel
	Passive	
	Vendor performance is monitored by a shipping/receiving system and QC personnel	

Table 3. Summary of Government v. Industry PPI Collection Systems

PPI Evaluation:	Government Model	Industry Model
Key Elements Evaluated	Quality	Quality
	Delivery	Delivery
	Cost Control	Cost Control (manual)
	Business Relations	Business Relations (manual)
Priorities	1) Socio-economic objectives, 2) Cost, Schedule, Performance	1) Profit & shareholder interests, 2) Reputation based on quality
Competition	- Full and Open competition (FAR Part 6 and CICA of 1984)	- No competition requirement (UCC Article 2 is silent)
Invitation to provide a bid, quote, proposal	Right	Privilege
Most important source selection factor	Technical Capability	Past Performance/Use of pre- approved vendors
Best value source selection	Responsibility Determination: 1. Technical Capability 2. Past Performance 3. Cost/Price After a lengthy evaluation of proposals, only the offerors whose proposals are considered <u>responsive</u> to the solicitation and determined to be <u>responsible</u> (capable) are kept in the <u>competitive range</u> . These vendors are then evaluated, similar to industry according to: 1. Technical Capability 2. Past Performance 3. Cost/Price	Responsibility is generally <u>pre- determined</u> - only the best performing vendors are given opportunity to provide bids, quotes, or proposals. These vendors are then evaluated, similar to government according to: 1. Technical Capability 2. Past Performance 3. Cost/Price

Table 4. Summary of Government v. Industry PPI Evaluation Methodology

RECOMMENDATIONS

Based on interviews with government and industry acquisition professionals in the field and data collected from those interviews, the researcher makes the following recommendations:

1. Government should continue building and improving on the existing government PPI collection system. FAR Part 15 has given the Government PCO the authority to eliminate non-responsive and non-responsible offerors from the competitive range or from final contract award. However, *a robust PPI system must be in place in order to back up the PCO when challenged.* For this reason, government must continue to move forward in its objective to provide a reliable PPI collection and evaluation system.

2. Industry should continue with a scorecard PPI system. The threat of senatorial or congressional inquiries for arbitrarily awarding contract requirements to “A Team” vendors is not great enough to warrant an elaborate PPI system.



3. Competition in Contracting Act (CICA) of 1984 is in need of revision. Industry has a decided advantage in Procurement Action Lead Time (PALT) when compared to government. Although PALT is a somewhat dated measure of procurement efficiency, it does bring to light an obvious mismatch between the public and private sectors. If government is willing to accept a 210 PALT when industry is awarding the same contract requirement in 75 days, then change is not needed. However, if government is serious about positive change, CICA and government socio-economic policies must be revisited. Major reasons for industry's decided advantage are the public sector's following issues: 1) the right to provide a quote, bid, or proposal, 2) government's mandate to use full and open competition whenever possible, and 3) socioeconomic policy.

4. Continued compliance with established policies in reporting past-performance history is required. As discussed briefly above, one of the main difficulties of using past performance information from a government database is the lack of data about individual vendors. Timely CPARs inputs are needed.

CONCLUSIONS

Throughout this field study, the researcher has noted observations in both government and industry regarding how each collects and evaluates PPI for the purpose of making a valid assessment of risk. Following is a summary of these conclusions:

- Industry is probably where it needs to be regarding collection and use of vendor past-performance history. A passive "somewhat hand-off" PPI collection system centered around a closed-loop purchasing-shipping-receiving-QC system is probably sufficient given industry's volume of procurement activity and current lack of competition or socioeconomic requirements. Also, the level of PPI infrastructure should be tailored to the relative size of the industry firm.
- Government's PPI collection system is much larger, more robust, and exceedingly more man-power intensive than industry's. Yet, if allowed to evolve, researchers will probably witness an increase in the relative weighting given to past performance as a source-selection factor in individual solicitations. Although government is always on the path to re-invent itself, it is not likely that it will come much closer to adopting industry PPI procedures than where it currently stands.
- Opportunity for improvements: Acquisition cycle-time or PALT. Being afforded the opportunity to converse directly with industry acquisition professionals at their own respective sites yielded one major lasting impression on the researcher. That lasting impression centers around the *speed and efficiency in which industry operates in the acquisition-planning, proposal-evaluation, source-selection, and contract-award processes*. It is obvious that industry has the competitive advantage in acquisition cycle-time. The only way to address this shortcoming of the governmental process is to address government-mandated competition requirements and socioeconomic goals.

As the world situation continues to change, the way we fight wars must subsequently change. Key to that effort is acquisition. Government must take bold steps to evolve the acquisition process into an agile, efficient, streamlined process if it is to remain responsive to both the war fighter and the taxpayer.



Panel—Financial Management

Thursday, May 19, 2005	Financial Management & Budgeting
10:45 a.m. – 12:15 p.m.	Chair: G. Fredrick Thompson , Willamette University Papers: <i>“Budgeting for Acquisition: Analysis of Compatibility Between PPBES And Acquisition Decision Systems”</i> Lawrence R. Jones, Naval Postgraduate School Jerry L. McCaffery, Naval Postgraduate School <i>“A Critical Examination of the DoD’s Business Management Modernization Program”</i> Christopher Hanks, RAND <i>“Cost As an Independent Variable (CAIV): Front-End Approaches to Achieve Reduction in Total Ownership Cost”</i> Michael Boudreau, Naval Postgraduate School

Chair: G. Fredrick Thompson—is the coauthor of *Reinventing the Pentagon* (with LR Jones), “Responsibility Budgeting in the Air Force Materiel Command,” *Public Administration Review* (forthcoming) and *Efficiency Counts: Developing the Capacity to Manage Costs at Air Force Materiel Command*, IBM Center for The Business of Government in the Center’s August 2003 issue of their Transforming Organizations Series (with Michael Barzelay, London School of Economics), and “Why a New Public Management; Why Now?” in the *Review of Public Personnel Administration* (2003, December) 23(4), pp. 328-343 (with Hugh Miller, Florida International University).

Fred is the founding editor of *International Public Management Journal* and has served on over a dozen other editorial boards, currently including *Journal of Comparative Policy Analysis*, *Journal of Public Administration Research and Theory*, and *Public Budgeting & Finance*. He is the recipient of PAR’s Mosher and NASPAA-ASPA’s Outstanding Research Award. He also recently served as a referee on the work of the NRC-NIM’s Committee on Accelerating the Research, Development, and Acquisition of Medical Countermeasures against Biological Warfare Agents.

Fred is the Grace and Elmer Goudy Professor of Public Management and Policy, Geo. M. Atkinson Graduate School of Management, Willamette University, Salem, OR.



BUDGETING FOR ACQUISITION: ANALYSIS OF COMPATIBILITY BETWEEN PPBES AND ACQUISITION DECISION SYSTEMS

Presenter: Lawrence R. Jones, PhD, serves as Admiral George F. A. Wagner Professor of Public Management in the Graduate School of Business and Public Policy, Naval Postgraduate School, Monterey, CA. Professor Jones teaches and conducts research on a variety of government financial and management reform issues. He has authored more than one hundred journal articles and book chapters on topics including national defense budgeting and policy, management and budget control, public financial management, and international government reform. Dr. Jones has published fifteen books including *Mission Financing to Realign National Defense* (1992), *Reinventing the Pentagon* (1994), *Public Management: Institutional Renewal for the 21st Century* (1999), *Budgeting and Financial Management in the Federal Government* (2001), *Strategy for Public Management Reform* (2004), and *Budgeting and Financial Management for National Defense* (2004).

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Presenter: Jerry McCaffery, is Professor of Public Budgeting in the Graduate School of Business and Public Policy at the Naval Postgraduate School where he teaches courses focused on defense budgeting and financial management. He has taught at Indiana University and the University of Georgia. His current research interests include defense transformation and the PPBE system and their impact on DOD acquisition and resource allocation. He and Professor Jones are the authors of *Budgeting and Financial Management for Defense* (2004).

ABSTRACT: The DoD employs three sophisticated systems to assist leaders in making decisions on warfighting requirements, weapons acquisition, and financing. These systems provide the DoD some of the best warfighting equipment in the world. However, the systems also exhibit dysfunction. Correction of related problems is part of Secretary of Defense Rumsfeld's transformational initiative. The purpose of this paper is to investigate the congruence between PPBES and Acquisition decision systems. We describe these systems, the fiscal and political environment in which they operate, and ongoing transformational efforts. We suggest the systems are imperfectly articulated; therefore, friction arises and dilutes desired outcomes.

Draft: Not for Quotation

INTRODUCTION

Transformation of the Department of Defense may best be understood in the context of the federal government's reform to introduce more efficient business-management practices, improve financial and accounting procedures and systems, improve strategic planning and budgeting, and to manage more directly for performance and results. As explained in this paper, a considerable degree of transformational reform is currently under implementation in the Department of Defense.



This paper focuses on the business side of DoD transformation and not on the transformation of the fighting forces. However, the premise throughout is that business-management transformation must track, support and keep pace with the changes in the force structure and the needs of the fighting forces to respond to the threats posed in the national security environment. The business transformation initiatives of the Bush administration under Secretary Rumsfeld should be viewed as a continuation, albeit at an accelerated pace, of many of the recommendations for federal government reform recommended by the Packard and Grace Commissions in the 1980s, and of the very ambitious changes in business practices instituted under the Defense Management Report/Review (DMR) under Secretary of Defense Dick Cheney and his staff, including Deputy Secretary Donald Atwood, Comptroller Sean O'Keefe and Deputy Comptroller Donald Shycoff (Jones & Bixler, 1992; Thompson & Jones, 1994). Many of the DMR initiatives and programs were continued with success under Secretaries Aspin, Perry and Cohen during the Clinton administration, under the direction (for part of this time) of DoD Comptroller John Hamre and Under Secretaries of Defense for Acquisition and Technology Paul Kaminsky and Jacques Gansler, among others.

With respect to the continuing need for transformation throughout the DoD, hastened by the attacks of 9/11/2001 and the demands of fighting the war on terrorism, Secretary of Defense Donald Rumsfeld has explained, "We're likely to face fewer large armies, navies and air forces, and instead more adversaries who hide in lawless, ungoverned areas and attack without warning in unconventional ways. Our challenge is not conventional, it's unconventional" (cited in OFT, 2004). Recently, former Deputy Secretary of Defense Paul Wolfowitz approved the 2004 DoD Training Transformation Implementation Plan (IP) to better enable joint operations. This replaces the 2003 plan as a result of the department's experience in transforming the force and of lessons learned during operations in the Global War on Terrorism (OFT, 2004).

However, DoD transformation and the part of that initiative which relates to planning, budgeting and acquisition is not done in isolation within the Department. The leadership of the Department of Defense is compelled to live in a fishbowl in the environment of the nation's capitol. Much has been made of the transformation initiatives of Defense Secretary Donald Rumsfeld during the administration of President George W. Bush. And in this fishbowl, criticism is omnipresent. For example, on March 7, 2001, in testimony before Congress, Comptroller General David Walker articulated what many hope and believe, that the United States Department of Defense was the best in the world in its primary mission—that of warfighting: "The Department of Defense and the military forces that it is responsible for are the best in the world. We are an A in effectiveness, as it relates to fighting and winning armed conflicts, when those forces have to be brought to bear" (McCaffery and Jones, 2004, p. 335). Subsequent events in Afghanistan and Iraq provided ample support for this appraisal. That, however, was not the end of Walker's speculations. In the same testimony, Walker assigned the DoD a failing grade in economy and efficiency: "At the same point in time, the Department of Defense is a D plus as it relates to economy and efficiency." Walker then indicated that the DoD had six of twenty-two federal government high-risk areas within its purview, noting that these ranged from human capital challenges, to information technology, to computer security. In the areas of acquisition and contracting Walker said, "the acquisitions process is fundamentally broken, the contracts process has got problems, and logistics as well" (McCaffery and Jones, 2004, p. 335). In testimony before the Senate Homeland Security and Governmental Affairs Committee, in February of 2005 Walker indicated that DOD was involved in 14 of the 25 high risk areas and called this 'unacceptable.'

It is clear these are not trivial problems. GAO estimates that the DoD spent \$146 billion in developing and acquiring weapons in 2004 and that this investment was scheduled to grow to \$185 billion by FY 2009. Moreover, GAO warned that, as a result of inefficient systems and



practices, the DoD invites a series of troubling outcomes: "Weapon systems routinely take much longer to field, cost more to buy, and require more support than provided for in investment plans" (GAO, 2005a, p. 68). GAO noted that when weapon systems require more resources than planned, "the buying power of the defense dollar is reduced" and this can result in unfavorable tradeoffs, such as increased spending or reduced defense capability. GAO opined:

For example, programs move forward with unrealistic program cost and schedule estimates, lack clearly defined and stable requirements, use immature technologies in launching product development, and fail to solidify design and manufacturing processes at appropriate junctures in development. As a result, wants are not always distinguished from needs, problems often surface late in the development process, and fixes tend to be more costly than if caught earlier. (GAO, 2005a, p. 68)

No one wants to imperil the DoD's "A" performance in warfighting; in fact, the transformation in military affairs in the DoD in the past five years is exemplary, although much remains to be done to adapt to a new warfighting environment and the Global War on Terrorism. Still, the fact remains that inadequate acquisition, logistics, and financial management systems have severe negative consequences—not only for the management side of the DoD, but for the military side as well. Money wasted as a result of poor management practices equates to loss of resources to improve the effectiveness of the fighting forces. Poor business practices may result in buying weapons systems that do not meet warfare requirements. Moreover, inefficient collateral weapons and forces support systems result in increased risk to warfighters. Because of mismanagement, inventory may be lost in transit and shortages of critical spare parts may occur. On the financial side, Secretary of Defense Donald Rumsfeld has estimated that modernized business management systems could save the DoD roughly 5% of its annual budget, about \$22 billion dollars on the FY 2004 budget. In the late 1990s, when the DoD was pursuing non-compatible goals of recapitalization and budget reduction rather than transformation, \$22 billion would have paid for about half of the more conservative estimates of dollars needed to achieve rebuilding the DOD hard asset base. And even if recapitalization was not deemed necessary, there are other reasons to adopt efficient systems. Underlying them all is the principle that in the use of taxpayer dollars, the DoD should be a good steward of its finances.

To its credit, the Department has made continuous efforts to improve its acquisition and financial management processes. GAO observed: "Specifically, DOD has restructured its acquisition policy to incorporate attributes of a knowledge-based acquisition model and has reemphasized the discipline of systems engineering" (GAO, 2005a, p. 68).

In addition, the DoD recently introduced new policies to strengthen its budgeting and requirements determination processes in order to plan and manage weapon systems based on joint warfighting capabilities. However, GAO also warns that the path ahead is still difficult:

While these policy changes are positive steps, implementation in individual programs will continue to be a challenge because of inherent funding, management, and cultural factors that lead managers to develop business cases for new programs that over-promise on cost, delivery, and performance of weapon systems. (GAO, 2005a, p. 68)

GAO has been keeping a high-risk list since 1990 of programs it feels need urgent attention to ensure they are operated in the most effective and efficient manner. Programs are put on the list when GAO believes their systems are inadequate and could lead to abuses. GAO



identifies these programs and reports on them to Congress with suggestions for improvement. GAO says of its high risk list:

AO's high-risk program has increasingly focused on those major programs and operations that need urgent attention and transformation in order to ensure that our national government functions in the most economical, efficient, and effective manner possible. [...] [F]ederal programs and operations are also emphasized when they are at high risk because of their greater vulnerabilities to fraud, waste, abuse, and mismanagement. In addition, some of these high-risk agencies, programs, or policies are in need of transformation, and several will require action by both the executive branch and the Congress. Our objective for the high-risk list is to bring "light" to these areas as well as "heat" to prompt needed "actions." (GAO, 2005a, p. 5)

Of the 25 high-risk areas on the 2005 update, the DoD is explicitly named in eight areas and participates in a least five other areas. The list is shown in Exhibit 1, indicating the high risk by area and the date it was placed by GAO on the high-risk list.

Exhibit 1. High-Risks Areas and Date of Nomination

Table 3: The Year that Areas on GAO's 2005 High-Risk List Were Designated as High Risk

Area	Year designated high risk
Medicare Program	1990
DOD Supply Chain Management	1990*
DOD Weapon Systems Acquisition	1990
DOE Contract Management	1990
NASA Contract Management	1990
Enforcement of Tax Laws	1990 ^b
DOD Contract Management	1992
HUD Single-Family Mortgage Insurance and Rental Housing Assistance Programs	1994
DOD Financial Management	1995
DOD Business Systems Modernization	1995
IRS Business Systems Modernization	1995 ^c
FAA Air Traffic Control Modernization	1995
Protecting the Federal Government's Information Systems and the Nation's Critical Infrastructures	1997
DOD Support Infrastructure Management	1997
Strategic Human Capital Management	2001
U.S. Postal Service Transformation Efforts and Long-Term Outlook	2001
Medicaid Program	2003
Managing Federal Real Property	2003
Modernizing Federal Disability Programs	2003
Implementing and Transforming the Department of Homeland Security	2003
Pension Benefit Guaranty Corporation Single-Employer Insurance Program	2003
Establishing Appropriate and Effective Information-Sharing Mechanisms to Improve Homeland Security	2005
DOD Approach to Business Transformation	2005
DOD Personnel Security Clearance Program	2005
Management of Interagency Contracting	2005

Source: GAO.

*This area was formerly entitled DOD Inventory Management.

^bOne of the two high-risk areas that were consolidated to make this area—Collection of Unpaid Taxes—was designated high risk in 1990. The other area—Earned Income Credit Noncompliance—was designated high risk in 1995.

^cIRS Financial Management has been incorporated into the IRS Business Systems Modernization high-risk area. Both areas were initially designated as high risk in 1995.



There were 14 areas on the high-risk list in 1990. Over the intervening 15 years, twenty-nine areas have been added; 16 removed and 2 consolidated. However, no DoD area has ever been removed from the list. Supply-chain management and weapons system acquisition made the list in 1990. Of this, Senator Voinovich (R. OH) said, “I just think it’s unacceptable [...] Defense Department supply chain management—15 years; DOD weapons system acquisition, we’re talking billions and billions of dollars—15 years, and nothing’s been done” (Barr, 2005, p. B02).

It is not true that nothing has been done. As GAO notes:

DOD has undertaken a number of acquisition reforms over the past 5 years. Specifically, DOD has restructured its acquisition policy to incorporate attributes of a knowledge-based acquisition model and has reemphasized the discipline of systems engineering. In addition, DOD recently introduced new policies to strengthen its budgeting and requirements determination processes in order to plan and manage weapon systems based on joint warfighting capabilities. While these policy changes are positive steps, implementation in individual programs will continue to be a challenge because of inherent funding, management, and cultural factors that lead managers to develop business cases for new programs that over-promise on cost, delivery, and performance of weapon systems. (GAO, 2005a, p. 68)

GAO worries that programs move forward with unrealistic program cost and schedule estimates, that they lack clearly defined and stable requirements, that immature technologies are used in product development and that there is a failure to solidify design and manufacturing processes at the appropriate times in the development processes. Thus says GAO, “wants are not always distinguished from needs, problems often surface late in the development processes, and fixes tend to be more costly” (GAO, 2005a, p. 68).

This is a picture crudely drawn, though it is of a sizeable and costly problem which has a direct impact on our nation’s ability to wage war and its fiscal capacity to afford defense. It is not an insignificant problem. It is not an unrecognized problem. GAO, Congress, the executive branch and various Secretaries of Defense have confronted these issues, the last among them being Donald Rumsfeld. Progress has been made, but the problem seems so intractable that DOD financial management was put on the list in 1994, DOD business systems modernization in 1995 and the DOD approach to business transformation in 2005. Not only are the original problem in supply chain management (1990) and weapons acquisition (1990) still with us, but the solution process itself has become a high-risk venture.

It is no secret that DoD problems have historical antecedents, dating to the War and Navy department days. When the DoD was created, the different services constituted a confederation of fiefdoms, with each feeling that they contributed something unique that had to be supported with its own systems. Thus, stove-piped systems, some reaching back to Revolutionary War days, were preserved, as well as the ancillary systems which had developed in support of them. Not only were the main systems different, but so were all the collateral systems. With computerization, stovepipes (as they existed) were largely computerized; the result is that stovepipes are alive and well. They support and are supported by individual service cultures. This thinking is pervasive within the DoD as financial and program managers can hardly wait to break down numbers and get them into their own systems and models that they can work and trust, rather they relying on dozens of other providers for partial information.



The cultural imperative within the DoD is to do warfighting well—and regardless of what is said about the need to improve collateral systems, change has been slow. Partially this is because the DoD is large. Partially it is because the DoD is unlike the nation's largest private-sector companies; thus, simply borrowing solutions does not seem to work well. Also, the pace of technology means that the DoD—because of its size and cultural diversity—is still implementing a solution a generation or two old when the private sector has adopted it, seen its strengths and weaknesses and moved on to something newer and better. Leadership in the DoD is often singled out as the culprit in this story; leaders come, go, and underemphasize reform; or, they are not there long enough to exert enough pressure to do the job. All of these observations have some merit.

In this paper we want to suggest yet another problem. In essence we believe part of the problem lies in the solution. The DoD has created three sophisticated and intricate systems to surface warfighting requirements, acquisition needs, and resourcing decisions. We suggest these three systems are imperfectly articulated with each other; so, they each do the job they were intended to do, but their interaction causes offsetting frictions to come into play; in other words, the sum of the whole is less than that of the parts—something like a driver unexpectedly confronted by an object in the road who wrenches the steering wheel while flooring the accelerator and stomping on the brake. The DoD analogs rest in the warfare-requirements determination system, the PPBE resourcing system, and the formal weapons acquisition system. We begin with an examination of the fiscal environment for national defense.

NATIONAL DEFENSE FISCAL ENVIRONMENT

We begin this line of explanation to place the topic of this paper—improving the fit between PPBES and Acquisition decision making systems—with a short analysis of the fiscal predicament which confronts defense resource managers and officials.

Acquiring weapons platforms such as aircraft, ships, tanks, and weapon support systems for military forces is central to accomplishing the mission of the Department of Defense. Each year, the President submits the defense acquisition budget as part of the overall budget for the Department of Defense to Congress for review and appropriation. Threats to national security and political priorities drive the amount of defense funding requested and appropriated for weapons acquisition. Congress, representatives from the executive branch and the DoD, industry lobbyists, analysts in defense think tanks, media experts and a variety of other agents debate the merits of spending and programmatic alternatives and maneuver to receive resources. Congress expects the DoD to provide quality products that meet warfighter needs while sustaining program stability—and, more recently, to shorten acquisition program cycle times, to develop more innovative approaches to weapons research, development, design, testing, evaluation, production, support, and use.

Program managers from the DoD promote and attempt to garner funding for their programs in the annual budget process. Following appropriation, Congress and the DoD provide directives and guidance to assist the military services in weapons acquisition. The weapons asset investment budget is constrained by the defense budget top-line and squeezed by increasing operating and support costs for aging weapon systems, and since September 11, 2001, the cost of fighting the war on terrorism. In the 1990's, the procurement account constituted a declining share of a contracting defense budget. As is shown in Exhibit 10, in 2002 the procurement account remained substantially below its Cold War average, while aging weapons systems were kept in place and the cost of replacement systems accelerated.



While total defense budget has increased significantly since the events of September 11, 2001, much of the increase has gone into defense against terrorism and active war-fighting expenditures. The investment budget remains squeezed between rising costs for maintenance of increasingly aged systems and the necessity to re-capitalize and buy expensive new systems. This situation is primarily the legacy of the procurement holiday of the 1990's. With the passage of time and the addition of new responsibilities, the unmet future burden backlog grows more serious.

In the past decade, increased acquisition costs have led to greater reliance on private-sector products and processes to improve performance. The movement to adopt better business practices is part of the Defense Department's initiative instituted under the Clinton administration, and continued under the administration of George W. Bush, termed in the early 2000s as the "Transformation in Business Affairs" (TBA). The TBA has four primary goals in the area of acquisition. First, it intends to stimulate the production of high-quality defense products. Second, it is supposed to reduce average acquisition systems' cycle time for all major acquisition programs by 25 percent (from 132 months to 99 months). Third, the DoD is to lower total ownership costs (TOC) of defense products, with the goal of minimizing cost growth in major acquisition programs to no more than 1 percent annually. The fourth goal is to reduce overhead costs to provide less expensive weapons platforms. In some cases, these goals may be achieved by purchasing assets (typically components of, or support items for, weapons and systems) manufactured by the private sector for general (non-defense specific) markets. Given the size of the annual budget deficit for 2003 and beyond, constrained budgets for defense may be anticipated. However, the mission of the DoD continues to expand as the U.S. faces new, more diverse, terrorist threats. What this means in terms of major system asset renewal and re-capitalization for the DoD and the military departments and services is that such requirements inevitably exceed budgets. Thus, the operational question from a resource management and budgeting perspective is how to best cope with this reality?

HISTORICAL TRENDS FOR ACQUISITION FUNDING

Our first task is to understand trends in funding for acquisition. This section provides budget data on weapons acquisition contrasted with military support accounts. It begins with a review of budget authority, total obligational authority, and outlays for the DoD for the period 1988 to 2000. Budget Authority (BA) is provided to the DoD through appropriation by Congress. BA grants the DoD permission to spend money to make or buy necessary defense assets. BA is appropriated for one year or for multiple years, e.g., three years for aircraft acquisition, five years for ship construction. BA allows departments and agencies to incur obligations and to spend money on programs. Thus, BA results in immediate fiscal-year or future-year obligations and outlays. Total Obligation Authority (TOA) is a budget term that indicates the total of all money available from prior fiscal years and the current fiscal year for spending on defense program in the current fiscal year. Typically, asset acquisition is paid for using both current- and prior-year appropriations and extends over a multiple year time horizon.

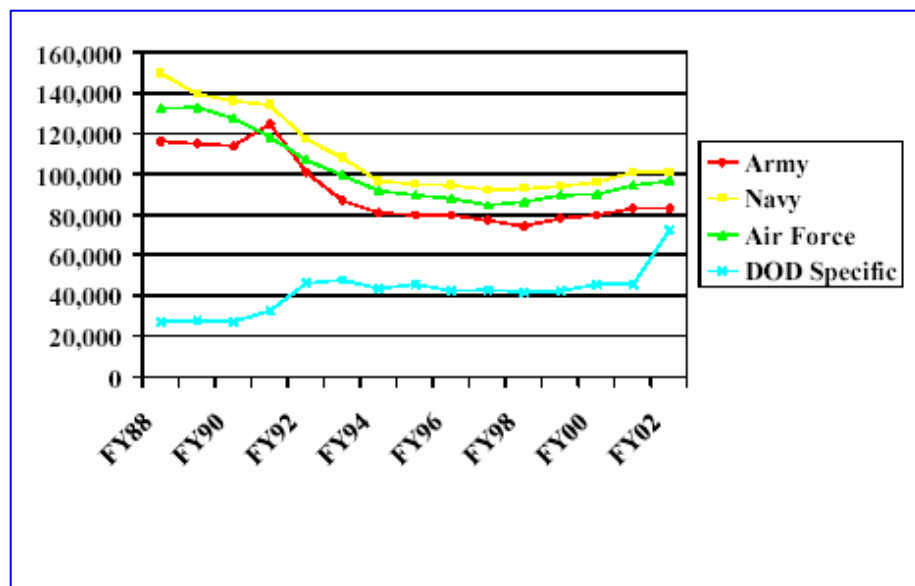
TOA is, in effect, the accumulation of annual Budget Authority. As with all federal departments and agencies, the DoD attempts to spend all the funds appropriated to it for the purposes specified by Congress. By law, unexpended BA for which spending authority expires before obligations are incurred is returned to the Treasury and is no longer available for the DoD to spend.

Budget Authority is spent via the obligation process. Hiring personnel, contracting for services, buying equipment, letting a contract are all ways of incurring obligations against



Budget Authority. Outlays, then, are the actual expenditures that liquidate government obligations. Before passage of FY 1989 defense authorization and appropriation legislation, prior-year unobligated balances were reflected as adjustments against TOA in the applicable program year only. However, since then, both the Congressional Budget Office (CBO) and Office of Management and Budget (OMB) have scored (recorded) such balances as reductions to current-year BA. Previously, reappropriations were scored as new Budget Authority in the year of legislation. However, in preparing the amended FY 1989 budget, CBO and OMB directed scoring of reappropriations as Budget Authority in the first year of availability (Department of the Navy, 2002a). The change reduced DoD spending flexibility in out-years.

Exhibit 2. DoD TOA by Military Department and DoD specific (Constant FY 2003 \$M)



Source: (Knox, 2002, p. 20).

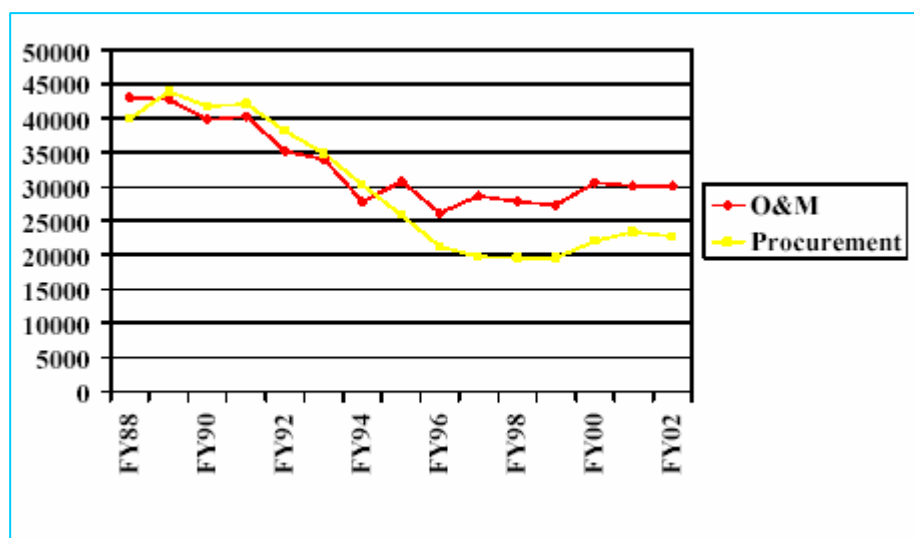
Exhibit 2 shows TOA by military department and service in constant FY 2003 dollars. The Exhibit reveals decreasing TOA from FY 1988 until FY 1994 when it leveled off until FY 1999, after which it has increased slightly. One of the most serious problems faced by the DoD is how to fund the replacement of used assets that have served far beyond their projected depreciation term. In an ideal world, new money would be appropriated by Congress to pay for new weapon assets. In the world as it exists, however, the DoD cannot make enough money available to fund new asset acquisition while sustaining spending in other parts of the DoD budget. This has and will continue to force the DoD to cut spending in non-acquisition accounts, programs, and activities to fund asset replacement. Some observers have argued that Operations and Maintenance funding has been cut over the past few years to free-up money for acquisitions. Others have argued the contrary, that the procurement accounts have been cut to fund the O&M accounts to support peacekeeping initiatives during the 1990s and that they remain compacted by the level of wartime activities in Iraq.

The historical record as to what happened is not clear; both the O&M and Procurement accounts declined during the 1990's (as is shown in Exhibit 3) and to suggest that one is borrowing from the other is to suggest that two neighbors equally impoverished are forced to borrow from one another. Measured by per-capita spending, CBO predicts that the O&M spending per service member will continue a slow growth pace out to 2020, but that investment per service member will peak in the year 2010 and then decline a bit (McCaffery & Jones, 2004,

p. 71). Longer term predictions about fiscal matters are difficult to make now given the instability of the situation in Iraq which has led to large wartime supplemental appropriations. In 2005, the March supplemental was very large (about \$80 billion, about 20% of the size of the total defense budget) and mixed together some personnel and transformation spending, which might normally have been included in the regular budget. (Senator Levin and others on the Senate Armed Services Committee argued that it should have been in the regular budget.) Then, in testimony over the regular DoD appropriation, CNO Clark defended the DoD's position that its transformation efforts would allow it to reduce its carrier force by one to fund its transformational shipbuilding account, which itself was underfunded. At the end of the day, despite an overall increase and a reduction in one of its main lines of business—carriers—the Navy shipbuilding budget still appeared underfunded.

Exhibit 3 shows part of the historical record for these accounts. It shows Acquisition and O&M appropriations in constant FY 2003 dollars for one service, the Navy. O&M and acquisition dollars trended downward from FY 1988 to FY 1994, with a few spikes upward in FY 1995 and FY 1998.

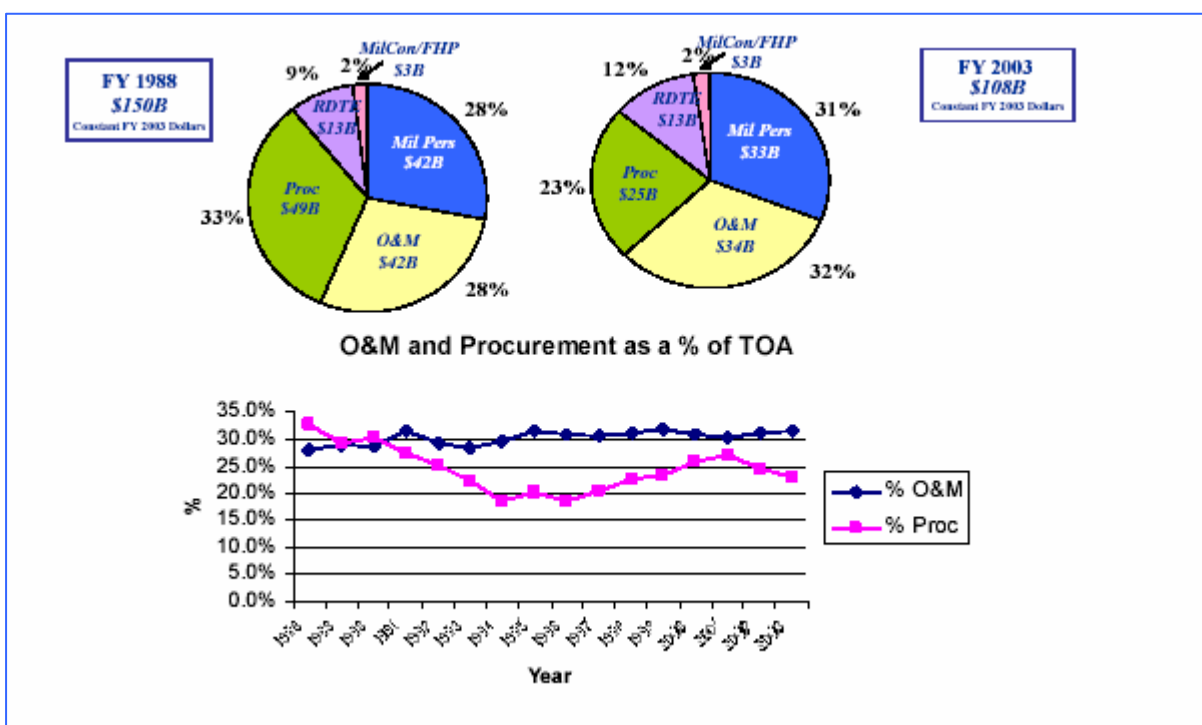
Exhibit 3. Navy O&M and Procurement Outlay Trends in Constant FY 2003\$M



Source: (Knox, 2002, p. 22).

This is a rough measure, but it can be argued that some part of the O&M increase was caused by increased maintenance and repairs needed to support older ships and aircraft in FY 1996 to FY 1999. There was some recovery of acquisition funding in FY 2000, but the gap between O&M and acquisition funding rates remained relatively steady.

Exhibit 4. Navy TOA and Acquisition 1988 to 2003



Source: (Knox, 2002, p. 22).

The pie charts in Exhibit 4 indicate the change in budget share in the Department of Navy budget from 1988 through 2003. The line graph shows how Navy O&M and procurement have varied as a percentage of TOA. Here Navy O&M is roughly flat as a percentage of TOA while procurement declined from just below a 35% share to 20% in the mid-1990s before rebounding in the later years of the decade. While O&M has been consistent at about 30%, the procurement decrease in the mid-1990s is clearly evident.

ACQUISITION AND THE PLANNING, PROGRAMMING, BUDGETING EXECUTION SYSTEM

Budgeting for acquisition takes place within the PPBE system. The defense acquisition budget process integrates two major DoD decision support systems into PPBES. Within the Planning process, the warfare requirements' generation system identifies missions and matching assets needed to enhance force capability for existing systems or for adding new operational capabilities. Then, in the programming phase of PPBES, the acquisition-management system translates requests for new operational capability into operational system requirements for hardware, i.e., specific weapons and systems to perform mission requirements such as aircraft to operate from aircraft carriers or new tanks or ships. This process provides the basis for making informed decisions based on affordability constraints and the needs of the fighting forces.

The PPBE system is intended to provide a stable and routine decision process for planning, programming, and budgeting for the research, development, test and evaluation (RDTE), and acquisition, fielding, and maintenance of new or modified weapon systems. However, integration of the two support systems with the PPBES process is complicated as it operates presently; therefore, it causes delays and creates turbulence in the acquisition

process. Acquisition planning, programming, and budgeting integrate the definition of mission requirements and acquisition management demands into PPBES. Projections for future weapons system needed to counter anticipated threats are stated in the primary vehicle for planning, the Future Years Defense Plan (FYDP). In addition, the weapons acquisition system requires adherence to a set of milestone phases for decision that are prescribed in statutory (legislation passed by Congress) and administrative law (DoD regulation).

For purposes of clarification for the analysis that follows, some definition of terms is necessary. ACAT I programs are Major Defense Acquisition Programs (MDAP). The acronyms MDAP and ACAT I are used interchangeably here. An MDAP is defined as a program estimated by the Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) to require eventual expenditure for RDT&E of more than \$365M (in FY 2000 constant dollars) or acquisition of more than \$2.190B (in FY 2000 constant dollars), or other programs designated by the USD (AT&L) to be ACAT I. There are three major acquisition categories stipulated by regulation in DOD: ACAT I, ACAT IA and ACAT II. ACAT ID (defense) and ACAT IC (component or individual service) are analyzed in more detail subsequently.

Responsibility for coordinating the components of the acquisition funding process rests ultimately on individual program managers (PM). As the lead acquisition official for a program, the program manager is charged with integrating the administrative demands of PPBES (e.g., how much to ask for in the budget process) with the management demands of the acquisition process (e.g., meeting milestone requirements in acquiring weapons and weapons support systems). The process for major acquisition programs (ACAT I) is the most complicated, has the highest level of importance and, normally, the largest financial exposure. Consequently, this category receives the greatest oversight attention from various offices within the DoD and from Congress (Bendorf, 2000). An ACAT I program manager has to meet strict qualification requirements, higher than those for non-ACAT I program managers. Training and experience requirements are designed to select program managers who possess a broad base of acquisition experience. PMs must be or become adept at the skills of managing acquisition while also operating effectively as proponents and defenders of their programs in the programming and budget processes. Without proper positioning in the PPBES process, a weapon system can be designed and tested and still not be acquired because it does not survive the gauntlet of the PPBES and congressional review and decision processes.

Within PPBES, once a system has been identified as necessary to meet mission requirements (in the planning phase of PPBES) it has to be reviewed for inclusion in the Program Objective Memorandum (POM). The POM is constructed separately by each military service and department. For example, the Navy official responsible for preparing the POM is the Chief of Naval Operations (CNO) and the CNO staff (OPNAV). The POM and budget processes used to operate separately and sequentially. However, in 2001, Secretary of Defense Donald Rumsfeld required that the POM and budget processes operate concurrently.

According to the new process, once the POM and budget are approved by the service chiefs, e.g., the CNO for the Navy, the POM is sent to the Service Secretary (Secretary of the Navy) and then the program review staff of the Office of the Secretary of Defense. Military service and department (MILDEP) acquisition executives (Assistant Secretaries for Acquisition and related functions—also referred to as Component Acquisition Executives or CAEs) compile and review requirements for defense acquisition programming and budgeting before the POM and budget are forwarded to SECDEF staff—specifically to the Under Secretary for Defense for Acquisition (USDA, or, currently, the USD AT&L—Under Secretary of Defense for Acquisition, Technology and Logistics).



The Under Secretary of Defense for AT&L and staff review requests from the military services and departments to establish an Acquisition Program Baseline (APB) and budget for all of the DoD. This step requires an agreement between the Milestone Decision Authority (MDA) manager in the Office of the Secretary of Defense for Acquisition and the PM on the cost, schedule, performance objectives and thresholds of all acquisition programs. The Acquisition Program Baseline (APB) contains the most important cost, schedule, and performance parameters and is updated as required.

Weapons program officials establish the Acquisition Program Baseline (APB) to document the cost, schedule, and performance objectives and thresholds for their program. The program manager prepares the APB at program initiation for acquisition category programs, at each subsequent major milestone decision, and following a program restructure or an unrecoverable program deviation. APBs contain objectives for cost, schedule, and performance parameters, as noted above. The specificity and number of performance parameters evolve as the program is better defined. The schedule parameters include program initiation, major milestone decision points, initial operating capability and any other critical system events. These critical events are proposed by the PM and approved by the Milestone Decision Authority (MDA) for each program.

Maximizing PM flexibility to make cost, performance and schedule tradeoffs without "too much" higher-level review and micromanagement is deemed essential to achieving programmatic objectives from the view of the program office. Therefore, creating an executable agreement and sustaining consistent milestone reporting in conformance with the APB is a critical task for the PM. The level of ACAT designation (e.g., I, II, etc.) normally is assigned after approval of the operational requirements document (ORD) by the MILDEP and USD (AT&L). A proposed ACAT designation is provided in the requirements document.

THE DEFENSE ACQUISITION BOARD AND THE DEFENSE PROGRAM AND BUDGET

In the acquisition resource decision process, the intended weapon's user (e.g., the Army) identifies an operational need that cannot be satisfied by anything but a fixed asset (weapon, system or platform) and produces a Mission Need Statement (MNS). Once the MNS is approved by the service Chief of Staff and validated by the Joint Chiefs' of Staff (JCS) Joint Requirements Oversight Council (JROC), the USD (AT&L) convenes the Defense Acquisition Board (DAB). The DAB is the Defense Department senior level forum for advising the USD (AT&L) on critical decisions concerning ACAT I programs (see exhibit 20). Some programs are administered at the DoD level and others at the military departmental level. The USD (AT&L) is the milestone decision authority (MDA) for "ACAT ID" programs where the "D" stands for defense. The service component is the milestone decision authority (MDA) for "ACAT IC" programs, where the "C" stands for component, e.g., Army, Navy, Air Force. For example, the Navy MDA is the Assistant Secretary of the Navy (Research, Development and Acquisition).

The DAB is comprised of DoD senior acquisition officials. The DAB reviews the mission needs statement (MNS) and makes recommendations to the Milestone Decision Authority (MDA) for concept studies of a minimum set of alternatives. This review and MDA approval constitute the Milestone 0 decision point. The MDA oversees the "concept studies" and approval process and directs the initiation of Phase 0 (concept exploration and definition) with an acquisition decision memorandum (ADM).



Milestones are major decision points for weapons systems. The milestone review process is predicated on the principle that systems advance to higher acquisition phases by demonstrating that they have met prescribed technical specifications and performance thresholds. For all ACAT I programs, a lifecycle cost estimate is prepared by the program manager in support of program initiation and all subsequent milestone reviews. For example, the Navy program manager establishes, as a basis for lifecycle cost (LCC) estimates, a description of the salient features of the acquisition program and of the system itself (Department of the Navy, 2002b). The LCC estimate plays a key role in the management of an acquisition program. At each milestone decision point, including the decision to start a program, lifecycle costs, cost, performance, schedule tradeoffs, cost drivers and affordability constraints are major considerations. Here the primary purposes include providing input to acquisition decisions among competing major system alternatives. Lifecycle costs (LCC) help determine requirements. Cost Drivers are identified among alternatives. LCC also provide an index of merit for trade-off evaluations in design, logistics, and manufacturing and the basis for overall cost control.

In budget preparation, various Departmental components initiate the process and state their spending and execution priorities. For example, the Navy Component Acquisition Executive, Assistant Secretary of the Navy, Research, Development and Acquisition (ASN RD&A) prepares the budget-estimate request for Navy ACAT I programs in support of Milestones II and Milestone III. Once the budget is enacted, the ASN (RD&A) exercises line management over Program Executive Offices (PEOs) and direct reporting program managers (Department of the Navy, 2002b). The PEO generally relies on hardware systems commands for administrative support, including comptroller functions for financial management. Once the budget begins the execution phase, the fund-flow for both PEO and hardware systems commands comes within a single conveyance via a normal path for appropriations. The PEO exercises control of designated resources within the hardware systems command allocation.

Once the programs and budgets for each military department have been reviewed by the Defense Acquisition Board, they are included in the approved SECDEF POM and, subsequently, in the DoD budget. The defense acquisition budget is merged with the budget comprised of all spending accounts by the Assistant Secretary of Defense, Comptroller and, once approved by SECDEF, is sent to the President's Office of Management and Budget for inclusion in the documents to be presented to Congress, where it then follows the normal appropriation process.

ISSUES IN BUDGETING AND MANAGING OF WEAPONS ACQUISITION

Members of the legislative and executive branches, including the Department of Defense, the military departments and services, defense agencies, program managers and special industry interest groups all are involved in budgeting for the acquisition of defense weapons. In the acquisition process, program managers must give specific attention to their actions and responses toward their external political and budgetary environment. However, dealing with the complexities of acquisition budgeting requires the attention of all players in the process. A number of issues seem to persist over time to confront acquisition budgeting. Some of the more important of these issues are addressed as follows.

Congress regards the President's budget as a statement of executive priorities to address the national interest and constituent needs. Congress also has its ideas about national priorities and constituent needs. Thus begins a long process of debate and amendment before a final appropriation is made to fund the new fiscal year needs. The FY 2003 budget proposed an



addition of \$48 billion for national defense (see Exhibit 5). This represented a 13 percent increase in constant dollars—the greatest one-year increase since the defense build-up of the 1980s (Department of the Navy, 2002a). Defense outlays were projected to approach 3.5 percent of Gross Domestic Product in FY 2003, the highest levels since 1995. In contrast, during the mid-1980s defense spending averaged nearly 6 percent of GDP. Included in this request was \$10 billion designated as “wartime contingency” for combating terrorism in Afghanistan or other locations, including Iraq. Funding for acquisition was increased by 13.2% in FY2003 budget.

Exhibit 5. Actual FY 2002, Estimated FY 2003, Requested FY 2004-2005 Funding

Procurement	Actual 2002	Estimate 2003	Request 2004	Request 2005
	62,227.2	70,430.9	72,746.5	77,187.3
Percent change		13.2%	3.3%	6.1%

Source: (Department of Defense, 2003e).

After 2003, the President’s FY 2003 budget projected a much slower growth in budget authority for defense—for an average annual rate of 3.2 percent through 2012 (Department of Defense, 2003c). In the end, Congress, caught between defense hawks and tax cut hawks and other pressing needs, basically accepted the President’s budget, making only marginal changes in the appropriation bill while reacting to specific defense and homeland security needs with a series of large supplemental bills. Altogether, the DoD appropriation increased 29% for FY98 through FY2003, while the procurement account increased 42% for the same period. These were the largest increases since the Reagan buildup of the early 1980s. Nonetheless, they did not solve DoD problems with aging weapon systems and the need for recapitalization (e.g., buying ships, aircraft, and tanks on a planned replacement schedule to modernize the inventory). Meanwhile, SECDEF Rumsfeld pursued transformation efforts as a way around the fiscal dilemma to provide a more agile, more lethal force. These issues and their resolution demonstrated the inevitable tension in funding national defense between how much is enough and how much can be afforded. The perception of threat is crucial and relative; it is always open to interpretation. Further, constituent demands for defense spending, and particularly for acquisition dollars, typically is well-represented—new acquisition programs often mean new jobs and increased revenues to companies in the defense industry.

There is no magic number for spending for weapons asset acquisition. The Pentagon wants as much money as would seem commensurate with meeting the threat and realistic program development and execution. However, defense cannot have it all, and Congress often articulates and debates the tradeoffs that must be made between “guns and butter.” Some insiders believe the defense acquisition budget process is best characterized as a reaction to contingencies. The budget is expected to respond to contingencies in the external threat environment and the changing political priorities of the President and Congress. Further, the change in the annual defense budget is in many ways less important than the trend represented in the President’s projected requests for future years and Congressional Budget Resolution out-year spending targets.

The debate about how much spending is enough in effect results in a *de facto* multi-year budgeting approach for defense and acquisition, subject to annual revision. Budgeting for the rest of the discretionary budget generally focuses more on annual appropriations. In this respect, national defense budgeting is different. The stakes are higher when budget decisions over annual spending in the tens or hundreds of billions of dollars are accumulated over a multi-

year period. Only the overall federal deficit or surplus and spending for entitlement programs command the type of attention given to defense and acquisition budgets. Because the amount of spending is of such volume and magnitude, both the executive and legislative branches of government always have difficulty negotiating and reaching consensus on how much to spend, and what to spend it on. Absence of consensus tends to result in longer-term swings upward and downward, which makes acquisition of military assets harder to plan, budget, and execute (Jones & Bixler, 1992, p. 9).

Sustaining the Industrial Base for Defense Asset Production

The President's FY 2003 and out-year defense acquisition spending plan, intended to assist in recovery from defense spending cuts at the end of the Cold War, drew concerns from industry groups. Among those most vocal were defense-industry executives, including former Assistant Navy Secretary John Douglass (President of the Aerospace Industries Association), retired Air Force Lt. General Larry D. Farrell (President of the National Defense Industries Association), and former Congressman Dave McCurdy (President of the Electronic Industries). For example, Douglass remarked about ship-construction funding, "You can't maintain a defense base on five ships a year" (Douglass, 2002). A projected build rate of only five ships per year caused distress among defense-industry representatives—five was not enough in their view. They said the nation needed a viable defense industry to be prepared for a time of war and cited the reduced number of makers of major defense platforms as a cause for concern.

To combat the decline in shipbuilding and to maintain a force of 310 ships, the Navy acquisition plan includes the construction of an average of nine ships per year. However, getting the money in the DoD budget for construction at this rate has not been successful. After two DDG-51 destroyer ships were requested in the FY 2003 President's budget, the Shipbuilding Association asked Congress to add \$935 million to the budget to procure a third DDG-51 in FY 2003 and to fund advance acquisition for a third DDG-51 again in FY 2004. This increase would, "move the Navy closer" (Farrell, 2002) to the requirement that it procure four DDG-51s a year, the rate needed (according to the National Defense Industries Association) to sustain a fleet of 116 destroyers and other surface combatant ships. In response to industry lobbying, a third DDG 51 was added by Congress to the FY 2003 budget.

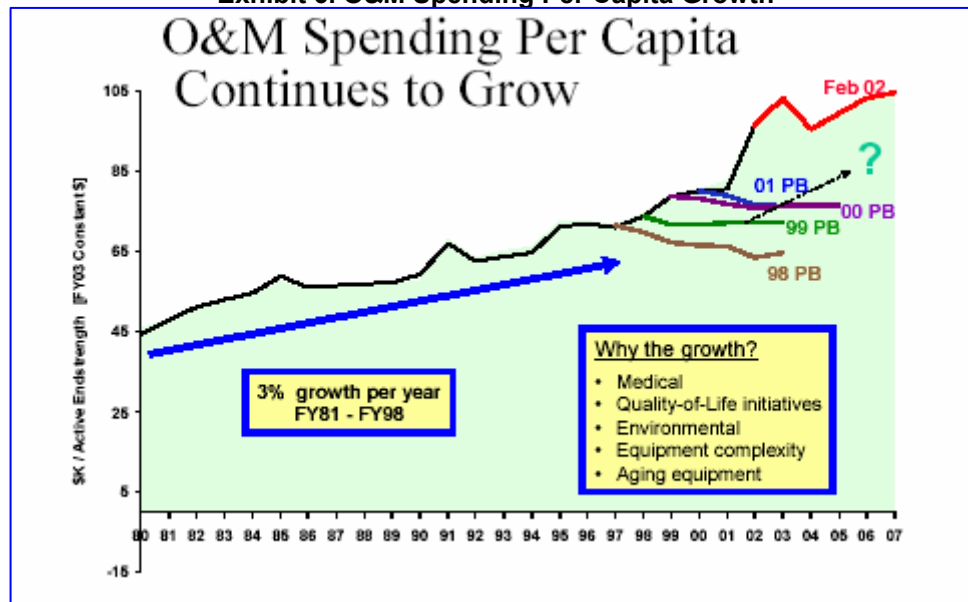
Consolidations, mergers, and bankruptcies have reduced the number of major weapons systems contractors. Contractors making Navy surface ships shrank from eight to three from 1990 to 2000, as did the number of companies producing fixed-wing military aircraft (Ahearn, 2002). As of 2003, there still were two makers of submarines, although this was only because Northrop won a bidding contest with General Dynamics Corporation. Rotorcraft makers, such as helicopters and the V-22 Osprey tilt-rotor airplane, declined from four to three, while makers of strategic missiles shrank from three to two during this period (Ahearn, 2002). The number of companies filling contracts in the undersea warfare area fell by two-thirds, from fifteen to five, while producers of torpedoes slipped from three to two (Farrell, 2002).

Farrell estimates that, "shipyards are operating at 50 percent of capacity," which is inefficient, and costs the Navy, "hundreds of millions of dollars annually" as compared to costs of operating shipyards at higher, more efficient output levels (Farrell, 2002). Rep. Norm Dicks (D-Wash.), a member of the House Defense Appropriations subcommittee, charged that the Bush administration budget fell short of what several studies showed was needed to make up for years of under-funding acquisition. The Congressional Budget Office, a trusted source for such studies, found that acquisition should have risen to at least \$94 billion (Selinger, 2002).



Congressman Dicks wrote, "The Defense Department acquisition budget is in crisis" (cited in Selinger, 2002). The Congressman said acquisition levels were not only inadequate to sustain the force structure, but were driving up operation and maintenance costs because aging weapon systems were not being replaced quickly enough. As an example, he noted that the aging Navy F-14 Tomcat aircraft experienced a 227 percent increase in maintenance hours per flying hour from 1992 to 1999. Aging equipment, increased equipment complexity, and quality-of-life issues have increased O&M spending. Although the DoD and the military departments have consistently cut O&M funding over the past five years to shift money to acquisition, Exhibit 6 shows the continued overall growth in O&M dollars as a result of aging equipment, environmental clean-up costs, medical care cost increases and so on. Not only have O&M costs grown, but they have grown faster than anticipated. As can be seen from the Exhibit, each year from 1998 through 2001, the President's budget (PB) anticipated a decline in O&M spending per capita; yet, in reality it grew, and grew by more than its historical average of 3% a year from FY81 to FY98.

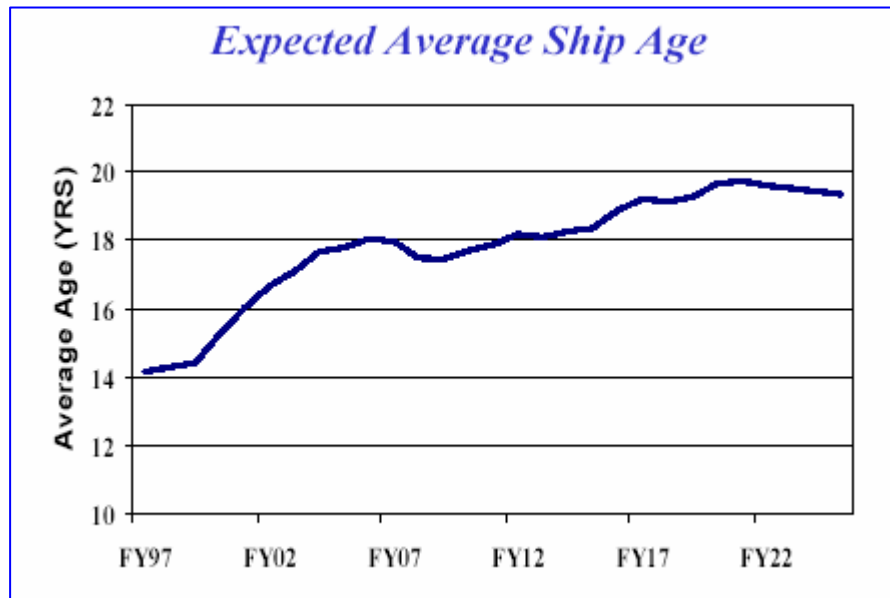
Exhibit 6. O&M Spending Per Capita Growth



Source: (McCaffery & Jones, 2004).

Secretary of Defense Donald Rumsfeld indicates that the low rate of ship production was not a problem in the near term due to the relatively young age of the fleet, averaging 16 years in 2002 (Wolfe, 2002). However, the expected average ship age is projected to increase, as shown in Exhibit 7. As fewer ships are built, the average age of ships increases; likewise, maintenance and repair costs also should increase. Secretary Rumsfeld was critical of the trend allowing the aging of Navy combat assets (Rumsfeld, 2002). Congressional efforts to add acquisition dollars into the budget over the President's request for recapitalization have been directed towards reducing fleet average age, which also would reduce some O&M costs. The Navy has had to make difficult choices in its budget to fully fund spare parts, munitions and steaming hours, as well as adding capability through ship conversion.

Exhibit 7. Expected Average Ship Age



Source: (McCaffery & Jones, 2004)

The Future Years Defense Plan calls for a build rate of five ships in FY 2004, seven in FY 2005, seven in FY 2006, and ten in FY 2007. Rumsfeld indicated that contractor problems and more realistic cost estimates for weapons systems by the DoD raised costs and resulted in fewer ships requested in FY 2003 (Defense Daily International, 2002, p. 23). Rumsfeld noted that the military services traditionally have underestimated contract costs. For example, in FY 2003, the Navy paid \$600 million for past shipbuilding bills resulting from previously underestimated costs. Rep. Gene Taylor (D-MI) suggested to Rumsfeld that the real problem was not enough contracts and not enough money for shipbuilders. Taylor told Rumsfeld that no company would try to build a shipyard given the poor return on current shipyard operations (Defense Daily International, 2002, p. 23).

In 2005, GAO (GAO, 2005b) reported a study of eight ship construction projects, each at about the 30% completion stage. Half of the eight were first ships in a new class; the rest were more mature shipbuilding programs where there was greater certainty about costs. GAO found significant cost growth. Budgets for the eight ships required increases of \$2.1 billion and increase of 11.3% over the original \$18.5 billion budgeted. GAO estimates that by the time the ships will be finished the cost overruns will reach \$3.1 billion, or 16.7% more than the original appropriation. These overruns are significant both in percentage and dollar terms.

GAO concluded that the cost growth happened for several reasons. First, shipbuilders reported that “design modifications, the need for additional and more costly materials, and changes in employee pay and benefits” were the key causes of this growth. For example, the San Antonio class lead ship continued to experience design changes “even as construction began” and this “required rebuilding of completed areas to accommodate the design changes.” Secondly, materials costs were “often underbudgeted as was the case with the Virginia class submarines and the Nimitz class carriers” (GAO, 2005b, Highlights). GAO concluded that Navy practices for estimating cost, contracting, and budgeting resulted in unrealistic funding of shipbuilding programs. GAO also noted that the Navy does not account for the probability of cost growth when estimating ship costs and does not do an independent cost estimate when substantial changes are made in the design (GAO, 2005b, Highlights). Finally, GAO noted that

incomplete and untimely reporting on the shipbuilding programs delayed the identification of problems and hampered Navy's ability to correct those problems. GAO (2005b, p. 5) also noted that during the 1980's, when the Navy was building about 17 ships a year, fiscal shortfalls and overruns could be smoothed out by making funding adjustments for under-spending programs from over-spending programs. Since 1999, however, the Navy has built an average of six ships a year, and this kind of smoothing is no longer possible—making accurate systems fiscal forecasts all the more important.

In the GAO study, about 38% of the cost growth was due to cost growth in materials; most of the rest was due to labor hour increases, either in direct labor or overhead. About five percent of the cost growth was due to the cost increase in Navy-furnished equipment. In regard to materials cost growth, GAO feels the Navy does not provide sufficiently for cost growth in the estimate. Yet, this is a difficult question to solve politically. An overly-generous estimate of materials cost growth could push the total cost of the program beyond what is acceptable within the current year topline limits, i.e., it could become too expensive to buy. No doubt one of the main contributing factors here is the small number of ships currently being built. Ships normally take from 4 to 7 years to build (according to GAO), and all programs have glitches here and there; thus, when the Navy was building 17 ships a year, smoothing the curves between fiscal under-runs and over-runs was easier. With six ships a year this “smoothing” becomes more difficult, if not impossible. Moreover, the Navy is at a point where almost all of its ship construction is transformational, i.e., first ship of a new class. What this means is that design changes are likely to become more, rather than less, likely. The tables below from the GAO study indicate what the shipbuilders reported as the reasons for cost growth, first in materials and then in labor rates and overhead (See exhibits 8 and 9: GAO 2005b, Tables 8 and 10).

Exhibit 8. Reasons for Materials Cost Growth

Table 8: Reasons Given by Shipbuilders for Material Cost Growth

Case study ship	Reasons for growth
DDG 91	<ul style="list-style-type: none"> Consolidation with Northrop Grumman allowed for quantity material buy savings
DDG 92	<ul style="list-style-type: none"> Rework requiring additional tools, utilities, and shop stock Information technology costs shifted from overhead to materials
CVN 76	<ul style="list-style-type: none"> Increases in costs for specialized materials Underbudgeted material costs Accounting changes Additional subcontracting
CVN 77	<ul style="list-style-type: none"> Increases in costs for specialized materials Underbudgeted material costs
LPD 17	<ul style="list-style-type: none"> Subcontractor engineering design efforts Design tool development, originally assumed to be funded by the state resulted in additional costs to Northrop Grumman.
LPD 18	<ul style="list-style-type: none"> Increases in LPD 17 translated into more costs for LPD 18
SSN 774	<ul style="list-style-type: none"> Lack of suppliers for highly unique materials Immature design on material components
SSN 775	<ul style="list-style-type: none"> Lack of suppliers for highly unique materials Nonrecurring costs for computer integration

Sources: Shipbuilder (data); GAO (analysis).

Source: (GAO, 2005b, p. 16: Table 8).

It is apparent from the breakdown above that the problem is more difficult than simply estimating what inflation will be four to seven years into the future and building it into the baseline estimate of the ship. Taken together with Exhibit 10, this information suggests that

whatever happens in the greater society also impacts these shipbuilding programs, including corporate mergers, increases in cost of specialized materials, lack of suppliers for highly unique materials, failure of the state to make good its promise to pay its share of tool development, health care cost increases, fluctuations in financial markets that change pension costs, union negotiations and the ebb and flow of work itself and its impact on overhead rates. All of these factors make it difficult for precise acquisition and budget-cost estimates.

Exhibit 9. Reasons for Overhead and Labor Rate Cost Growth

Table 10: Reasons Given by Shipbuilders for Overhead and Labor Rate Cost Growth

Case study ship	Reasons for growth
DDG 91	<ul style="list-style-type: none"> • Pension plans affected by financial market changes • Increase in medical benefit costs • Union negotiations increase labor rates • Loss of workload
DDG 92	<ul style="list-style-type: none"> • Medical care cost increases due to inflation and loss of favorable medical care contract • Loss of workload
CVN 76	<ul style="list-style-type: none"> • Changes in accounting of overhead • Union negotiations following strike increase labor rates
CVN 77	<ul style="list-style-type: none"> • Changes in accounting of overhead • Union negotiations following strike increase labor rates • Medical care cost increases • Capital investments • Pension plans affected by financial market changes • Workload changes
LPD 17	<ul style="list-style-type: none"> • Pension plans affected by financial market changes • Loss of anticipated workload • An over 2-year delay in lead ship delivery and change in the procurement schedule
LPD 18	<ul style="list-style-type: none"> • Pension plans affected by financial market changes • Loss of anticipated workload • An over 2-year delay in lead ship delivery and change in the procurement schedule
SSN 774	<ul style="list-style-type: none"> • Changes in pension, health care, and workman's compensation • Overhead rates decreased due to increased workload
SSN 775	<ul style="list-style-type: none"> • Loss of expected business and training new workers • Additional costs to restart submarine production capability at the shipyard

Sources: Shipbuilder (data); GAO (analysis).

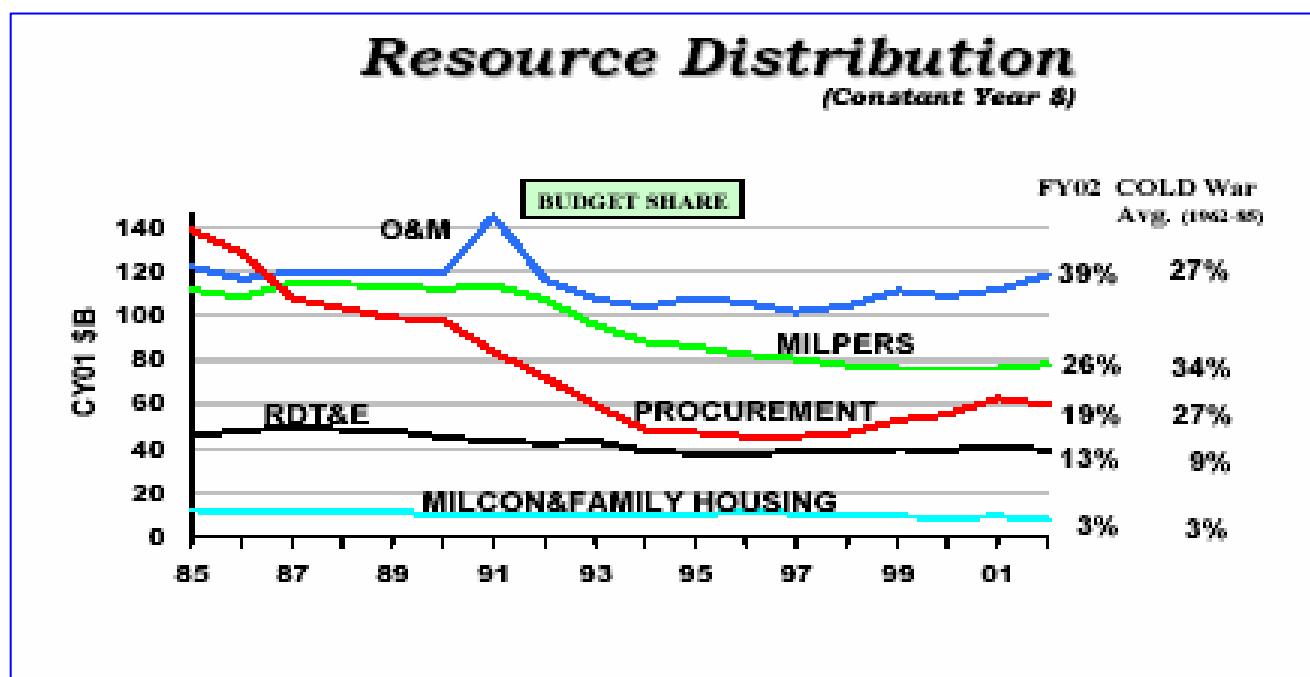
Source: (GAO, 2005b, p. 18: table 10).

Increased Operation and Maintenance Spending versus Acquisition Investment

As shown in Exhibit 10, O&M costs have increased since 1997 and comprised a 39% share of the DoD budget in FY2002—substantially more than their Cold War share. The decline in procurement from Cold War levels is evident. Moreover, according to the GAO, the DOD 2001 Future Years Defense Plan consistently understated cost and overstated savings projections in Operations and Maintenance (GAO, 2000c). The core problem is that planned spending increases for acquisition may be squeezed out to pay for operations and maintenance funding shortfalls. According to GAO, analysis of the costs, benefits, and alternatives for defending U. S. forces and assets by the DoD is weak and needs to be improved (GAO, 2001a). GAO suggested that better analysis was needed to allow decision makers in the DoD and Congress to make decisions on the number of missiles to buy. Exhibit 10 also shows the DoD

spending by primary account in 2001 constant dollars and as percentage of total expenditures from the Cold war years to 2002.

Exhibit 10. DOD Resource Shares (FY 2001 Constant \$B)



Source: (McCaffery & Jones, 2004).

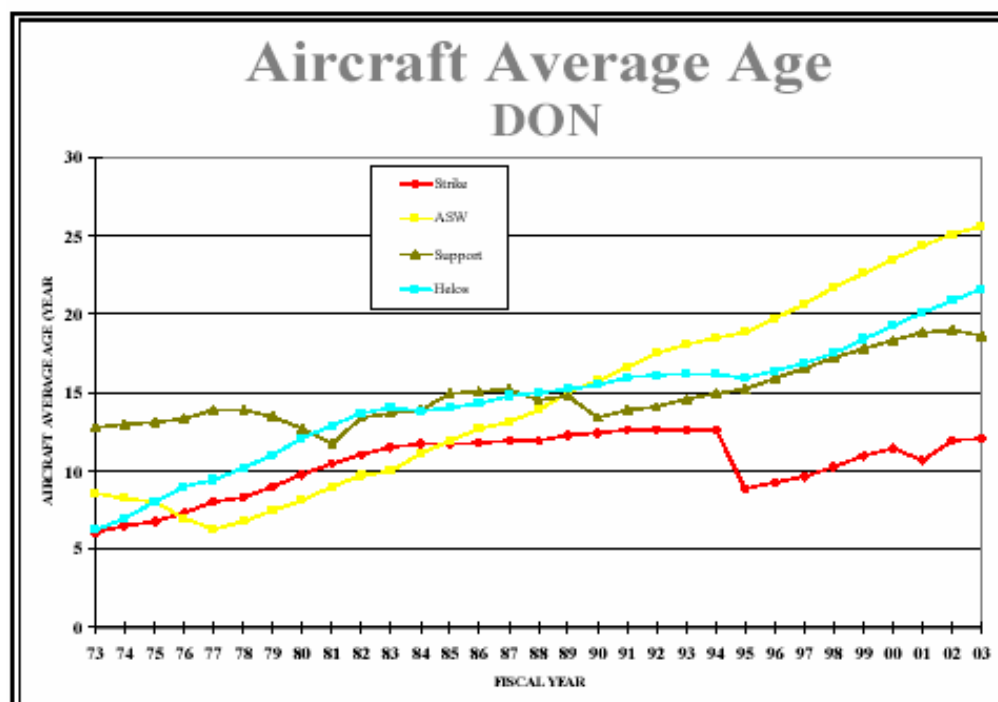
The increased ship operating tempos (OPTEMPO) in the war on terrorism has resulted in increased depot maintenance costs (Department of the Navy, 2002a). In 1993, the Navy had 108 ships forward deployed; this represented 24 percent of its 458 ship battle force. In 2003, the Navy projected that 87 of its 308 ships would be deployed—28 percent of the battle force (Department of the Navy, 2002a). In fact, this estimate was low due to the size of the force needed to support the war in Iraq. The high rate of utilization along with the aging of assets inevitably results in depot maintenance for ships and other assets that exceed costs projected in budgets (Department of the Navy, 2002a). It would appear that reductions in operations and maintenance spending and military personnel appropriations are necessary to generate the savings required to adequately fund ship and other weapons modernization. However, just the opposite trend is in progress. In 2005, Army budgets were increased in the supplemental appropriation, both for personnel costs and in expenditures for transformation. This will lead to increases in future-year personnel costs and in the O&M accounts in the annual budget and, absent future topline relief, may lead to compression in the Navy procurement accounts.

Limited Funds Force Acquisition Trade-offs

In 2002, Admiral Vern Clark, the CNO, observed that the Navy needed \$12 billion more per year than it was receiving to buy aircraft, ships and other major weapons systems. Clark indicated that the Navy must make a \$12-billion-a-year commitment to shipbuilding to have an adequate Navy in the future. “We can’t undo what has happened over the course of years in under-funding acquisition accounts,” Clark said in arguing that acquisition accounts must grow over the FYDP. “We must buy more ships and aircraft to meet the needs of tomorrow’s Navy” (Aerospace Daily International, 2002, p. 10). Years of under-funded weapons acquisition

programs have also contributed to aging aircraft. Exhibit 11 shows the increasing average age of Navy aircraft by category.

Exhibit 11. Average Navy Aircraft Age



Source: (McCaffery & Jones, 2004).

The trade-offs forced by limited funding for acquisition have produced heated discussion both inside the pentagon and in Congress. For example, the controversial acquisition of the Joint Strike Fighter (JSF) has competed with and driven out acquisition dollars for other assets for all of the military services. In essence, the JSF acquisition is the initiative of the DoD to attempt to save money by buying a single aircraft type that all services can use for strike capability. Funding for the JSF has been taken from each of the military service budgets, thereby reducing funding to support development and delivery of other systems. Former Secretary of the Navy, Gordon England, told the Senate Armed Services Committee in 2002 that the Navy had funded the JSF program adequately. The Navy provided \$1.7 billion to the Lockheed Martin Joint Strike Fighter (JSF) when it could have bought other aircraft such as the F/A-18 or other aircraft or ships. The JSF is intended to enhance Navy strike capability for future war fighting forces (Defense Daily, 2002, p. 4). However, the issue for the Navy and other services is how to sustain acquisition of other assets while paying for this expensive program.

For the Navy, funding the shipbuilding program remains a critical problem. In House defense appropriations hearings, Representative Jo Anne Davis (R-VA) noted that shifting future carrier acquisition by one year and moving the DD-21 acquisition program into a research and development program rather than an actual buy would result in a “huge dip” in the future work force at Northrop Grumman Newport News Shipbuilding. “Right now, they’re having problems with their work force,” she said, adding that it was difficult to hire specialized shipyard workers again once they are let go (Davis, 2002). Congressman Rob Simmons (R-CT) said that laid-off workers at General Dynamics (GD) Electric Boat submarine facility often required at least two years to get their security clearances back once they are rehired (Defense Daily International, 2002, p. 23).

Congressman Reed, whose state is home to the GD Electric Boat facility, stated that buying one new attack submarine a year (as planned in the 2001 Quadrennial Defense Review) would not be adequate to sustain a fleet of 55 attack submarines. An attack submarine's life is about 30 years. Reed said the acquisition rate of two attack submarines has been proposed for years, but has been continually put off due to budget constraints. He warned that further delays in increasing the rate would create a deeper acquisition shortfall that would be even harder to overcome (Defense Daily , 2002, p. 23). The Shipbuilding Association proposed that Congress add \$415 million to the Bush administration budget to fund advance acquisition to allow the Navy to reach an acquisition rate of two attack submarines a year by FY 2005.

Infrastructure Reduction Savings Do Not Always Result

Over the past decade, proposals to reduce and streamline DoD infrastructure have been debated, and some have been implemented to generate savings to modernize weapon systems (GAO, 2001a). DoD officials have repeatedly emphasized in congressional budget hearings the importance of using resources for the highest priority operational and investment needs. Infrastructure reductions are difficult and painful because achieving significant cost savings requires up-front investment, closure of installations, and the elimination of military and civilian jobs. Further, promised infrastructure savings have not fully materialized. While it is expected that the next round of base closure and realignment in 2005 will be significant, it is also clear that past efforts to cut bases have not saved what was projected.

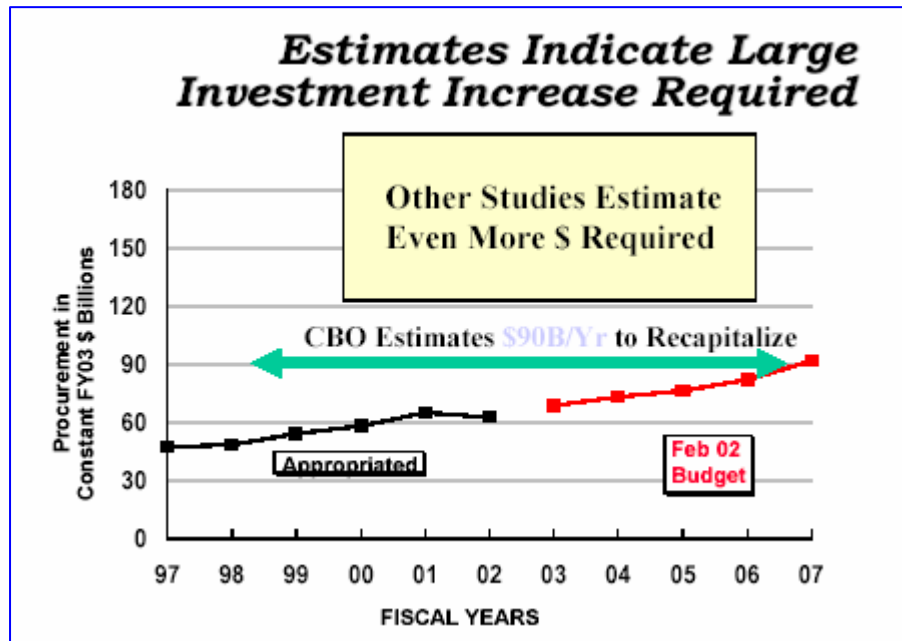
The 1988, 1991, and 1993 base realignment and closure (BRAC) produced decisions to fully or partially close 70 major domestic bases and resulted in a 15-percent reduction in plant-replacement value. Between FY 1996 and FY 2001, no significant savings resulted from infrastructure reforms; the proportion of infrastructure spending in DoD budgets remained constant. The 1995 BRAC was supposed to reduce the overall domestic base structure by a minimum of another 15 percent, for a total 30 percent reduction in DoD-wide plant-replacement value. However, the 1995 closures and realignments resulted in a total reduction of approximately 21 percent, 9 percent short of the DoD goal (GAO, 2001e). Still, 21 percent is a significant savings.

Inadequate FYDP Estimates for Acquisition

The DoD has attempted to re-sequence its acquisition spending timelines. The Department has reduced planned acquisition in successive FYDPs and has reprogrammed some acquisition to the years beyond the FYDP. Optimistic FYDP planning results in uncertainty with regard to defense priorities. The result of all this is that tough decisions and trade-offs have been avoided and pushed into the future (GAO, 2001a). Exhibit 12 illustrates that, according to the Congressional Budget Office, a large investment increase will be required to make up for deferred funding. This view conforms to that of the military departments. The challenge for senior DoD officials and program managers is how best to maximize weapons acquisition dollars in an uncertain funding environment where competing demands are numerous. The debate in 2005 clearly revealed that the number of ships that could be appropriated had decreased because each ship was more expensive. DoD planners pointed to increased capability and noted that warplanners now talk about targets per sortie, rather than sorties per target due to the increased capability of weapons systems. Even so, the turbulence around acquisition estimates in FYDP's remains as expected ship numbers decrease with each new FYDP.



Exhibit 12. Large Investment Increase Estimates



Source: (McCaffery & Jones, 2004).

Uncertainty and Low Rates of Initial Production

Program managers have been forced to sponsor low rates of initial production (LRIP) of military hardware by industry because of inability to demonstrate that weapon systems will work as designed. However, on many buys the DoD still has begun full-rate production of major and secondary weapons without first ensuring that the systems meet critical performance requirements. For example, the F-22 aircraft program involves considerable technical risk because it embodies technological advances critical to its operational success. Nevertheless, the DoD and the Air Force began production of the F-22 aircraft well before beginning initial operational testing, committing to a buy of 70 aircraft at a cost of \$14 billion before initial operational testing was complete (GAO, 2003c). The General Accounting Office has reported that DoD policy to begin low-rate initial production of weapons with little or no operational testing and evaluation (OTE) has in some cases resulted in acquisition of substantial quantities of unsatisfactory weapons (GAO, 2003c).

Operational Test and Evaluation (OTE) is the primary means of assessing weapon system performance in a combat-representative environment. It consists of field tests, conducted under simulated “realistic” conditions, to determine the effectiveness and suitability of a fixed asset for use in combat by military users. The options available to the DoD and Congress are significantly limited when a system proves deficient. Used effectively, OTE can be a useful internal control tool to ensure that decision makers have good information about weapon system performance (GAO, 2003b). The decision to proceed with production should be made with OTE data because, in many cases, the LRIP is also the *de facto* full-rate of production. The primary problem with low initial rate of production is that unit costs are higher. This puts additional pressure on already under-funded projects (GAO, 2003c).

Too often under current practice, program managers begin production of weapon systems before development, and operational testing and evaluation (OTE) is complete. When

this strategy is used, critical decisions are made without adequate information about demonstrated operational effectiveness, reliability, logistics supportability, and readiness for production. Rushing into production before critical tests have been successfully completed results in purchase of weapon systems that do not perform as intended. Premature purchases have resulted in lower-than-expected availability for operations, higher maintenance, and often have led to expensive modifications. However, there are some advantages to properly managed and executed LRIP. LRIP can shorten the acquisition lead-time when utilized in combination with risk-mitigation techniques such as adequate testing and evaluation (Yoder, 2003).

Underestimation of Program Costs

The prevailing DoD acquisition culture continually generates and supports acquisition of new weapons. This is the role expected of spending agencies in the budget process (McCaffery & Jones, 2001, 164-165). Also typical is the presence of incentives, augmented by special-interest lobbying, to override the need to meet weapon requirements at minimal cost. As a result of this, the desire not to underestimate costs and to obtain some slack in the budget, program managers often exhibit a tendency to overestimate future funding and to underestimate program costs. This results in the creation of more programs than can be executed. The discovery of inadequate estimates also tends to undermine trust in the program manager (PM) and program.

In defense of the PM, there are increased costs of doing business where budgets are constrained, as noted above with low initial rates of production. For example, program managers often have to reduce, delay, and stretch out programs as ships get more expensive or as appropriations are smaller than expected; this substantially increases the acquisition and lifecycle cost of systems. In addition to the higher unit costs caused by program stretch-outs, the primary downside to the mis-estimation problem is the inability to address valid requirements because resources have been consumed on lower priority projects that were thought to be affordable due to poor cost estimation (GAO, 2003b).

Pressure to Reduce Acquisition Cycle Time and Unreliable Cost Estimation

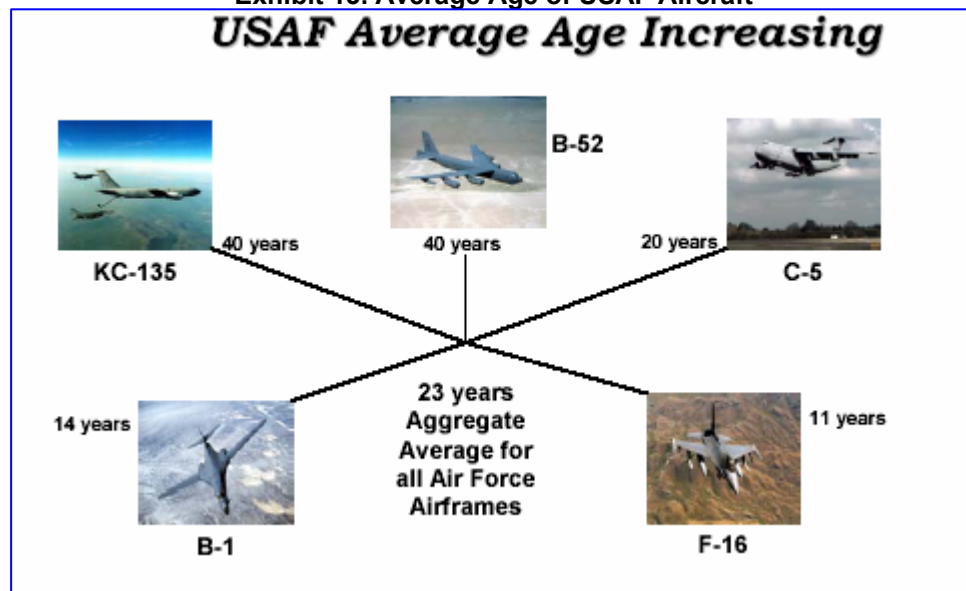
The DoD has a compelling need to accelerate the weapon systems acquisition cycle so that weapons are fielded more quickly. It is not in the interest of the fighting forces to take ten to fifteen years from planning for requirements to fielding weapons. An additional incentive to reduce cycle time is to lower average unit production costs. The Department has a goal to increase acquisition spending through "recapitalizing" about \$10 billion dollars per year in the next decade by shifting funds to acquisition from other accounts. The DoD Inspector General (IG) expressed doubt that planned actions will free up the amount of funding required. The IG has reported that a significant gap exists between weapon-systems-modernization requirements plans and planned funding shifts and savings (Department of Defense, 2003b).

To make matters worse, in some cases program sponsors have made unrealistically optimistic assumptions about the pace and magnitude of technical achievement, material costs, production rates and savings. Some savings, anticipated as a result of increased industry competition to keep cost low by presenting attractive milestone schedules, appear to be unjustified. Budget problems are inevitable when weapon systems cost more to acquire than estimated, take longer to field, and do not perform as promised. This occurs when careful cost estimation is secondary to the speed of fielding a new system (GAO, 2002b). Here, the program manager faces a "Catch 22" situation; either meet the need for faster acquisition or reduce costs—the PM is required to promise both results when this outcome is unlikely.



The DoD continues to pursue a number of major defense acquisition programs on the assumption that savings needed to complete an economical buy will materialize. Far too much weapons-acquisition planning is based on overly optimistic assumptions about the maturity and availability of enabling technologies. The result is that DoD program and spending plans generally cannot be executed within the funding available (GAO, 1997b). Numerous problems persist in DoD and congressional budgeting and spending practices for weapon system acquisitions, suggesting that wants and needs are not balanced within affordability limitations. In 2002, the Air Force had a clear need for force structure modernization (see Exhibit 13), but no one was able to identify where the money would come; thus, the Air Force had to plan for force modernization without identifying the funding sources in the outyears of the FYDP. This is not uncommon; it sometimes appears as “taking a negative wedge against personnel” in anticipation of savings, but when the need is large and the personnel account itself is under pressure from other tensions, this practice is counterproductive.

Exhibit 13. Average Age of USAF Aircraft



Source: (McCaffery & Jones, 2004).

Obsolete Systems Requirements

One of the tensions in the POM process currently is whether to prepare for a peer competitor in the near future (2015 or 2020) or to divert weapons system dollars totally to the War on Terrorism. Wisdom lies in doing both, of course, but this is harder than it seems. The result: some weapon systems are still under development with production rates which appear designed to meet warfighter needs of a decade past or more. Even though the Cold War threat upon which they were justified has disappeared, many anti-Soviet designed systems are still purchased by the DoD. These may meet the threat of a new peer competitor. Analysts who do not fear the rise of a peer competitor or who assume the threat can be negotiated away view these systems as obsolete Cold War relics. These feel obsolete requirements and solutions are wasteful and consume dollars needed elsewhere in the acquisition budget (GAO, 1997b). Continued acquisition of weapons and systems that do not satisfy the most critical current and future weapon requirements, along with continued commission of plans for more acquisition to programs than cannot reasonably be expected to meet future needs (and may not even be available in future) impairs efficient resource allocation in the DoD. This situation is intensified as the cost for obsolete weapons systems continues to rise while performance becomes

increasingly inadequate to the current war fighter. Further, delivery schedules continue to slip on modernization; some of them fail to meet current needs. Exhibit 14 shows the rising average cost of weapon replacement.

Exhibit 14. Fielded and Replacement System Cost Comparison

<i>Fielded and Replacement System Cost Comparison</i>				
Fielded System Unit Cost*		Replacement System Unit Cost*		
			Service Est	CAIG Est
F-15C	45.2	F-22	99.8	124.0
SSN 688	845.0	SSN 774	1,615.1	1,620.0
A/V-8B	29.9	JSF	51.6	70.0
OH-58D	9.8	RAH-66	23.3	27.5

***Average Procurement Unit Cost in Constant Year 2000 \$M**

Note: CAIG estimate made by DoD Cost-Analysis Improvement Group.

Source: (McCaffery & Jones, 2004).

The DoD continues to generate and support acquisition of existing weapons, supposedly modernized to meet future requirements. However, when system upgrades fail to work or are not even produced, money is wasted. Inherent in the acquisition culture are powerful incentives that influence and motivate participants in the process (i.e., the military departments, OSD, Congress, and industry) to behave in what may be termed a dysfunctional, self-interested manner. The result is that acquisition money is wasted.

It is not unusual to discover some DoD incentives which resist comprehensive force modernization and replacement of assets and coincide with special-interest pressure to override the need to meet the most critical new weapon requirements. For example, the Air Force C-17 aircraft continued production despite analysis which showed that if the C-17 program were halted at 40 aircraft, 64 commercial wide-body aircraft could be added to the existing airlift fleet for an estimated lifecycle savings of \$6 billion when compared with acquisition of a fleet of 120 C-17 aircraft. The Air Force acknowledged that there were considerably cheaper alternatives to meet airlift requirements than full production of the C-17, but delayed making a change, instead launching a new study to determine an optimal mix of aircraft to meet airlift requirements (GAO, 1994a). The C-17 continued in production despite significant schedule delays, performance shortfalls (e.g., problems with wings, flaps and slats) and cost overruns. Political pressure on the DoD from members of Congress helped keep the production line alive and caused the Air Force to incur substantial funding-opportunity costs. Cultural resistance to change, service parochialism, and public and congressional concern with the economic effects of reduced or cancelled weapons all contribute to reluctance to consider cutting programs that may no longer be effective. Moreover, since promotion goes to managers of successful programs, personal career advancement often results in some program managers pressing for continued support of their programs whether or not they meet the needs of the forces.

A number of decision points in the acquisition process exist to support the need for research on alternative systems before continuing existing weapons programs. The Analysis of Alternatives (AoA) is one such tool to determine whether weapon systems are needed. The AoA is an analysis of a proposed system's operational effectiveness related to its lifecycle costs compared to various other alternatives which could meet the mission need. Although the military services conduct extensive analyses to justify major acquisitions, these often are narrowly focused and do not fully consider alternative solutions.

The program manager's job is to provide analysis, advice and counsel to DoD acquisition executives, particularly regarding the selection and executability of proposed alternatives (Department of Defense, 2002b). Research and technology efforts are not disassociated from weapon programs until they reach the program definition and risk-reduction phase. Historically, military service analyses do not include joint acquisition of systems with other services (GAO, 1997b). Previous failed attempts at joint weapons development (such as the TFX Fighter) were due to parochialism, cultural biases and inaccurate requirement determination. In contrast, programs like the Joint Strike Fighter may prove to be a success in joint acquisition.

Because the DoD does not routinely develop information on joint mission needs and aggregate capabilities, there is little assurance that decisions to buy, modify or retire systems are based upon comprehensive assessment of all appropriate alternatives. This is an area in which the planning component of PPBES and related processes in the acquisition decision system are badly in need of transformation.

Outdated Acquisition Budget and Financial Support Systems

US defense outlays have purchased many of the world's most capable weapon systems. However, many acquisition contract administration systems and processes are costly and inefficient. The DoD continues to rely on a huge number of poorly coordinated and complex networks of financial, logistics, personnel, acquisition, and other management-information systems. Roughly eighty percent of these systems are not under the control of the DoD Comptroller or any other DoD official, including the USD (AT&L). These systems gather and store the data needed to support day-to-day management decision making. The Government Performance and Results Act (GPRA) and the Chief Financial Officer Act (CFOA) have not proven effective in forcing the DoD to reform this labyrinth of support systems, although some progress has been made.

Many DoD business operations use old, inefficient processes and outmoded "legacy" information systems, some of which were developed as long ago as the 1950s and 1960s. For example, the DoD still relies on the Mechanization of Contract Administration Services (MOCAS) system—which dates to 1968. The development of this network system has not been by design. Instead, like many DoD information systems, it has evolved into an overly complex and error-prone entity that presents many problems in use. These include the usual suspects: a lack of standardization across DoD components, multiple systems performing the same tasks, duplicate data stored in multiple systems, manual data entry into multiple systems, and a large number of data translations and interfaces that combine to reduce data integrity.

The Standard Procurement System (SPS) was intended to replace the contract administration functions currently performed by MOCAS. GAO reported that the DoD has not economically justified its investment in SPS because its analysis of costs and benefits was not credible (GAO, 2001e). Although the DoD committed to fully implementing SPS by March 31,



2000, the Department allowed this target date to slip by over 3 ½ years to September 30, 2003. Whether SPS will perform as intended once fully operational remains to be seen.

Another example of inadequate support systems is the DoD's financial-management information system. The DoD's financial systems have not been able to adequately track and report whether \$1.1 billion in earmarked funds that Congress provided for spare parts and associated logistical support were actually used for intended purposes (GAO, 2002a). The vast majority of this funding, approximately 92 percent, was transferred to military service operation and maintenance accounts. Once the funds were transferred into O&M accounts, DoD could not separately track the use of funds. As a result, Congress lost confidence in the DoD's ability to assure that the funds it received for spare parts purchases were used for that purpose. This is only one example of many that indicate the weakness in DoD financial-management systems. Problems with the DoD's financial-management operations go far beyond accounting and finance systems and processes. Wasteful contract administration practices add billions of dollars to defense acquisition costs. In the following section, we turn our attention to recent initiatives to reform the acquisition process to improve planning, budgeting, and management.

ACQUISITION REFORM INITIATIVES

The mission of the DoD continues to expand as the US faces new, more diverse, terrorist threats. Consequently, acquisition, procurement and contracting processes must become more efficient and focus on cost control. Recent acquisition transformation initiatives emphasizing continuous reform include revision of the DoD 5000-series of acquisition rules and guidelines, spiral acquisition (continuous and simultaneous program and project research, development, test, evaluation and procurement rather than serial/sequential processes), commercial off-the-shelf procurement (COTS), and the Director of Acquisition program initiative (McCaffery & Jones, 2004). During the past decade, the DoD 5000-series has been continuously revised—both as Presidential administrations changed and in response to the attempt to integrate better business practices.

In 2002, Secretary Rumsfeld directed that DoD 5000.2R would be converted from a regulatory tool to a more functional and flexible policy-guidance document. The 5000-series had, in the past, been regarded as administrative law. It demanded user requirements including the preparation operational requirements documents (ORD) and estimation of initial operational capability. The 5000.2R acquisition requirements had been firm and not subject to modification without specific waivers. However, Rumsfeld and staff, the services, and program managers recognized the need for greater flexibility to manage acquisition. The new DOD 5000.2-R document promises to piggy-back on other recent acquisition reforms, allowing greater flexibility and control for acquisition leadership. DoD 5000.2-R was revised to recommend that integrated process teams (IPT) be used during program definition to improve the specification of requirements and system supportability. In addition, program structure changes are directed to include an acquisition strategy of open systems. To maximize program effectiveness, the program manager is directed to use commercial sources, risk management, and CAIV. Reforms direct Program Managers to use program designs incorporating integrated product and process development (IPPD) and place system-engineering emphasis on production capability, quality, acquisition logistics, and open system design.

Although previous versions of the 5000-series documents have always acknowledged the desirability and need for flexible management approaches, administrative discretion, and sound business judgments in acquisition, many in the DoD have tended toward a more bureaucratic mindset of strict adherence to these documents, thereby providing them the virtual



status of administrative law. The revision of May 12, 2003, approved by Deputy Secretary of Defense Paul Wolfowitz, continued to attack this mindset by promoting flexibility, responsiveness, innovation, and streamlined decentralized management as governing acquisition policies. Further, the framework for managing acquisition programs under the current 5000-series emphasizes evolutionary and incremental strategies rather than “grand strategies” that may tend to limit flexibility, change, and innovation.

The Director of Acquisition Program Initiative is another element of acquisition reform. Annually, the Director of Acquisition Program Integration determines if each major defense acquisition program (MDAP) has reached 90 percent or more of cost, schedule, and performance parameters when compared to acquisition program baseline thresholds. The appropriate decision authority must make a similar determination for non-major acquisition programs. If ten percent or more of program parameters are missed, a timely review is required. The review addresses any breaches in cost, schedule, and performance and recommends suitable action, which may include program termination.

Major acquisition defense program baselines must be coordinated with the DoD Comptroller before approval. Cost parameters are limited to RDT&E, acquisition, the costs of acquisition of items procured with operations and maintenance funds, total quantity, and average unit acquisition cost. As a program progresses through later acquisition phases, acquisition costs are refined based on contractor actual costs from program definition and risk reduction (PDRR), engineering, manufacturing and development, or from initial production lots. Cost, schedule, and performance objectives are used in application of the cost-as-an-independent-variable (CAIV) process to set the Acquisition Program Baselines. Cost, schedule, and performance may be traded-off by the PM, within the range between the objective and the threshold, without obtaining Milestone Decision Authority (MDA) approval. This initiative is intended to improve executive level oversight and program management reporting. In addition, it may enhance executive and PM flexibility in the best use of available funding.

The reforms noted in this paper have opened a wide range of new possibilities for acquisition which the DoD is only now beginning to explore. Stimulated under the leadership of former Under Secretary of Defense for Acquisition Jacques Gansler in the 1990s and continued under the Bush administration, the pursuit of these new approaches reflects fundamentally different configurations of government-contractor relationships in acquisition. The initiatives increased outsourcing, competitive sourcing, privatization initiatives, public-private partnerships, and franchising. The outcomes of such programs remain to be assessed, but they indicate the environment of tremendous potential (and uncertainty) that now exists for acquisition policy-makers and managers.

In mid-2004, Deputy Under Secretary for Defense (Acquisition, Transportation and Logistics) John Young requested that service acquisition system commands reorganize themselves to create and clarify ownership and accountability for weapons platform, systems development and execution to eliminate poor management practices and overlapping, unclear lines of authority and responsibility characteristic of many of these commands. While this is an enormous undertaking, the commands have complied with significant redesigns of their structures and staffs. While the proof of this latest transformation effort in the acquisition commands is still in progress, many observers note that this type of change to clarify managerial and control responsibility and accountability is a long-needed improvement. However, whether the redesigned organizations will accomplish the desired objective remains to be evaluated.



To move focus briefly to the related area of contracting reform (much change has occurred in the contracting arena that is beyond the scope of this paper), as is the case for the rest of the federal government, recent trends reflect a significant increase in DoD contracting for services. Many functions that had been viewed in previous years as properly provided by government are now provided by private sources. While holding promise for increased efficiency and lower costs in service delivery, this trend raises numerous questions, e.g., how to best determine the proper definition and extent of “core” government competencies, how to design appropriate contracting mechanisms, and how to provide adequate oversight and contract management. Significant reform in education and training has been implemented in the past decade to upgrade the management capability of the DoD workforce; yet, large challenges remain, and new problems have emerged as contractors replace military and DoD employees in commands at home and abroad in the war-fighting environment.

In some cases, the appropriateness and wisdom of the roles of contractors working in military operations has provided high-visibility material for the media. As the scope of their duties also has been the subject of scrutiny from Congress, some number of highly trained special forces and other military personnel have left the services to become much more highly paid contractors. Further, the deaths of forty-two Halliburton/KBR employees (as of July 2, 2004) in support of the war in Iraq raise numerous contracting and logistical issues too complex to be explored here. It may be expected, however, that these issues will remain as US forces continue to employ contractors in trouble spots around the world to perform, via the private sector, what are quasi-military functions and duties. Some critics ask: is this the front-end phase of the privatization the US military will use to cope with high deployment and operating tempo requirements?

In summary, many of the issues and initiatives identified here have much to do with the world-wide trend of evolution of public-private relationships and partnerships. New institutional arrangements have emerged in virtually every area of provision of services to the public at all levels of government. The basic challenges in weapon system development and procurement remain, as evidenced in results, e.g., continuing management and technical problems in major acquisition programs including the F-22 Raptor and V-22 Osprey. Further, the effects of defense industry consolidation on weapons development and production remain unclear. The overall challenge to the DoD is how to re-capitalize an aging force structure where costs are high and RDT&E and procurement budgets do not match projected requirements or military service re-capitalization plans and schedules. Changes in the defense industry in many cases confound the problem of attempting to use the market to achieve the greater efficiency which is supposed to result from competition. Both the theory and the arguably partisan rhetoric about the advantages of market pressures are fine, but where there is no market (and, therefore, no competition), few, if any, advantages may be found.

The initiatives explicated here are but a few of the many acquisition changes currently under implementation as under the defense business transformation flag. Issues that have been raised about the wave of continuous reform include whether there is too much change taking place at once to be fully assimilated by a defense acquisition workforce that has been reduced in size and has lost some critical expertise due to budget and staff reductions—and whether new processes have resulted in excessive centralization of authority in the Office of the Secretary of Defense at the expense of efficiency, effective communication, program management and, in some cases, common sense (Dillard, 2003).

Pervasive problems persist in the process for acquiring defense assets. These problems include affordability, cost control, punctuality (keeping to schedules), and performance-



estimating errors. Accurate estimates of program affordability or weapons acquisition often are based on optimistic assumptions about the maturity and availability of enabling technologies (GAO, 1997b). The use of outdated information systems makes the ability to accurately track and measure acquisition costs even more difficult. Thus, weapons acquisition reform is driven by a myriad of factors and borne out of the desire to acquire the best weaponry at the least cost. Beyond technical issues, the politics of acquisition are complex and present additional challenges which must be overcome. In summary, continual tension persists between top-level policy and budget-process players (including Congress), and defense acquisition executives and mid-level DoD officials (including program managers and comptrollers) confronted with limited resources and competing political priorities.

The following section reviews some (old and new) of the more important procedural, regulatory, and legislative reforms to the defense acquisition process which have influenced (to varying degrees) transformational changes in the DoD. Some of the reforms noted have been enacted, but still require implementation effort and have implications for current and future processes. Though some of these changes are no longer under implementation, understanding their intent helps to paint a picture of how the DoD acquisition system has evolved to where it is today. For example, the Federal Acquisition Reform Act (FARA) and the Federal Acquisition Streamlining Act (FASA) have been incorporated into other DoD acquisition administrative law, referred to as instructions by number in the Department, e.g., DoD 5000.2R. In each example of reform, policy decisions and legislation have been intended to address significant acquisition reform problems.

Spiral Acquisition

The concept of spiral acquisition has permeated the acquisition community to the point that it is both common practice and, to an extent, "urban legend" in that it may be viewed too optimistically as a panacea to speed the development and fielding of weapons and systems. Spiral acquisition means continuous adoption of changes during the development of systems as new and better technology becomes available for incorporation into the designs of the warfighting assets acquired by the DoD. Spiral acquisition is particularly important with respect to the integration of new information systems and computer (and related) technology, because new hardware and software becomes available at a rapid pace in the highly competitive environment of private-sector technology development. The old idea of designing in specific hardware and software applications many years in advance of actual purchase of weapons systems has given way to incorporation of the best available technology as it becomes available.

While the idea of spiral acquisition is straight-forward, in practice it is both difficult and expensive to do. The cost of new systems, and the system software upgrading of such systems that becomes inevitable once these systems are installed, is one part of the difficulty. Also, new technologies often require changes at the point of interface with the ships, aircraft, tanks and other assets into which they are to be incorporated. And the basic problem of how much new technology can be afforded regardless of the advantages provided is always an issue in a cost-constrained environment.

There is much more to be said about spiral acquisition beyond the scope of this paper with respect to how to accomplish it (e.g., how to break into the regular cycle of acquisition decision-making to get new systems in and old systems out, how to change contracts and, in some cases, the suppliers of new technologies when existing contracts for older systems are still in place, system integration difficulties beyond those we have mentioned, and more).



However, that spiral acquisition is a significant part of the new business practices of DoD transformation is undeniable. It represents both opportunity and challenge to maintaining continuity in system development and procurement. In addition, implementation of spiral acquisition has been stimulated greatly by the demands of war. As one Navy admiral remarked in March, 2005, "Years ago I would never have believed that I would see the complete conception, development and fielding of a new system in the period of one year—but recently it has been done in response to the needs of the warfighters in OIF."

The Federal Acquisition Streamlining Act of 1994 (FASA)

The DoD issued an update to its regulations governing the acquisition of major weapon systems on 13 October 1994. Among other things, the update incorporated new laws and policies (including the Federal Acquisition Streamlining Act), separated mandatory policies and procedures from discretionary practices, and reduced the volume and complexity of the regulations. The Federal Acquisition Streamlining Act of 1994 (FASA) required the SECDEF to define cost, schedule and performance goals for all of the Major Defense Acquisition Programs (MDAP) and for each phase of their acquisition cycles. Highlights included streamlined proposal information or page count, shortened proposal submission time, reduced evaluation team size or evaluation time, and limited source-selection factors pertaining to cost, past experience, performance, or quality of content. FASA called for full and open competition, to be obtained when, "all responsible sources are permitted to submit sealed bids for competitive proposals" (Federal Acquisition Regulations, 2000). Full and open competition is achieved through open specifications (USC 253a (1) (A)).

FASA establishes a clear preference for acquisition of commercial items in the federal government. It requires agencies to reduce impediments to buying commercial products and to train appropriate personnel in the acquisition of such products. One such impediment is the use of design specifications, which restrict competition and make acquisition of commercial products difficult. Design specifications typically tell a vendor how a product is to be made or how a service is to be performed. A commercial vendor, whose product has been developed for public use, seldom conforms to government design specifications. FASA instilled flexibility, and timeliness into the acquisition process, but there are still some problems inherent in requesting particular design specifications in a commercial sector.

The Federal Acquisition Reform Act/The Clinger-Cohen Act (FARA)

The major pieces of legislation affecting acquisition and information technology were the Federal Acquisition Reform Act and the Information Technology Management Reform Act. While originally passed as two separate initiatives, their impact on each other made it impossible to consider each separately. The two acts were later combined and renamed the Clinger-Cohen Act (1996). The major impact on information technology was the repeal of the Brooks Act and its associated restriction on acquisition of resources. The Clinger-Cohen Act encouraged the acquisition of commercial off-the-shelf (COTS) IT products and allows the Office for Federal Acquisition Policy (OFPP) to conduct pilot programs in federal agencies to test alternative approaches for acquisition of IT resources. The Act directs agencies to use "modular contracting" based on successive acquisitions of "interoperable increments" (Federal Register, 1996, p. 27). The Clinger-Cohen Act created the Chief Information Officer for the Department of Defense, and combined life-cycle approvals for weapon systems and information technology systems into a single instruction—the DoD 5000.1 series.



FARA and FASA have been overtaken or superseded by other DoD reform initiatives applicable to MDAPs and weapons acquisition. Still, both FARA and FASA are still valid and enforceable. FARA, among many other things, expanded the definition of “commercial items” to include those things not only sold to the general public, but also those *offered* to the general public. These initiatives were pushed by industry, primarily because under the two Acts, firms participating in government acquisitions with qualified “commercial” products are exempted from over 100 statutory and regulatory requirements. For example, firms may be exempted from the Truth in Negotiations Act that requires firms to certify cost and pricing data on negotiated actions greater than \$550K (Yoder, 2003).

Commercial Off-the-Shelf Procurement

Federal Acquisition Regulation (FAR) applies to all contracting regulations. The pertinent part of the FAR with regard to commercial off-the-shelf reforms (COTS) is part 12, which indicates, in essence, that federal government organizations should perform market research to maximize the use of commercial products. DoD enforcement of Part 12 of the FAR over the past five years has caused weapon program managers to evaluate and, where appropriate, purchase commercial or non-developmental items (CNDI), when they are available from industry and when they meet the organization needs. Defense contractors are required to incorporate CNDI to the maximum extent possible.

Initial feedback on the success of this initiative is highly positive. It appears that the change has permitted commercial firms to produce the kinds of outcomes from their development of new products that meet the Department’s needs. Specifically, firms that developed sophisticated products in significantly less time and at lower cost than their predecessors have been rewarded with contracts. However, to some extent the quality and credibility of commercial-firm cost information available to DoD acquisition decision makers remains a problem. The long-term life cycle support costs associated with utilizing potentially rapidly obsolete commercial items has yet to be fully documented (Yoder, 2003).

Cost as an Independent Variable (CAIV)

DoD Directive 5000.1 directed a new development in cost analysis termed “Cost as An Independent Variable,” or CAIV. System performance and target costs are to be analyzed on a cost-performance tradeoff basis. The CAIV process is intended to make cost a more significant constraint as a variable in analysis of effectiveness and suitability of systems. CAIV is intended to reduce acquisition costs. After Desert Storm and before the war on terrorism began on September 11, 2001, threats from potential peer competitors were not increasing in perceived capability at a fast rate. Also the fall of the Berlin Wall created expectations for a peace dividend and there was, in fact, a peace dividend, but it was not equally distributed across all DoD accounts. As Exhibit 15 illustrates, the procurement accounts took a greater hit.

Exhibit 15. The Cold War Dividend: % Change in DoD Accounts 1990-1998

Military Personnel	-31.17%
Operations and Maintenance	-9.05%
Procurement	-52.36
RDT&E	-13.70%
Military Construction	-7.69%
Family Housing	+2.50%
DoD total	-26.83%

(Adapted from McCaffery & Jones, 2004: Table 3.4, p. 60).



Absent a peer competitor and in a generally peaceful world, it was appropriate for the DoD to make cost a stronger driver in system design. Moreover, such an approach also was consistent with commercial practices in new system developments, where market forces drive the price of new systems.

CAIV helps the program manager recognize that the majority of costs are determined early in a program's lifecycle. This means that the best time to reduce lifecycle costs is early in the acquisition process. These cost reductions may be accomplished through cost and performance tradeoff analysis, which is conducted before an acquisition approach is completed. Incentives are available to both government and industry managers to achieve the objectives of CAIV. Awards programs and "shared savings" programs are used creatively to encourage generation of cost-saving ideas for all phases of lifecycle costs. Incentive programs target individuals within government and industry teams. The program manager (PM) works closely with the user to achieve proper balance among cost, schedule, and performance while ensuring that systems are both affordable and cost-effective. The PM, together with the user, proposes cost objectives and thresholds for MDA approval, which will then be controlled through the APB process (Lifecycle Costs). One of the responsibilities incumbent upon a program manager is to constantly seek out innovative practices to reduce lifecycle environmental costs and liability.

Research by Coopers and Lybrand identified over 120 regulatory and statutory "cost drivers" that, according to the contractors surveyed, increased the price the DoD pays for goods and services by 18 percent (cited in Lorell & Graser, 1994). These cost drivers included government-imposed accounting and reporting standards and systems such as Cost Accounting Standards (CAS) and complex contract requirements and statements of work (SOW) (Lorell & Graser, 1994). The basic goal of this study was to develop a more "commercial-type" defense acquisition process. This included reducing regulator burden, transferring more program cost, design and technology control authority and responsibility to the contractor, exploiting commercially developed parts, components, technologies and processes, and making cost/price a key requirement. This study was compatible with the goals of the Revolution in Business Affairs under the Clinton administration and, later, the Transformation of Business Affairs under the Bush administration.

The basic thrust of CAIV is to make cost important in monitoring and controlling acquisition and procurement. While it might seem surprising to say that cost should be considered seriously, this is not always the case in practice. Thus, this initiative was stimulated by the desire to increase awareness of cost in all phases of the acquisition process—and particularly in managing projects and programs in program and budget execution.

The Single Process Initiative

In 2002, Secretary of Defense Donald Rumsfeld directed the DoD to change the management and manufacturing requirements of existing contracts to unify them within one facility, where appropriate (Rumsfeld, 2002). This initiative is called the block change or single-process initiative (SPI). Program managers are tasked with ensuring that the SPI reduces weapon acquisition costs. Allowing defense contractors to use a single process in their facilities is a natural progression from the contract-by-contract process of removing military-unique specifications and standards initiated in FASA. Despite the likelihood of transition costs that equal or exceed savings in the near term, moving to common, facility-wide requirements is intended to reduce government and contractor costs in the long term.



In some ways, the changes to acquisition-decision making at the level of the Navy secretariat and at the OSD level reflect the concept of the single-process initiative. The Navy Assistant Secretary for Acquisition has convened a number of reviews of programs in a single forum—including all the primary players in a program buy or planned buy, asking them to work together in one place at one time to improve both communication and decision making. Reports from participants give this initiative high marks. Also, in the SLRG reviews chaired by Secretary Rumsfeld a similar approach has been taken to get all players to sit together to engage in fact discovery, analysis of alternatives and dialogue leading to better decisions.

DoD 5000.2R Transformation from Regulatory to Policy Guidance

In addition to what we have observed earlier in this paper on this topic, it is important to cite that in 2002, Secretary Rumsfeld directed that DoD 5000.2R be converted from a regulatory tool to a more functional and flexible policy guidance document. The 5000 series has in the past been regarded as administrative law. It specified user requirements including the preparation of operational requirements documents (ORD) and estimation of initial operational capability. The 5000.2R acquisition requirements had been firm and not subject to modification without specific waivers (Rieg, 2000). However, SECDEF, the services, and program managers recognized the need for greater flexibility to manage acquisition.

The new DoD 5000.2-R document promises to piggy-back on recent acquisition reform, allowing greater flexibility and control for acquisition leadership. DoD 5000.2-R was revised to recommend that integrated process teams (IPT) be used during program definition, to aid the definition of requirements and system supportability. In addition, program structure changes are directed to include an acquisition strategy of open systems. To maximize program effectiveness, the program manager is directed to use commercial sources, risk management, and CAIV. The PM is also directed to use program design incorporating integrated product and process development (IPPD) and place system-engineering emphasis on production capability, quality, acquisition logistics, and open-system design (Oberndorf & Carney, 1998).

Additional Related Acquisition System and Process Changes

Additional reforms have involved fostering the development of measurable cost, schedule, and performance goals and incentives for acquisition personnel to reach those goals. Among other things, program managers, as well as senior DoD and military department officials, now must establish cost, schedule, and performance goals for acquisition programs and annually report on their progress in meeting those goals. They must establish personnel performance incentives linked to the achievement of goals. Program Executive Offices also must submit recommendations for legislation to facilitate the management of acquisition programs and the acquisition workforce.

In this respect, it should be noted that each service has an acquisition executive responsible for acquisition and contracting workforce education and training, among other things. For example, in the Navy the Director of Acquisition Management (DACM) is responsible for all Navy acquisition career-management issues, both military and civilian, including, but not limited to:

- Promotion parity analysis
- Reservist policies
- Congressional and legislative education/training issues



- Defense Acquisition University mandatory training
- Acquisition Workforce Tuition Assistance
- Business and Financial management

Contracting out services has been a major initiative since 2000, under the guidance of the Office of Management and Budget. In 2000, federal agencies procured more than \$235 billion in goods and services. Overall, contracting for goods and services accounted for about 24 percent of federal government FY 2001 discretionary resources (OMB, 2003a).

Complicating this reform process is a natural demographic situation. About 38 percent of acquisition personnel government-wide are either already eligible to retire or will be eligible by September 30, 2007 (OMB, 2003a). At DoD and DoE—the two largest contracting agencies—39 percent of the acquisition workforce will be eligible to retire by fiscal year 2008 (GAO 2003d). What this means is that the human capital skill mix will change dramatically as retirements proceed and new personnel are hired. In the meantime, new requirements, tasks, and skills are demanded of both old and new acquisition managers as a result of federal and acquisition regulatory reform efforts. A review of some of these changes follows.

THE CHANGING CONTEXT FOR ACQUISITION PROCESS REFORM

Defense acquisition has long been beset by problems related to both politics and efficiency. Numerous reforms since the 1950s have attempted to improve the acquisition process. Recent reforms including more open competition, streamlined acquisition procedures, elimination of obsolete regulations and more effective program management are some of the substantial changes made in DOD in the last ten years to improve acquisition budgeting and management. Establishing open competition also is a significant part of recent acquisition transformation initiatives. Changes in acquisition information technology resulting from the passage of the Clinger-Cohen Act, using cost as an independent variable as a means of reducing acquisition costs, and spiral acquisition practices are other changes expected to yield positive results.

Congressional and DoD transformation initiatives have focused on greater reliance on commercial products and processes and more timely infusion of new technology into new or existing systems. Commercial product usage is implemented with an understanding of the complex set of impacts that stem from use of commercial products (Oberndorf & Carney, 1998). Solicitation requirements are written to include performance measures. If military specifications are necessary, waivers must first be obtained. Solicitations for new acquisitions that cite military specifications typically encourage bidders to propose alternatives (Secretary of Defense, 2002a). The DoD has made significant progress in disposing of the huge inventory of military specifications and standards through cancellation, consolidation, conversion to a guidance handbook, or replacement with a performance specification or non-government standard.

Some reforms already have had unanticipated consequences. For example, FARA and FASA eliminate, with minor exceptions, the requirement for "certified cost and pricing data" under the Truth in Negotiations Act (TINA). This has been heralded as a blessing for industry, but has caused problems for contracting officers who are mandated to determine "fair and reasonable" cost and price prior to award of contract. Specifically, there are instances where firms have claimed "commercial item exemptions" from TINA, when not one single item has ever been sold to the general public, and hence, there is little or no standard for determining the reasonableness of the price. Without TINA and cost analysis, the contracting officer may be



awarding without solid factual benchmarks, standards, or measures of what is "fair and reasonable" (Yoder, 2003).

The Defense Acquisition Corps has increased education and training requirements for key positions such as for the Critical Acquisition Position (CAP). CAPs are the most senior positions in the defense-acquisition workforce, including program executive offices, program managers, deputy program managers of MDAP ACAT I defense acquisition programs and the program managers of significant non-MDAP ACAT programs. Maximizing program manager and contractor flexibility to make cost/performance tradeoffs without (unnecessary) higher-level permission is essential to achieving cost objectives. Therefore, the number of threshold items in program requirements documents and acquisition program baselines has been reduced. All of these changes add up to significant, albeit incremental, transformation of the DoD acquisition system.

Despite all of this change, the primary criticism of the acquisition process remain—that it is too complex, too slow, and too costly. In some cases it also may produce weapons that are "over-qualified" or irrelevant to the task at hand when they are finally put in the field because the threat and warfighting environment have changed since they were contracted. Annual budget cycle politics adds complexity, turbulence and confusion to this mix. The continual purchase of weapons because they are good for congressional electoral districts irrespective of defense needs is wasteful but cannot be stopped. In addition, there is the fact-of-life adjustment to the contemporary post-911 context following the period of retreat on objectives under the Clinton administration in the 1990s. The procurement holiday in this period resulted in increased maintenance costs for and continued use of older weapons systems. The outcomes include increased O&M account demands, and the fact that the gap in the procurement budget and in military recapitalization plans, a gap that will not be closed in the near future, now reaches into the tens of billions of dollars. Add to this mix that almost 40% of the federal and defense acquisition community will be eligible to retire in 2008. This combination would seem to leave a problem of substantial magnitude. However, as we have documented above, these are not new problems.

The defense acquisition process has almost always appeared to be broken to some degree; given the expectations and contingencies it must meet, this seems inevitable. However, the irony of this inevitability is that the products it produces are among the best in the world. The fact that Marines went into battle in Iraq in their fathers' helicopters, that some pilots flew their grandfathers' bombers over Afghanistan and Iraq, that the main U. S. battle tank has been superior to anything on the field for over a decade—all of this attests that good assets were bought in the first place, but also that they are being used beyond their expected life-cycles. Moreover, the to-some-degree "broken" acquisition process engineered and deployed missile-firing UAV aircraft while the war in Afghanistan and OIF were in progress. The system can and has reacted quickly. America, the society of disposables, fast food, and microwave cuisine also has produced weaponry that is excellent and durable. The process is cumbersome, overly expensive, complicated—and highly political, but it does work. And critically, the American public continues to support it to the degree necessary considering the cost of acquiring new defense warfighting assets. Still, we wonder how much longer Congress will continue to support high defense spending, and OIF and GWOT through generous supplemental appropriations.

In the best of worlds, the DoD would acquire weapons assets in an environment of stable funding and management. Acquisition process reform over the past ten years has sought to provide this more stable environment in which to acquire better, more efficient weapons. However, the era following the end of the Cold war and the advent of the war on terrorism has



made acquisition more difficult. Further, reform of both the acquisition and PPBES processes has created its own turbulence simply because change has been continuous. At times, program managers and others involved in the DoD acquisition process have difficulty staying up-to-date on the status of change because one wave of reform spills over into the next. John Dillard suggests that one result of this is that program managers face a continuous cycle of decision reviews and may now have fewer resources to manage their programs as they spend more of their time and budgets on managing the bureaucracy. The result of this is that reforms may have actually lengthened the production cycle (Dillard, 2003). Nonetheless, continuing reform seems a fact of life, but this continuous improvement of weapons-acquisition budget estimation, execution and management has and will continue to present a challenge to all participants in the process. We should expect this process of continuous improvement to continue.

THE IMPORTANCE OF CHANGES IN PPBES TO ACQUISITION DECISION MAKING

For four decades the Department of Defense (DoD) has developed resource plans and budgets using the Planning, Programming, Budgeting System, or PPBS—renamed PPBES in 2003 with an “E” added to emphasize the importance of budget execution. As a decision process, PPBES is important to understand for many reasons, not the least of which is that through it commitments are made that result in spending over \$400 billion annually (US Budget, FY2005, p. 87). This amount comprises approximately 49% (US Budget, FY2005-table 8.1, 125) of the discretionary portion of the U. S. federal budget for FY 2005 and approximately \$2.6 trillion (Budget, FY2005-Outlays by Function-table 3.2, 58) in spending for the period 2004-2009. Despite the fact that PPBES coordinates spending of this magnitude, not much academic attention is paid to the DoD budget and resource management processes. Although the magnitude and opportunity costs of defense spending are questioned routinely, the resource decision process has been ignored to a considerable extent. Perhaps this is explained by the perspective that PPBES is too complex to be understood and that it is not comparable or relevant to analysis of budgeting in other federal departments and agencies, or to state and local government budgeting.

PPBES is part of what has been termed the transformation of business affairs in the DoD; it constitutes a significant initiative to improve and correct many of the evident problems that have weighted-down the functioning of PPBS. First, the change to PPBES merged separate program and budget reviews into a single review cycle performed concurrently rather than sequentially. Second, it incorporated a budget process matched to national electoral cycles, with major strategic changes slated for the second and fourth years of a Presidential term and minimal updating done in the first and third years, given no major change in the threat. Third, it fixed timing of the process so that planning and budgeting were clearly derivative processes driven by the Quadrennial Defense Review and the National Military Strategy. Fourth, it changed the cycle for Office of the Secretary of Defense provision of top-level planning information to the military departments and services from an annual to a multi-year schedule with a two-year combined program and budget review.

The essence of the PPBES reform is to establish a four-year resource planning and decision cycle to replace the previous system that operated in a six-year cycle for planning, a two-year cycle for programming and an annual cycle for budgeting. Year one would require “review and refinement” of the previous President's strategy and plans, including only limited changes in programs and budgets, an early national security strategy, and an “off-year DPG.” MID-913 anticipated that in year one, “a small and discrete number of programming changes will be required to reflect real-world changes and as part of the continuing need to align the defense program with the defense strategy” (SECDEF, 2003a, p. 5). Changes would be made



in overall defense resource posture in response to information provided from two new and separate planning guidance documents and processes: the Strategic Planning Guidance (top-level DoD civilian staff input) and the Joint Planning Guidance (input from the military Joint Chiefs of Staff—the SPG and JPG) replaced the single Defense Planning Guidance. These two processes reflect incremental changes in the threat and the posture of the US and its allies. As is normal, a new administration may take steps to insert its defense policy priorities in the budget submitted to Congress and to make changes caused by fact-of-life events in acquisition programs.

In the summer of year one, work would be begun on the Quadrennial Defense Review for reporting to Congress. Part of the reason for this change in timing is that senior defense officials had argued to Congress that the requirement to submit a QDR in the first year was too much to ask of a new administration still involved in the rigorous congressional process. During this first year, the program structure and budget undergo minimal and incremental updates, given no major changes in the threat.

Year two is a year of major change. Following the completion of the Quadrennial Defense Review in late winter and other studies as directed by OSD and the military departments (for example, on the nature of undersea warfare), new SPG and JPG documents are prepared and a full program and budget review is undertaken. This constitutes a major scrutinizing of the force structure and resource priorities and patterns following the changes in the SPG/JPG. The POM and budget process for the following year are built around incremental changes to this DPG; therefore, the next year is termed an off-year. In the off-year, program-change proposals and budget-change proposals are considered as necessary to adjust to changes in the real world.

This means that in a four-year Presidential administration, fundamental change is targeted for the second year of the cycle with the first and third years changed only as threat environment demands increased modification. In practice, the most current fourth year, 2004, was devoted to fighting and financing the fighting of the war in Iraq. There was a controversial POM, particularly in respect to reductions in the Navy shipbuilding program. In a sense, 2004 was an on-year, but since it was not enveloped by a QDR, it can also be assigned off-year status. In the fourth year, a POM may be done, but it will not have the profundity of the second year POM which follows the QDR. Given a stable environment, year two (in the system where the results of the QDR drive the POM) would result in the most fundamental analysis and change in programs and budgets. Whether the defense environment is stable enough to support a four-year decision system remains to be seen.

The ‘E’ in PPBE indicates a new emphasis on budget execution. In 2003, DoD Comptroller Dov Zakheim (2003) indicated that the DoD would use the off-years when budgets were not prepared from scratch to examine how well the DoD was executing its programs and dollars. Zakheim (SECDEF, 2003a, pp. 3-4) reported that the intent was to measure the “burn rate” (rate of spending) in an execution review. Zakheim observed that the review would include asking questions such as how money had been spent, whether it should be moved to other areas and accounts, and what results have been achieved. The off-years provide additional decision-space for execution analysis.

These changes have created a combined two-year program and budget-review decision cycle (but not a biennial budget), with a complete review in year one, followed by limited incremental review in year two. This change in cycle from a full-program review and a full-budget review to a combined review is meant to reduce the inefficiencies of unnecessary re-



making of program decisions; the program should drive the budget rather than the opposite. With the programming and budgeting cycles operating contemporaneously, decisions are intended to be arrived at more effectively, whether they are made in the off- or on-year. Changes made in each off-year cycle are intended to have quicker effect by compressing the programming and budgeting cycles while still preserving the decisions made in the on-year cycle through the off-year by limiting reconsideration of decisions to only the most necessary updates. In essence, decisions flow from the Quadrennial Defense Review and other studies; then, a structure is erected in the Strategic and Joint Planning Guidances that provides direction for the remaining years of a Presidential term. This structure remains in place unless dramatic changes in worldwide threat occur. Year-to-year changes in the program structure and budget then are made only to adjust to incremental fact-of-life changes. The inefficiencies of conducting comprehensive reviews every year as intended in the previous PPBS process are avoided, and the decision process itself supposedly moves more responsively to war fighting and preparation demands.

The changes made in the period 2001-2004 came about in large part because Secretary of Defense Donald Rumsfeld believed (correctly in our view) that the PPBS process was too slow and cumbersome, and did not produce the best decisions on defense resource requirements. Also, we may speculate that he preferred reform, as did SECDEF Robert McNamara, which increased resource-decision control at his level (OSD) versus in the military departments and services.

Off-Year Changes

In this new PPBES cycle, the first and third years are off-years. During these off-years, military departments and the military commanders of major commands may create Program Change Proposals (PCPs) to affect the POM, and Budget Change Proposals (BCPs) to justify new budget requirements. The PCPs allow for fact-of-life changes to the previous year's POM; they are meant to be few and of relatively large size, and they must be balanced so they pay for themselves. Guidance for 2003 indicated the PCPs had to exceed a set-dollar threshold or had to be driven by serious policy and programmatic implications. For example, in 2003 the Navy submitted only three PCPs, one worth \$100 million that involved 450 line items.

The PCP process provided the combatant commanders (those with direct warfighting responsibilities) with a new tool in the PPBES process, but like the military departments, they have to suggest offsets. For example, if a warfighter wants to increase force protection in one area at a certain cost, he/she has to suggest weakening force protection in another area as an offset or tradeoff for the increase. This is meant to be a zero-sum game. Changes have to be accompanied by offsets. As is usual with any offset procedure, budget claimants who submit either PCPs or BCPs take the risk that the offsets they suggest will be accepted, but the accompanying change proposals the offsets were intended to fund might not be funded. In such cases, the offset reveals a cache of money for a lower-priority item that might be directed to a higher-priority area. The budget change proposals (BCPs) were expected to be more numerous than PCPs, but smaller. They too would be largely fact-of-life changes (e.g., cost increases, schedule delays, new congressional directives) and would have to be paid for by offsets. Although the individual BCP need not be offset, the package of offsets proposed by a Military Department has to be offset and provide a zero-balance change. Whether in an off-year or an on-year, the results from the above decisions are consolidated into one database. This is an important change to the PPB system which had multiple databases for different purposes.



ANALYSIS OF THE SIGNIFICANCE OF A TRANSFORMED PPBES PROCESS

With the introduction of PPBES, the budget process within the DoD was dramatically changed. However, the outcome of this change still may be viewed as a triumph of incrementalism. For example, only changes to the POM and the budget were brought forward in 2003, and 2004 was a year primarily dedicated to fact-of-life changes in budget execution as the demands of the campaign in Iraq continued to impact the budget. This is a dramatic change from the past with its focus on complete review of the threat, force structure and programs.

One significant result of the 2003 budget process reform is that unless a budget change proposal is explicitly approved, then unit budgets are the same as they were in the previous year. This might be termed “re-appropriating the base.” Even if an inflation adjustment is given, no new program changes are created. Thus, if a unit does well in the on-year cycle (second year and fourth year), it may carry some “fat” through the off-years. Since the stakes are now higher, it would seem that one long-run consequence would be an increase in the intensity of the struggle during the on-year process, both within the pentagon and Congress. Success is rewarded for at least two years and failure is doubly penalized. In other words, to change in the off-year, offsets have to be offered up; so, the only way to get better in the off-year is by giving up something else.

This new process puts the Secretary of Defense into the decision environment at an earlier stage than in the old PPB process; it puts him “in the driver’s seat,” in the words of one budgeteer. Decisions in the new PPBES are intended to reach the Secretary while options are still open, and while important and large-scale changes still can be proposed—before the final decision has become a foregone conclusion at the military department level. When the Defense Secretary’s input came at the end of the stream of decisions, some changes that could have been made were pre-empted because they would have caused too much “breakage” in other programs.

It is evident that Secretary Rumsfeld had a clear interest in process “transformation” through PPBES reform, but not all communities within the defense establishment were equally committed (or committed at all) to Rumsfeld’s vision. We may note that inserting the Secretary of Defense into the decision process early stands up so long as history proves the decisions he makes are correct over the long-term. While this is true whether this input is early or late, elevating the role and authority of the Secretary in the PPBES process puts a larger burden of proof on his office and him personally.

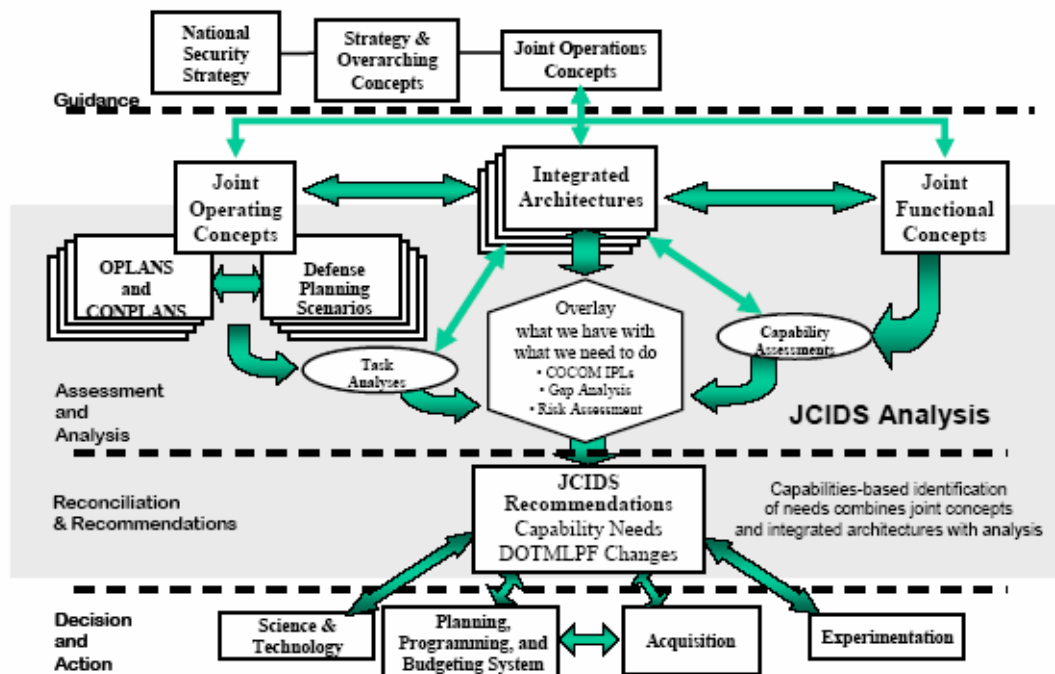
Process Interactions

The Joint Capabilities Integration and Development System (JCIDS), Planning Programming, Budgeting and Execution (PPBE) system and Defense Acquisition System (DAS) form the core of Defense resource decision making and allocation. To understand incompatibilities in these three systems, some understanding of the individual processes and how they are linked is required.

JCIDS has replaced what used to be known as the Requirements Generation System (RGS).



Exhibit 16. Requirements and Defense Acquisition



The JCIDS Process (Source: Fierstine, 2004, p. 22)

Through JCIDS, Defense decision makers apply the general precepts of national and defense strategy to create joint fighting forces capable of performing the military operations required by the changing nature of the threat situation. JCIDS was developed to more effectively identify joint warfighting requirements and to emphasize a top-down orientation. Instead of the Services determining a “mission need” and discovering a joint need to increase a program’s funding attractiveness while routing it up the chain of command, in JCIDS, the Chairman first determines if the required capability exists, then pushes it down to the resource sponsor for acquisition. If jointness is required, then the program is “born joint.” In addition, the term “capabilities-based” can be confusing. In JCIDS, gaps in warfighting capability, either current or those programmed in the Future Years Defense Plan (FYDP), are identified and any risks associated with those gaps are quantified. JCIDS decision makers then determine future capabilities to address those existing gaps. In doing so, it is important the decision makers be specific enough about a new capability to include, “key attributes with appropriate measures of effectiveness, supportability, time, distance, effect (including scale) and obstacles to be overcome.”

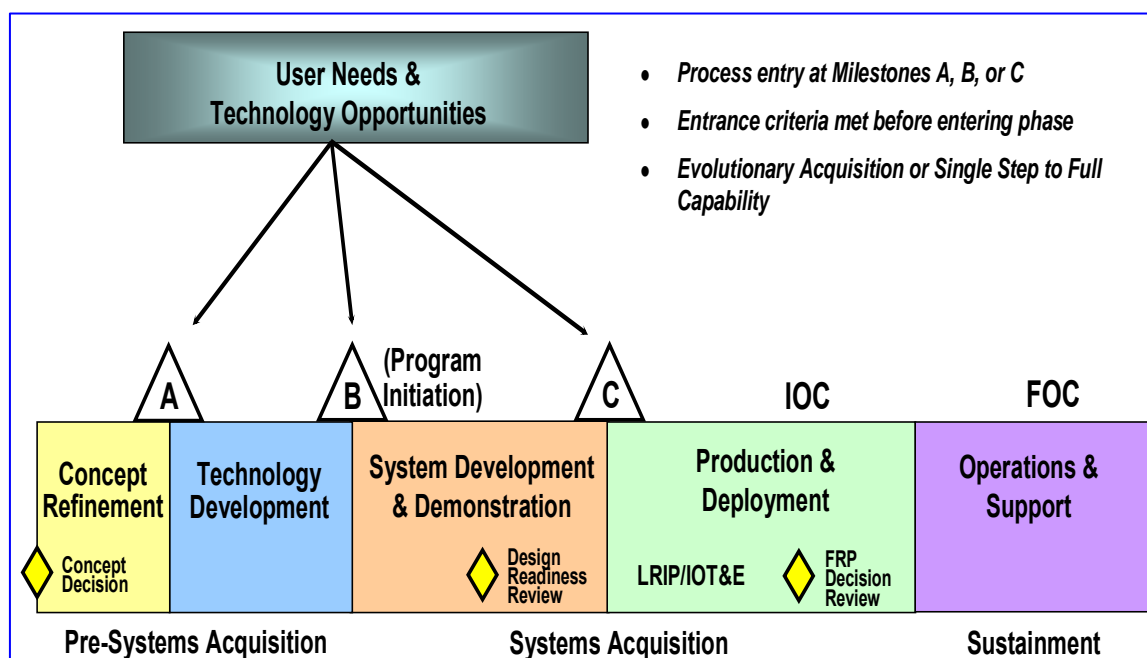
Additionally, the capability need be general enough to not prejudice decisions in favor of a particular means of implementation. Finally, National Security is not DoD specific. A gap between

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Additionally, the capability need be general enough to not prejudice decisions in favor of a particular means of implementation. Finally, National Security is not DoD specific. A gap between strategy, current capacity and the desired future capability to address that gap may cross governmental/ department boundaries (Homeland Defense, Immigration and Naturalization Service, Department of Transportation, etc.). Equally, other agencies may determine and/or have existing programs that could be leveraged by the DoD. JCIDS, Defense Acquisition System (DAS) and PPBES decision makers need to be sensitive to these possibilities and take advantage of them accordingly.

Exhibit 17. From User Needs to Acquisition



Source: (Fierstine, 2004, p. 33.)

Whereas decision makers use JCIDS to identify capability requirements as the current and future threat dictates, the Defense Acquisition System (DAS) takes JCIDS-discovered capability gaps, and initiates and executes procurement programs to field systems to bridge those gaps. In situations where the technology exists to fill a requirement, the DAS exists to acquire a tailored and capable product quickly and in a cost-efficient manner. When new technology is required to fill a capability gap, it is through the DAS that the DoD develops, tests, demonstrates and deploys the new technology in a timely manner and at a fair and reasonable price. In either case, the DAS is forward-looking and ensures that systems fielded support not only today’s fighting forces, but also those of the future.

The DAS exists in a highly dynamic and political environment. Since Defense acquisition in aggregate involves billions of dollars each year, the process, participants and individual programs are linked to powerful stakeholders. These include the Executive branch of the federal government with the DoD acting as its agent, the Legislative branch where the Armed Services and Appropriations Committees dominate, private industry where large defense contractors compete for business, market share, and product continuity, their subcontractors and small businesses seeking a piece of the action, and state and local governments where the defense industrial base is located, where its workforce lives, where dollars are spent and where taxes are collected. These stakeholders are both mutually supportive in seeking dollars for defense acquisition and rivals for business; this is true not only in the private sector, but between the military departments and the DoD, the military departments and each other, and within the military departments as weapons projects fight for life and budget share.

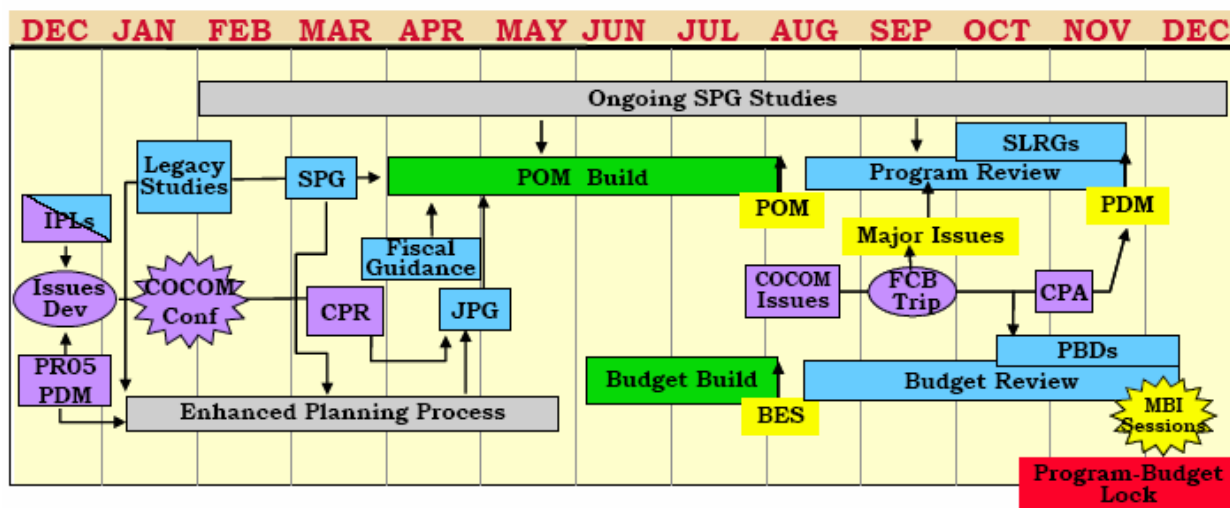
Since the DoD determines DAS policies and procedures, negotiates each annual budget, makes the decisions regarding acquisition programs including lucrative contracts with private industry, each major player in the process with authority and access can influence the DAS, be it for efficiency reasons, personal or organizational ambition or other sources of motivation. Ultimately, Congress holds the power of the purse and must balance defense and non-defense spending and do it presumably with an eye toward fiscal prudence. Nonetheless, all these stakeholders compete for both the good of the nation and for corporate, organizational and/or professional gain. While the customary venue for most of these battles is commonly thought to be within the DoD and in its relations with Congress, in the summer of 2004 the struggle over the Navy shipbuilding budget broke out publicly in newspapers before the POM process was finished, with various shipbuilders arguing that they could not survive with the proposed building programs under consideration. As we noted, DoD acquisition is performed in the “fishbowl” environment of Washington, DC.

This particular battle has continued in Congress in 2005, but the point here is that the stakes are so high that locales usually considered solely bureaucratic and mostly secret sometimes find information has somehow leaked and the struggle has become publicized. To do the job well, those who manage projects within the DAS must understand the political, social and economic aspects of this process. From the lowest echelons of program management to the top, the Under-secretary of Defense for Acquisition, Technology and Logistics (USD, AT&L)), all DAS participants must be both knowledgeable and sensitive to these sometimes-contrasting forces and craft each project so that ultimately, warfighters are provided (in a timely manner) the best tools to safely do the job of supporting national security policy.



PPBES as a Multi-Level System Integration Challenge

Exhibit 18. The PPBE System



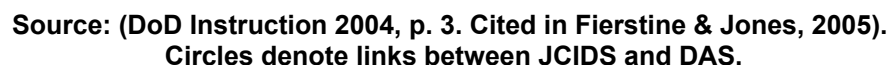
Source: (Fierstine, 2004, p. 49).

As noted, PPBES is a series of multistage and multilevel processes that cumulatively aide the DoD in determining capability needs based on strategic doctrine, the Defense programs that are needed to achieve the required current and future end-state, and the required annual monetary outlay required to acquire and sustain those programs. The machinations of the entire system regularly confound both participants and observers. This is due to the complicated nature of “colors of money,” i.e., money in different appropriation accounts, and the tangled web of overlapping processes that make up PPBES and the sheer size of the budget (in terms of numbers of programs as well as the massive amounts of dollars involved) compounded by the need to meet a series of deadlines (Candrea, 2004). Colors-of-money restrictions also create difficulties in the process, because Congress divides money differently than does the DoD (McCaffery & Jones, 2004). Congress views Defense money in terms of appropriations for manpower, aircraft procurement, operations and maintenance (O&M) and the like, whereas the DoD structures its use of money in the FYDP and views money in terms of programs and program elements (PEs).

As can be seen from that graphic above, PPBES involves a programming and budgeting system operating roughly contemporaneously. This system is guided and shaped by wisdom from DOD’s senior leaders at the Strategic Planning Guidance (SPG) and Senior Leaders Review Group stages (SLRG). The system is embedded in a net of ongoing legacy and planning studies. The Chairman of the Joint Chiefs and his staff submit input through the Chairman’s Program Recommendation and the Joint Planning Guidance and the Chairman’s Program Assessment. Combatant Commanders give input through their Integrated Priority Lists (IPL’s) and through conferences and lessons learned and through participation on the SLRG. The services have input specifically in building in the POM and the budget and through the service of their senior leaders on the SLRG, on studies, and in the POM and budget decision process. Fierstine and Jones describe this system as involving, “a web of studies, planning systems, and decision making sub-processes, involving a monumental number of participants, the sum of which defies simple description as a comprehensive structure” (2005, p. 42).

The JCIDS and the DAS systems are tied to each other a number of different ways. A primary precept of the DAS is to acquire capabilities for the DoD as directed through the Joint Chiefs, so there is a clear lead-follow relationship between JCIDS and the DAS. Fierstine and Jones state, “This relationship is carried out formally through the four formal JCIDS documents as well as through the many required DAS program reviews. They are also informally linked through the leaders of each process some of whom have multiple roles to play in both” (2005, p. 54).

Exhibit 19. Formal Pathways from JCIDS to DAS



There are also formal links created between the two systems when the same players hold important positions in both systems. First among these is SECDEF and his staff, including Undersecretary for Acquisition, Technology, and Logistics, the Deputy Secretary of Defense and several Assistant Secretaries. In particular, USD (AT&L) is central to this process; he chairs the DAB and Milestone Decision Authority for all the large procurement programs. He also has the authority to ask the JROC to review a program at any time. This gives him a powerful hand in both the JCIDS and DAS processes. The Deputy Secretary of Defense chairs the Senior Leaders Group (SLRG) where all the important decisions are made which involve both JCIDS and DAS items. Various Under and Assistant Secretaries of Defense serve on the SLRG, the DAB, and Functional Capabilities Boards. Fierstine and Jones suggest that the most noteworthy of these may be the “Assistant Secretary of Defense for Networks and Information Integration (ASD(NII)) who serves on both the DAB, the SLRG and the FCBs” (2005, p. 58).

On the military side of the House, the most important link is probably the Vice Chairman of the Joint Chiefs (VCJCS) who functions as chairman of the Joint Requirements Oversight Council (JROC) and is Vice Chair of both the Senior Leader Review Group (SLRG) and the Defense Acquisition Board (DAB). Staff organizations with the Joint Staff apparatus also are important. These include the offices of J-8 who is the Joint Potential Designator (JPD) Gatekeeper, J-7, who is the executive agent for transformation, and J-6 who ensures IT/NSS interoperability and provides review, coordination and certification functions in support of the JCIDS and DAS (CJCS 3170.01D: B-4).

Within the military departments, the vice chiefs of each service sit on the JROC and the service secretaries sit on both the DAB and the SLRG. It should be remembered that individual military personnel form the lion’s share of representation on oversight and analysis bodies related to both processes. Also, the Services are the sponsors for every program and research effort; service personnel form the program offices. Furthermore, the Services run the JCIDS analysis processes.

Since the JCIDS and the DAS are event-driven and follow similar courses, they are linked inextricably through their output (documentation and programs). While JCIDS and DAS are event-driven, the Planning, Programming, Budgeting and Execution System (PPBES) is a calendar-driven sequence of events. JCIDS or DAS events may or may not fit neatly in the POM/budget cycle. DAS events may or may not fit neatly into the off-year or on-year cycle.

For example, when a major program gets a “go” signal in an off-year, what this does to the basic concept of off-year is yet to be determined. It hardly seems like the program will be told to wait until next year, but if resources then are committed, does this mean that decision space is pre-empted from the following on year? Does this mean the on-year becomes an off-year? What if the go signal occurs in the first year of a Presidential regime? Will this mean a wait? If it is a major capacity enhancing acquisition, what will this mean for the QDR scheduled to arrive some 12 months later? Will strategy and doctrinal changes be pre-empted? What if a large program appears about to fail a major milestone, but it has been counted on as a part of a Presidential legacy in the fourth year of a Presidency: will the program be “forced” and the assumption made that it will get well (that its difficulty will be corrected) in the out-years? These decisions have consequences for each other, just as the battlefield concept in the late 1990s when the decision about armoring humvees was made: doctrine appears to have envisioned a front line/rear area split with little need to armor Humvees because only a few would be used in or near the front line. Iraq did not turn out that way, hence the scramble to uparmor Humvees.



The point is these systems have consequences for each other. It appears that, rather than through any other means, they are linked through personal interaction; PPBES particularly seems linked to the other processes primarily through the people who are involved. Also, any procurement effort can span multiple annual PPBES cycles, be under the influence of a series of layered PPBES decisions and feed data back into any number of current and future PPBES phases.

The link to PPBES formally comes from the Strategic Planning Council (SPC) which develops the Strategic Planning Guidance (SPG). The SPC is led by SECDEF and made up of the Senior Leaders Review Group (SLRG) and the Combatant Commanders; it includes virtually all of the senior leadership in the DoD, civilian and military, including 19 four-star billets, the service secretaries and various OSD-level representatives. This group produces the Strategic Planning Guidance, although it probably would be most correct to say that it is produced for SECDEF and belongs to him and that his views are predominant in the end product. The SPG sets the scene for the POM-budget process, feeding directly into the POM. The SPG focuses on such things as threat changes, war plans analysis, new concepts, and lessons learned. It identifies and sets up DoD-wide trade-offs and identifies joint needs, excesses, and gaps.

For example, one lesson learned might be that US forces may have to be prepared to fight in both traditional and non-traditional battlefields (WWII vs Iraq) and this could have consequences for both doctrine and acquisition of assets. If Humvees are going to be in harm's way wherever they go (a "front-line" is an everywhere scenario), then their armor needs will change. The POM process is also informed by issues surfaced by the Combatant Commanders (COCOMS) routed through an extended planning process to the joint staff. The result of this input of information is the Chairman's Program Recommendation (CPR) and the Joint Planning Guidance (JPG), which help integrate joint capabilities into the POM process. The link between DAS and PPBE here is that it is the JCIDS's capabilities analysis engine which is used to examine current and forecasted capability needs.

At the service level, a number of other interactions exist. For example, in the Department of the Navy during the POM and budget build/review processes, the Navy requirements officers and analysts under N7 and the Financial Managers and analysts under N8 independently conduct their own campaigns, scenario and program analysis. In doing so, they use the same scenarios, simulations and models as are used in JCIDS by OSD, the joint staff and the rest of the MILDEPS. Additionally, all the data regarding past, current and future program cost comes from the program offices who manage the Services' acquisition programs.

At the most basic level, the PPBE system and the Defense Acquisition system are linked through program cost data. Program offices build OSIPs (Operational Safety Improvement Programs); these are used to create the budget line items that detail program cost data and feed that data through their budget offices for their programs (BFMs) to the Navy Budget office (FMB); here, it is used during program cost analysis throughout the year. When the FMB asks questions about a program or recommends changes, it is done based on the data provided in these OSIPs. This may happen during the budgeting phase, when marks and reclamaes (appeals of budget cuts) are made, or during budget execution. The analysts in N7, who represent the warfare requirements community, and the analysts in N8, who are the budgeters and linked to the PPBE, closely monitor the acquisition programs. Fierstine and Jones assert, "In the current year, if a program is under-executing, then the program and budget analysts will make adjustments as necessary to ensure that money is diverted to those programs that will spend it by the end of the appropriation period" (2005, p. 65).

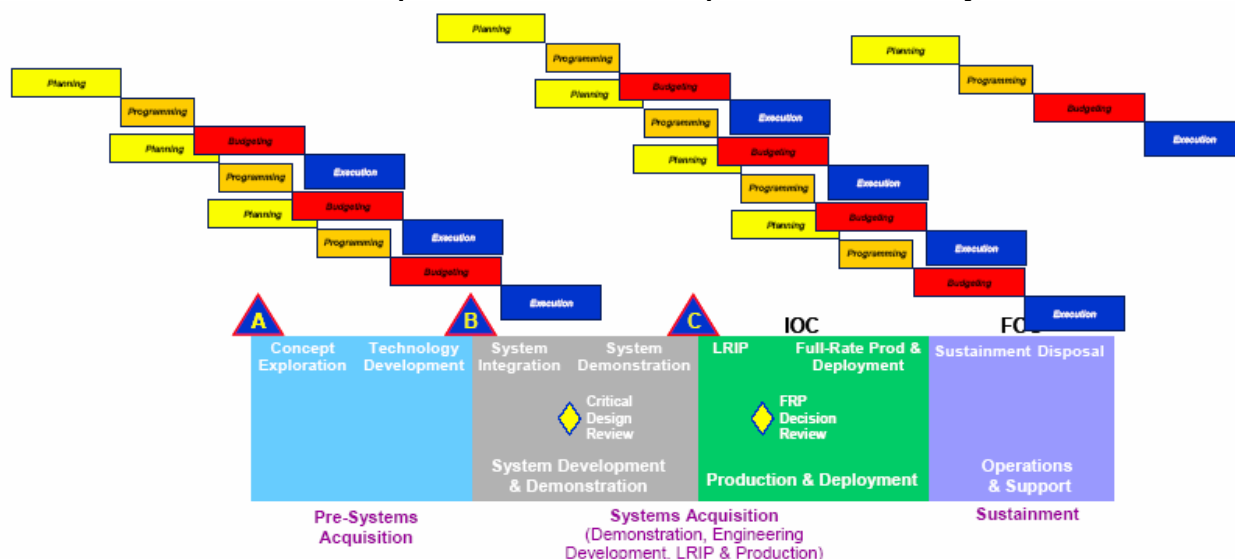


The result is that the warfighting-needs system, the acquisition system (DAS), and the planning/budgeting system (PPBE) are various points on integration and articulation—from an assessment of the threat in the SPG to a design for joint capabilities in the JPG through the POM building process and into the annual budget preparation and review processes. Most, if not all, of the top leaders hold multiple responsibilities in these systems; thus, co-ordination happens by forcing decisions on different aspects of defense needs through the same sets of players. Formal documents are required and reviewed by these players before decisions are made initially and at subsequent important check points, be they milestones, POM, or budget decisions. Additionally, staffs of analysts in different organizational locales have responsibilities for data production and review in program creation, implementation, and execution. They tend to be single-issue focused—on, for example, the best weapon system, or the most weapon systems for the money available this year. These players assume coordination and integration is done at levels above them or prior to program starts, or whenever the POM is built and reviewed, or whenever the threat changes or when new capabilities are needed or old capabilities may be foregone, or even when a strike in a tin mine in South America may imperil the pace of a program.

There is no doubt but that this is a complicated arrangement. Perhaps the single most confounding factor in these equations is time. Weapon systems take time to develop and build. The V-22 for the Marine Corps has been in development of one sort or another since the late 1980's, the Navy LPD-17 since 1998. Engineering and deploying the surveillance drone in Afghanistan in 18 months is the exception to the rule. Most weapons acquisition programs take years to develop. Exhibit 20 illustrates the event-driven nature of the DAS system (its milestones) and shows how this may overlap several PPBE cycles. Fierstine and Jones state, “the procurement effort can span multiple annual PPBE cycles, be under the influence of a series of layered PPBE decisions and feed data back into any number of current and future PPBE phases” (2005, p. 54).

Notional Mapping of PPBE against the DAS Event Timeline

Exhibit 20. Acquisition Timeline Overlaps Several PPBEs Cycles



Source: (Solis, 2004, 28. Cited in Fierstine, 2004, p. 54).

What this means is that when complicated programs (all weapons programs are complicated) are conceived and developed, they proceed through a series of PPB processes. What this means in practice is that they also are reviewed by different individuals. Turnover in personnel in the DoD is high. This happens by law and practice for military leaders; the effect is that turnover happens every two to three years. This level of turnover is just as true on the civilian side. Thus, the Marine V-22 program has seen six different SECDEF's. It was begun under Secretary of Defense (SECDEF) Caspar Weinberger and continued under SECDEFs Dick Cheney, Les Aspin, William Perry, William Cohen, and Donald Rumsfeld. In fact, the average tenure of senior leadership in the DoD is 1.7 years. Thus, co-ordination by position is riskier than it seems. If the distance between milestones A and B or B and C is more than two years, it is highly likely that most of the players in the SLRG will have changed. Even when they are the same people, they may be sitting in new positions and have changed the interests they represent. This is true for both civilian and military leaders. The result is that one should not count on the effectiveness of coordination by position. This leaves coordination by document as the fall-back position. Fiscal climate is also a complicating factor. Weapons systems that take years to develop and field will go thru varying fiscal climates: for example, the V-22 started in a rich procurement environment in the mid-1980s and was kept alive in the procurement holiday in the 1990's. Change also comes from change in the threat situation or battlefield doctrine: Rumsfeld's goal of transforming the Army to a lighter, agile, and more lethal organization doomed the Crusader artillery system. Another aspect of this happens when a service can not decide on the capabilities it wants and, thus, decides to maximize all capabilities; this is roughly what happened to Navy air plans in the early 1990's. The result was a years-long delay for plans for new aircraft. Thus, the passage of time means that people, resources, and doctrine change. These are all threats to the orderly integration of the warfighting Requirements, DAS and PPBE systems.

ANALYSIS OF INTERVIEW DATA ON DECISION SYSTEMS INTEGRATION: MATCH AND MISMATCH

In a research project designed and supervised by the authors of this paper, interviews were conducted in the Pentagon environment on the topic of the degree of fit between PPBES and Acquisition decision systems. Navy CDR Kory Fierstine, assisted by L. R. Jones, interviewed current and past DoD process players in and around the Beltway, including some now working in the private sector doing business with the DoD. Those interviewed in this project included representatives of Navy contractors, representatives from Navy air and sea system commands, Washington-based Navy resource management officials, OSD acquisition officials and active and retired JCS officials. Jones supplemented these interviews with discussions and briefs with high-level military officials in the OSD Office of Program Analysis and Evaluation (PA&E) and the Joint Chiefs staff (J-8). Fierstine and Jones' findings are not definitive, but they provide insight into potential and real dysfunctions within and between the PPBES and Acquisition analysis and decision processes. The problems that result in systems' discontinuity are divided into six categories.

Potential Dysfunctions in the PPBES-DAS Requirements Setting Processes

- 1) Politics and power
 - a) All levels of the chain of command produce budget estimates that are above guidance.
 - b) The political sensitivity of large weapons programs effect requirements analysis and resource decisions.



- c) Many decision makers use political clout to stave off directives from higher authority.
- 2) Other interactions on resource decisions
 - a) A small number of people in the processes have disproportionate amounts of influence.
 - b) Decisions are adversely affected by time compression compounded by the lack of sufficient information.
 - c) Decisions are adversely impacted by the excessive levels in the chain of command.
- 3) Overlap and churn
 - a) There is excessive duplication in processes at each level.
 - b) The excessive repetition of calculations to program cost data due to budget drills have an adverse affect on motivation.
 - c) Users report significant difficulty in execution when budgeted funds are lower than required.
- 4) Transformation
 - a) The concurrent processes of the new PPBE are causing a significant increase in workload without a significant increase in benefit.
 - b) Transformation has not solved the issue of getting appropriate information to decision makers.
 - c) Transformational change has added delays to many aspects of the processes.
- 5) Barriers to Change
 - a) Emergent user needs are not addressed adequately.
 - b) There is an over reliance on correct verbiage in the OSIPs.
 - c) Blanket joint requirements are ill-defined and cumbersome to work through.
 - d) The distribution of common funds is thought by some to be inequitable.
- 6) Innovation
 - a) Use of multiyear procurements constrains budget decisions and may reduce churn.
 - b) With regard to program documentation, semantics sometimes overshadows intent.
 - c) Monetary constraints drive changes in schedule and/or performance requirements, which in turn have an unintended effect on cost.

Under the first topic area, politics and power, some interview respondents thought that, as budgets moved up the organizational hierarchy, there was a tendency to overestimate dollars in order to get the correct amount of warfighting capability; they felt this resulted in budgets exceeding guidance. Their second point has a horizontal aspect to it; respondents felt the large and expensive weapons systems which were built over several Congressional Districts or states were, perhaps, not subjected to as searching a warfare analysis scrutiny as they should have been. The third item, explained below, seems mainly to mean that Congress is able to keep some programs alive and embellish others beyond what DoD has requested.

In section 2, respondents were concerned that “leadership can and does direct funding for programs deemed important, yet not supported by the analysis, given the info available to mid-level experts” (Fierstine & Jones, 2005, p. 99). They also said the lack of time and



insufficient data or expertise impacted the quality of the budget decisions that were made. Section 3 on overlap and churn needs no explanation. Fierstine and Jones speculate as follows: “The Services, the joint staff and OSD all do nearly identical analyses using the same data, models and simulations (and in some cases the same personnel) adding time and manpower to the process without necessarily reducing the use of guesswork and intuition” (2005, p. 100).

With respect to Section 4, respondents felt that transformation of PPBES was still a work in progress and had not produced a significant increase in benefits. Fierstine and Jones state: “The primary difficulty here is that the budgeters begin work on a POM package that is constantly changing rather than having a fixed package after the programmers are through and the work level increases while the timeline stays relatively fixed.” They also note that:

in the budget and programming process people are routinely making decisions without a full grasp of all the facts and data. This was evident at all levels from those in the program and requirements offices having to route paperwork through people unfamiliar with their platform, to those in FMB making spot judgments due to time constraints. Finally, everyone interviewed complained about the length of time it takes to route paperwork and get decisions. (2005, p. 101)

In Section 5, Barriers to Reform, respondents worried that emergent needs were not identified and integrated into the system soon enough—in effect, that joint needs had priority, and some programs were identified as joint and given priority when the likelihood of their being used in a joint environment was low. They also chafed at the cumbersome procedures in clearing through the joint process. Fierstine and Jones uphold these concerns. They state:

Specifically, all the programmers and requirements officers discussed how emergent needs of existing programs are not adequately addressed by the current system. They also agreed that a big part of it was the fact that the comptrollers were tied to the exact terminology in the OSIPs and that anything not specifically delineated in the OSIPs had to endure the lengthy delay of a new program start-up. They all complained about the difficulty navigating through the vague joint requirements required of all communication gear forcing them to route all associated programs and upgrades through numerous joint wickets even though many of the programs would not be used in such a manner as to require the joint standard. Finally a few interviewees took issue with the equitable distribution of funds in programs that took money from everyone in order to provide commonality to all platforms. They claimed that these funds were effectively an under-the-table system for certain airframes to get capability funded by everyone else. (2005, p. 103)

An interesting part of the research indicates the power of words; the analysis provides a vocabulary of terms used with certain appropriation accounts. Saying that something or some part of a process or decision “belongs” to another account can imply negative consequences for program funding, i.e., the effort top-push costs onto some other entity. Thus, the DoD programming and budget “game” must be played carefully and correctly—making it more time-consuming. The study (2005, p. 103) indicates that a number of terms are virtually synonymous and could be moved under any appropriation, without changing the general definition of the type of work done. However, programmers find themselves tied to each word as if they were pulled from “a sacred text.” This indicates that a careful analyst would use the terms “investigate or research” when writing justification for an RDT&E account, but use the terms “analyze or assess” when doing the same for an APN justification. And an O&M request using these words



would be looked upon unfavorably. The word “track” is probably as close as the O&M accounts get to in depth analysis.

In Section 6, respondents were concerned with innovative adaptations to organizational stress. Here, Fierstine and Jones discuss how requirements change (downward) as programs fail to meet requirements, and how program managers have found that if they can move their program to a multi-year profile they can fend off much of the churn that is driven by the annual budget process, particularly one that takes place in an era of scarce resources. Fierstine and Jones state,

programmers have begun to increasingly use multiyear procurement strategies in an attempt to fence off programs from the annual churn that is inevitable. [...] [B]reaking a MYP contract is a tremendously powerful argument for use in reclaims. The programmers also have used BTRs (Below Threshold Reprogramming) to their advantage to protect their accounts from raids during execution. This has the added benefit of cushioning them against the end of the year need to spend their money or lose it by designating the recipient of moneys unspent and then possibly getting reciprocation after the new budget comes along. (2005, p. 104)

Reflecting on the above research, the authors observe that the most significant issue discovered during this research was that an overwhelming amount of redundancy exists at all levels of the chain of command. They note that this finding is supported by a study by the Center for Strategic and International Studies warning: “that various military bureaucracies ‘unnecessarily overlap, resulting in duplicative and, in some cases, overly large staffs that require wasteful coordination processes and impede necessary innovation’” (Schmitt, 2004).

Fierstine and Jones reinforced this perspective as follows:

the research for this project found that almost every Secretary, Under Secretary, Assistant Secretary and Flag Officer with a required signature anywhere in these three decision making processes has their own group of analysts to recheck, re-verify and recertify the data provided them from others (all of which are in or near the Pentagon). An example with regard to aviation would be how the individual programs, BFM, N7, N8 and OSD all have cost analysis experts on staff looking at the same data, yet coming up with different conclusions. Although risk reduction is important, it seems that DoD analysis capability has grown (in aggregate) past the point of diminishing returns. (Fierstine & Jones, 2005, p. 124)

The results of this research project call for an effort to reduce these redundancies. The authors also would like to see communication among the three processes improved and suggest the creation of an information system to communicate (near) real-time, highly detailed, accurate and useful programmatic cost, schedule, and performance information to decision makers. Included in this system should be highly detailed prioritization lists so that when decisions have to be made at subsequent levels of the budgeting process, those having to make those decisions can more adequately determine what should be cut when necessary, or what should be bought when there is extra funding available.

The research report adds that this might increase decision speed since top leadership officials would be able to make decisions based on data in the system without having to, “drill back down into the program offices to get data that may or may not satisfy their needs” (p. 125).



The study also calls for simplifying the entire acquisition document and review process, but makes no specific recommendation. They suggest that current operators are reducing the risk of making the wrong decision by increasing the time to make the decision. Fierstine and Jones also worry that currently there is no satisfactory way to address “ideas or concerns that bubble up from the fleet that would add small increases in capability in the near-term” (p. 127). They divide this between existing programs that require attention and emergent ideas that require immediate funding and could be fielded quickly and at low cost. They say, “An example of a less urgent nature includes F-14 adaptation of the Air Force LANTERN pod. This upgrade was on the community’s, ‘top-ten upgrade list’ for years, but was only able to get funding after a monumental demonstration of fleet innovation [...]. [H]ad the acquisition pipeline been able to rapidly and cost-effectively address this need, then the fleet would not have been motivated to enter the business of test, evaluation and demonstration” (p. 128).

This research project commented that since changes like this are relatively small and tend to be “focused on the short term versus the JCIDS horizon of decades, they are unable to enter the funding debate without great difficulty” (p. 128). Fierstine and Jones argue that this is a small thing, but important to field users (in this case the fleets), and suggest a better system needs to be “established that will allow the adequate prioritization and swift communication of these fleet concerns up the chain of command” (p. 129). The authors also argue for:

a non-partisan, Defense-oriented analysis of failed DoD programs over the past decade to determine if anything could have been done to discover the warning signs earlier. By doing so, one might expect to learn more about why programs failed, and what political, social or other forces kept the programs alive for so long, and in turn, restricting funding from other priority programs. This would be for the benefit of leadership so that future decisions can be more effective. Therefore, like aviation safety reports, the investigations and findings should be for official use only and not legally binding. (Fierstine & Jones, 2005)

We believe these recommendations deserve measured study. What may first be observed is that they call for a reduction in staffs to reduce redundancies, but also call for the installation of a comprehensive real-time information system that would serve the same information to all participants and the creation of a failure-analysis unit and system. The risk here is that adding a new and complex information system and a new organizational entity to systems already rife with information systems and complexity is problematic. Also, the call to allow some systems to service military department needs more quickly and in a more direct manner pushes against the joint and centralizing tendencies currently in progress under transformation. Lastly, these changes would be imposed on decision systems already undergoing substantial and continuous change. All of these decision systems constitute moving targets. Consequently, any change will have to be made to systems that are already in the process of change. Thus, even more change will be hard to justify relative to the benefits and costs projected to result.

CONCLUSIONS

With respect to the integration of the PPBES and Acquisition decision cycles, there are some points at which substantial and reinforcing linkages exist, and others where the systems operate separately. The question is: to what degree should those parts that are not integrated presently be better integrated in the future? A key point with respect to increased integration that has been established under the leadership of Secretary Rumsfeld is in the programming “endgame”—the last part of the programming phase of PPBES. This is where the Senior



Leadership Review Group (SLRG) established by the Secretary reviews, approves and sometimes is forced to cut major acquisition programs. In 2004 and 2005, the Secretary and SLRG have had to consider both significant increases in acquisition and reductions forced by the tight fiscal constraints of POM 07 and the FY 2006 defense budget. The SLRG review, forced by the need to reduce spending projections due to the costs of the Global War on Terrorism (GWOT) and other budgetary costs (including those for personnel and personnel entitlements programs), resulted in some major acquisition program shifts and reductions. These include approval of the Navy's decision to retire an aircraft carrier early (the Kennedy), cancellation of the C-130J buy and reductions in the size of buys in submarines and surface vessels for the Navy, modularization for the Army (the acquisition portion of this initiative), and cuts in the Joint Strike Fighter, and the F/A-22 aircraft program for the Air Force.

In budget execution, the problems we have identified in this paper remain (as far as we can ascertain). This is an area where the budget drives program to a great degree. Some of this is inevitable, e.g., as a result of congressional politics that produce changes in defense budgets and acquisition programs beyond the ability of the DoD to resist. When this ordering occurs, it causes significant disruption in the budget—both in preparation of future budgets and in the execution of current appropriations. It also forces changes in both the structure and content of the POM and QDR, causing the programming process to have to move in reverse (to accommodate budget changes) in a way that almost always causes discontinuity in program management and execution.

Consequently, we may conclude that under Secretary Rumsfeld, changes have been made to improve the manner in which PPBES serves as a decision system for the DoD and the degree to which this system has been integrated into acquisition decision planning and programming. This is in part as a result of Rumsfeld's demand for better information upon which to base decisions and his willingness to listen carefully and to question vigorously the data and options provided to him from his staff. In addition, it is a result of the changes made in PPBES (detailed earlier in this paper) to better connect the process to the Secretary's decision preferences. We also conclude that this linkage has been strengthened through program review by the JCS (J8) where not just defense-wide acquisition programs as was the case before transformation of PPBES, but *all* DoD acquisition programs now are reviewed for jointness and feasibility.

With respect to budget formulation as opposed to execution, the DoD comptroller staff hold the view that budgeting always has integrated acquisition programming. However, programmers do not share this view, contending that too many budget decisions have driven the POM rather than the other way around. This may have changed to some extent over the past four years, but there is insufficient evidence available to us to show a demonstrable change in how DoD budgeting operates now compared to prior to 2001. What we can document is that DoD budgeting has had to be highly responsive to changes in the threatening and warfighting environment in the past four years.

Increased budgetary responsiveness may be viewed as a contingent reaction; and, a systematic improvement in budget and acquisition decision-process linkage, if it has occurred, may be attributed to necessity. The cost of responding in the post 9-11 context and then financing the GWOT, combined with the recently emergent desire of political leaders to make progress in reducing the size of the annual federal budget deficit, and the prospect of reduced, and then no defense supplemental appropriations for 2007, and the ever-present budgetary pressure caused by the inevitable rise in entitlement spending all have made better and more



constrained program and budget spending plans a necessity for the Secretary and his staff, the military departments and services, and the JCS.

However, we do not wish to present too rosy a picture of the results of transformation of budgeting for acquisition. We must observe that at the program and project-management level (within budget execution from the financial management perspective), there remains a high level of uncertainty regarding financial stability and management control (see Zolin and Dillard/Nissen papers in this proceedings). While macro changes at the DoD level may make participants in OSD believe that the system has been changed (and they probably are right with respect to their position perspective), the larger question remains whether macro system changes have improved the cost, performance, speed of delivery of weapons and weapons systems in reality. This improvement will only result from better management and management control at the point of relationship of the buyer (DoD) and the supplier (the private sector contractors). It is evident from preliminary analysis (and from the experience-based knowledge of serving and retired program and project managers) that there still is much to be improved in the nature of contracting, contract management, enforcement of DoD and government controls through a properly designed and enforced management control system (Jones & Thompson, 1994).

The dilemma is in part a result of management failure on the part of government in assuming that private-sector contractors will obey DoD and federal acquisition rules and guidelines, and the restrictions built into contracts, without sufficient DoD leadership, oversight and enforcement of law and contracts. Is the blame for project-cost overruns the fault of greedy contractors that attempt to take advantage of government incompetence or lax enforcement? Is the blame due to this absence of control on the part of the DoD? It appears that both are causes of the problems of costs exceeding estimates, the extended time taken to develop and deliver new and increasingly more technologically complex weapons systems, late delivery, system failures (despite higher than projected costs), inadequate documentation provided for training of end-users, installation deficiencies and many other problems with the quality and performance of systems delivered to the fighting forces.

Our point is that it is unwise and incorrect to gloat about or claim victory in the battle to make acquisition and its funding more efficient at the top levels of the Pentagon, when at the level at which programs and projects must be managed so little has changed to achieve improved the efficiency and effectiveness goals of transformation. No amount of change at the Pentagon level will achieve these goals. To bring meaningful reform, change must reach down to the level at which spending occurs and programs are executed, where the government and contractor interface and relationships are so crucial to improving performance and results.

How can the process of transformation reach down to the program and project level? Some may argue that a great deal of effort has been exerted toward deregulating and contracting out, much to the benefit of the DoD (generally) and acquisition (specifically). That deregulation (e.g., of the FAR and DAR, the DoD 5000 series, etc.) has been a focus is undeniable. However, the attempts to improve management of acquisition programs at the government/contractor interface have concentrated on auditing. The problem with this approach is that of "closing the barn door after the cows have escaped." It is fine to discover contractor overcharging *ex ante* and to extract penalty payments from contractors as a result. However, this is merely a financial transaction that does little or nothing to improve the services to and benefits of the end user—the warfighter. When unworkable products are manufactured and delivered, no matter what the cost to government, the result for the end-user ranges from frustration in the best of circumstances to casualties and death under the worst of circumstances.



It may be argued that what is needed is not more deregulation but adequate level of effort in enforcing the rules that are in place, which can only happen through high-quality, knowledgeable and skilled leadership. This, in turn, implies investment in the education of leaders and decision makers, better selection of those properly prepared to lead, increased continuity of leadership and the ability to manage looking forward rather than backward in the manner that characterizes the "reform by audit" mentality. Who advanced the conclusion that auditors would be the best source of the management knowledge and expertise needed to improve business practice? Even the audit community itself would not advance this proposition. So, where do we go from here? We believe the knowledge about how to improve acquisition management at the ground level resides to a great extent with those who have done the job, i.e., experienced (and typically retired) program and project managers. If this were not the case, then why would the private sector hire and pay these people so well to represent them in dealing with the DoD? The question of leadership in ground-level transformation, where it will make the most difference for the end-user, thus becomes how to retain this expertise rather than force it into retirement to engage in profit generation for contractors?

In addition, improvement in the nature of contracting instrumentation is vital—and much effort has gone into this initiative in the past several decades. As a colleague remarked, "What kind of cost-plus contract haven't we tried to create the right incentives to perform and deliver the results? We have tried them all!" We would suggest that it is one thing to write a good and enforceable contract and another to actually enforce it. Learning how to do this is one obstacle; getting the attention of a revolving crew of leadership to either do it or permit it to be done is another. Our hope is that pointing out that improved management and control is a start to moving in the right direction (to be realized through adopting the appropriate control system design and execution strategy) and should be a prime target for transformation—equally worthy to the reformulation of the PPBE system—will bring reform home to the level where it matters most (Thompson & Jones, 1994; Jones & McCaffery, 2005 forthcoming).

With respect to the continuing pace of transformation throughout the DoD, no Secretary of Defense can alone manage an enterprise as complex as the Department of Defense. And in fact, it is important to point out that in the past and presently, input to program and budget decisions in the DoD is provided by the Deputy Secretary of Defense and staff, the position in the DoD that bears a large part of the responsibility for actually attempting to manage the DoD. In addition, the Under Secretary Comptroller, the Under Secretary for Acquisition, Transportation, Logistics, and Assistant Secretaries for other OSD functional areas including program analysis and evaluation, policy, force management and personnel, legislative affairs, health, reserve affairs and others, all provide views and analyses to guide program and budget decision making.

From this perspective it must be observed that the task of defense resource planning and budgeting is part managerial and part political. Thus, from our perspective, no amount of budget process, PPBES or business process transformation reforms will reconcile the different value systems and funding priorities for national defense and security represented by opposing political parties, nor will it eliminate the budgetary influence of special-interest politics. Value conflict was evident in the early 1980s when public support combined with strong Presidential will and successful budget strategy produced unprecedented peacetime growth in the defense budget, in particular in the investment accounts. And despite the implementation of deficit-control reforms since 1985 and the Peace Dividend drawdown of the 1990's, constituent and special-interest pressures made it difficult for Congress and the DoD to realign the defense budget. While we applaud the changes made in 2001-2004, reform of defense budgeting process does not mean that producing a budget for national defense politically will be much



easier in the future than it has been in the past. Threat perception and assessment and politics drive the defense budget, not the budget process itself (McCaffery & Jones, 2004). Additionally, the size of the deficit and rate of increase in mandatory expenditures make top-line financial relief for the DoD unlikely.

We also may observe that a sequence of annual budget increases for national defense in the early and mid-2000s have not brought relief to many accounts within the DoD budget. At the same time, requirements of fighting the war on terrorism have intensified the use of DoD assets and the costs of military operations. Because the need for major asset renewal has been postponed for too long, new appropriations have gone (and will go in the future) largely to pay for new weapons system acquisition and for war fighting in battles against terrorism. What this means is that accounts such as those for Operations and Maintenance for all branches of the armed services will continue to be under pressure and budget instability; restraint will remain a way of life for much of the DoD. This places a heavy burden on DoD leadership, analysts and resource process participants to achieve balance in all phases of defense budgeting and resource management.

As explained in this paper, with respect to transformation initiatives beyond improved financial management systems and processes and PPBES implementation, considerable change is in progress. In the area of acquisition and logistics, transformation to what is termed spiral (continuous and simultaneous) and "sense and respond logistics" processes is underway. Improving information technology for management of inventory systems in real time to permit managers to know how much and where material is located on a worldwide basis also has been addressed and is fully operational in the Air Force. In information technology, network-centric combat information systems are under development in all of the military services. Such systems coordinate various types of data to a single command point in real time to improve the ability to see and manage military operations. Applications of network-centric IT in the area of business management may be the next step, although they are costly. However, such applications are one approach to coordination of decision making in flatter, network-types of organization (i.e., hyperarchies) rather than through traditional bureaucratic forms of organizing to solve complex and sometimes "wicked" problems (Jones & Thompson, 1999; Roberts, 2000). Given the vital importance of information technology, it is essential for the DoD to address the knowledge, skills and abilities of its workforce to fully leverage the potential of IT and other business-management methods.

These and the other initiatives identified in this paper are only a sample of the many transformational measures currently under some degree of implementation and experimentation in the DoD. Given the progression from the industrial age to the age of technology in an increasingly global commercial marketplace, capitalization on new technologies is a key part of transformation to create "knowledge warriors" for significant battlefield advantage. Most of these initiatives are not under implementation independent of budgets and cost accountability—virtually all are expected to reduce costs while cutting cycle time with either improvement of quality or, at least, no diminution of quality of service to customers. The business models and plans developed for these initiatives are mirrored on business processes tested and used in the private sector. Transformation also stresses continuous learning and the creation of self-learning organizations that can observe and orient themselves more quickly to new threat environments, then make decisions and take action to learn more quickly by trial and error in a cycle of restructuring, reengineering, reinvention, realignment and rethinking both means and objectives (Jones & Thompson, 1999). Further, critical issues related to transition management, organizational change, organizational design and appropriate institutional arrangements are raised whenever DoD reform is significant.



Overall, the major challenge facing the DoD in the period 2004-2008 is how to continue to modernize the fighting forces and continue the pace of business transformation while paying the high price of waging the war on terrorism. In essence, what the DoD must fund and support in the short-term must be traded-off against longer-term investments to improve both business-management efficiency and force readiness. Given this dilemma, key business-management challenges faced by the DoD leadership in the next decade include the following:

- How will the DoD business transformation keep pace and be coordinated with the transformation of military affairs?
- How will the DoD re-capitalize the force structure within limited budgets?
- How can DoD acquisition and procurement incorporate new technologies while producing and fielding war-fighting and support assets more quickly, especially given tight budgets in the foreseeable future?
- How will new cyber-management technologies and methods (e.g., net-centric warfare systems) be advanced within the limits of resource constraints?
- How will the DoD manage the transition of logistics support (e.g., toward spiral logistics) to the new environment of the war on terrorism?
- How will the DoD improve its accounting and financial management systems to enable analysis of performance and results related to costs, and provide the basis for better internal and external reporting?

These and other challenges face DoD officials as they attempt to improve budgeting, PPBES, acquisition processes and other management systems through transformation.

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A Critical Examination of the DoD's Business Management Modernization Program

Presenter: Christopher Hanks

EXECUTIVE SUMMARY

In its efforts to improve operations in what it has designated the five “business domains” in the US Department of Defense (DoD)—acquisition, financial management, human resources management, installations & environment management, and logistics management—the DoD’s Business Management Modernization Program (BMMP) is a key element of the DoD’s ongoing efforts to transform itself. This paper argues that the BMMP needs to be fundamentally reoriented to meet its goals. It provides an historical overview, research evidence from other studies, and additional arguments to support that view and suggests three steps that could be taken to begin the proposed reorientation.

The BMMP is facing a very wide range of challenges. At the DoD level, the Department continues to grapple with accounting problems that almost defy belief. In May 2001, the Deputy Inspector General reported to Congress the existence of \$1.1 *trillion* in *unsupported* adjustments to the DoD’s FY 2000 books, out of \$4.4 trillion in overall adjustments. This problem is so large that full audits by the DoD IG have been discontinued until DoD management is able to report that the Department’s books have become sufficiently reliable to justify the expense of another attempt at a full audit, which DoD management has not yet been able to do.¹

At the service level, improvements in support-system performance promised when the Defense Business Operations Fund (DBOF) was established in 1991 have not materialized. In the Air Force, for example, the overall “not-mission-capable-supply” rate for Air Force aircraft, a measure reflecting negative performance by the supply business area, rose steadily from 8.6 percent in FY 1991 to 14.3 percent in FY 2000. This occurred even as the after-inflation costs of Air Force depot-level repairs rose by 25 percent from FY 1994 to FY 2001, and as the after-inflation prices Air Force customers had to pay for spare parts rose by 14 percent over the FY 1992 to FY 2001 period.²

At the working level, where hundreds of thousands of individual “business” transactions occur daily in the DoD, the BMMP faces structural problems that demand new thinking. Many studies have shown, for example, that the “full-cost-recovery” (FCR) pricing practices in the Department’s Working Capital Fund (DWCF) activities can lead to counterproductive customer behaviors when the price signals are wrong. RAND analysis of the Army’s “Integrated Sustainment Maintenance” experiment in the mid 1990s, for example, provides examples of local repair decisions that appeared to save money from the unit’s perspective but did not save

¹ Congressional testimony on Defense Financial Management by the DoD Deputy Inspector General, May 2001, June 2002, June 2003, and July 2004. Retrieved from (<http://www.dodig.osd.mil/fo/index.html>).

² *Air force supply: Management actions create spare parts shortages and operational problems* (1999, April) GAO/NSAID/AIMD-9-77; Statement of General George Babbitt, AFMC/CC/ to Military Readiness Subcommittee of the HASC (1999, October 7); Air Force Working Capital Fund FY 2006/FY 2007 President’s Budget Submission, (AFWCF PB). (2005, February); AFWCF PBs for FYs 1995-2001; and, *Analysis of supply management activity group financial reports, prices, and cash management*, (1998, June). GAO/AIMD/NSAID-98-118.



money for the Army overall—e.g., an M939 axle assembly that the unit paid to have repaired locally for \$3646 when the cost of repairing the axle at an Army depot would have been \$2105. Based on the FCR price of \$5991, the unit thought it was saving the Army \$2345, but because virtually all of the extra costs embedded in the FCR price of \$5991 still had to be paid by the Army anyway, the local unit's decision, in fact, caused the Army to spend \$1541 *more* than it needed to have the axle repaired.³

Finally, the demands of the DoD's contingency missions have only increased the need for the BMMP to succeed. As the GAO has noted recently, for example, problems in DoD's business domains—inaccurate supply forecasts, delays in funding, delayed acquisition, and distribution problems—have been important contributing factors to equipment shortages experienced by Army and Marine Corps forces in Iraq.⁴

Against the above backdrop, this paper argues that the BMMP needs to change if it is going to be able to successfully address the kinds of problems described above. The thesis of the paper is that the BMMP's primary objective, combined with its acceptance of the conventional thinking about what it means for DoD support activities to be "businesslike," have prevented the BMMP from making any real progress against any of the types of problems described above—and will continue to do so until the BMMP is willing to undertake a fundamental re-examination of its primary objective, its basic operational assumptions, and the nature of the critical communication role it plays in the defense-transformation effort.

INTRODUCTION

The core assumption underlying the DoD's Business Management Modernization Program (BMMP), consistent with an inherent assumption of the Chief Financial Officers (CFO) Act of 1990,⁵ is that *financial accounting*—i.e., the kind of accounting done in the private-sector to produce external financial statements (balance sheet, income, and cash flow)—can add value in government activities. That this is a core assumption for the BMMP is borne out by the fact that the program's *primary objective* is to produce auditable financial statements ("achieve CFO compliance") for government activities in the five DoD "business domains" (acquisition, financial management, human resources, installations & environment, and logistics) identified in the Department.⁶ The problem with this assumption and objective—and, indeed, with the CFO Act

³ Brauner, M., Bondanella, J., Bolten, J., Galway, L., Pint, E., Ondaatje, E., & Sollinger, J. (1997). ISM-X evaluation and policy implications. MR-829-A. RAND. p. 45.

⁴ *Defense logistics, actions needed to improve the availability of critical items during current and future operations*. (April 2005). GAO-05-275.

⁵ The Chief Financial Officers act of 1990. Retrieved from <http://thomas.loc.gov/cgi-bin/query/z?c101:H.R.5687.ENR>:

⁶ The Vision and Goals section in the March 31, 2005 Update of the BMMP Business Enterprise Architecture (BEA), "Overview and Summary Information" (AV-1, p. 9), states that Goal #1 of the BMMP is to "provide timely, accurate, and reliable information for business management" in the Department. In pursuit of that goal, Objective 1.1 of the BMMP, as stated, is to: "Achieve an unqualified audit opinion (UAO) on 2007 consolidated DoD financial statements." Retrieved from http://www.dod.mil/comptroller/bmmp/products/architecture/BEA_3_31_05/iwp/default.htm. The January 31, 2005 BEA (p. 9) defines a "UAO" as follows: "An unqualified audit opinion is an auditor's report expressing the opinion that an organization's financial statements, taken as a whole, are presented fairly in all material respects in conformity with Generally Accepted Accounting Principles (GAAP) consistently applied and without any qualifiers." Accounting standards (GAAP) for the federal government are proposed by the Federal Accounting Standards Advisory Board (FASAB), which produces statements of Federal Financial Accounting Standards (SFFAS) and Statements of Federal Financial Accounting Concepts (SFFACs). The FASAB was created in 1990 by the Secretary of the Treasury, the Director of OMB, and the U.S. Comptroller General, following the passage of the CFO Act in that same year, for the express purpose of developing "applicable accounting principles"



itself in the DoD setting—is that none of the DoD’s support activities, even those that have been structured to appear the most businesslike, operate in a competitive marketplace. The result is, that whereas the requirement to regularly produce financial statements describing the financial condition of the enterprises they manage to external stakeholders does create pressure on private-sector managers to work at making their enterprises more effective and efficient, that same effect does not occur in the public-sector setting of the DoD.⁷

This paper reviews the history of the DoD’s efforts to structure and operate certain of its organic support activities as if they were “businesses”—focussing on three practices in particular where the attempted parallels with the private-sector are the most explicit. This history is important for the BMMP because it helps explain where and how DoD support activities are “businesslike” and where they are not; it also explains why, as a result, audited financial statements, even if they can eventually be produced, cannot be expected to have, and will not have, the same effects on defense support activities as they do on real businesses in the private sector. The three practices the DoD has used to structure and operate certain of its support activities “like businesses” are the following:

- The longstanding use of revolving-fund financing mechanisms, which set up customer-provider/buyer-seller relationships between operating forces and support activities and require the support activities to set and charge prices for the goods and services they provide;
- The passage of the CFO Act of 1990, which levied private-sector-style financial-reporting requirements on what the Act refers to as all “commercial functions”⁸ in the government, including all revolving-fund activities in the DoD; and
- The creation in 1991 of the Defense Business Operations Fund (DBOF)—now called the Defense Working Capital Fund—which incorporated all of the DoD’s existing revolving-

for the newly required CFO financial statements (see <http://www.fasab.gov/pdf/files/fasabfacts2.pdf>). The FASAB is modeled after the Financial Accounting Standards Board (FASB) in the private sector. The FASB, operating with the imprimatur of the U.S. Securities and Exchange Commission (which has ultimate statutory responsibility for setting U.S. financial accounting standards) is a private body that develops and proposes accounting rules and standards for public and private businesses and other enterprises (e.g., investment companies, trusts, nonprofit activities, etc.) that must periodically report their financial condition to their owners, shareholders, trustees and other interested stakeholders. In October 1999, the Council of the American Institute of Certified Public Accountants (AICPA) designated the FASAB as the body that promulgates GAAP for federal entities in the United States.

⁷ In their April 2001 report (p.8), the Friedman Task Force on Transforming Financial Management (discussed later in the paper—see note 16 below) makes this point as follows:

Many of the issues uncovered in our interviews and research have been dealt with effectively in private industry, largely because of the competitive forces of the marketplace and the focus on shareholder value. No similar external push exists within the DoD.

⁸ Subsequent to the passage of the CFO Act in 1990, the Congress passed the Federal Financial Management Act (also known as the Government Management and Results Act) in 1994. The FFMA extended the requirement for annual audited financial statements for “commercial activities,” as called for in the CFO Act, to *all* activities in the DoD and government, “commercial” and otherwise. The term “CFO compliance” has come to include compliance with the 1994 FFMA extension of the 1990 CFO Act’s financial-statement requirements. Subsequent to the CFO and FFMA Acts, given the difficulties the government was having complying with both of them, the Federal Financial Management Improvement Act (FFMIA) of 1996 required the heads of all the federal agencies to prepare and submit a “Remediation Plan” for bringing the agency’s financial-management practices into compliance with the new federal accounting standards that, at that point, had begun to be developed and promulgated by the FASAB (see note 6 above).



fund activities into a unified-fund structure centrally controlled at the DoD level,⁹ brought additional support activities previously funded by direct appropriations under the revolving-fund umbrella, and established an important new pricing policy (that would henceforth apply to *all* revolving-fund activities in the Department) called “full-cost-recovery” (FCR) pricing.

Against the backdrop of these practices, the BMMP has devoted most of its effort and resources over the last four years to attempting to assemble and hone an overarching “operational architecture” for transforming the business and financial practices of the Department.¹⁰ In doing that, the BMMP has treated the set of DBOF, WCF, CFO, and FCR practices above (henceforth referred to as the DWCF practices) as sacrosanct. That is, the BMMP has accepted without question that however the operational architecture is ultimately structured, it, and the information systems that are put in place to implement it, must support and facilitate the DWCF practices. By accepting DWCF practices as a given, the BMMP has denied itself the opportunity to even consider, much less develop, alternative operational architectures for some of the most important and expensive support activities in the Department—logistics activities being the prime examples. For instance, not only are the central supply and maintenance activities the largest and most expensive support activities the Department has,¹¹ but they are also where the revolving-fund approach has its deepest historical roots. Therefore, the DWCF practices hold the most sway over operational thinking within these activities.

Notwithstanding the commitment the DoD has made to the DWCF approach and the belief it has expressed in its value,¹² a substantial body of defense economics research done

⁹ Although the DBOF was reconfigured in 1996 to become the fivefold Defense Working Capital Fund (DWCF) structure that exists today in the DoD (see note 33 below), ultimate control over the five separate DWCF funds still resides with the DoD Comptroller. Program Budget Decision (PBD) 426, for example, is the PBD issued every year by the Comptroller that sets all WCF activity prices and costs for the budget year. The Comptroller, through the use of the DWCF “Unit Cost Goal” (UCG) controls, also exercises final control over how much the WCF activities are allowed to obligate during execution of the budget year.

¹⁰ As reported on March 16, 2004 by the DoD Comptroller to Congress, in the FY02-04 period, the BMMP obligated \$257.8M for:

initial delivery of the (BMMP) architecture; a transition plan; change management and communications initiatives; refinement of the Enterprise Architecture through business process modeling/reengineering for Increment One; test and evaluation activities; independent verification and validation efforts; engineering support; integration of the Enterprise Architecture; salaries, facilities, supplies, and program management support contracts. The \$257.8M does not include funding to resource Domain activities (\$45.1M in FY04-05, for example). Contractor support for the FMMP and the BMMP has been provided by a consortium called Team IBM led by IBM Global Services, with participation (as of March 2004) by main subcontractors KPMG, SAIC, CSC, and AMS.

Retrieved from http://www.globalsecurity.org/military/library/congress/2004_hr/04-03-31burlin.htm.

¹¹ Roughly half of the more than 180,000 DoD civilian FTEs’ employed in DWCF activities work either in central maintenance or central supply, and the DWCF supply and maintenance activities account for roughly 2/3 of the total DWCF revenues. The Army and Air Force both have four-star commands (Army Materiel Command in the Army and Air Force Materiel Command in the Air Force) that oversee the DWCF supply and maintenance activities in their management portfolios, while the Navy has Naval Supply System Command for central management of Navy supply, and has distributed management oversight responsibilities for its depot maintenance activities (shipyards and air rework facilities) among its operational commands.

¹² In the DWCF Handbook, for example, (available at the DoD Comptroller website at <http://www.dod.mil/comptroller/icenter/dwcf/dhintro.htm>), the final chapter concludes as follows (emphasis in original):



over the last fifteen years suggests that the DWCF approach, rather than improving cost visibility and helping to promote more efficient and effective use of the Department's resources, has tended to have the opposite effect along both of those dimensions.¹³ The studies in question do not appear to have been taken into account in the BMMP, so one of the purposes of this paper is to bring that literature to the BMMP's attention. The implications of these studies for the BMMP are clear. If the use of revolving-fund financing arrangements, the pursuit of CFO

While the DWCF financial structure continues to evolve, implementation also continues. Objectives are being met, and improvements are occurring on a routine basis. A working management structure is in place to provide policies and standardized procedures that will keep pace with changing requirements. This structure will also continue to incorporate new business areas as required, and evaluate existing business areas to ensure they are supporting the operating forces in an effective and efficient manner.

DWCF is here to stay.

It is incumbent upon customers and providers to continue improving DWCF processes and standards. After all, every dollar saved in support is another dollar available for the operating forces.

¹³Studies over the last fifteen years that have pointed out problems with the DWCF approach include:

- Camm, F. & Shulman, H. L. (1993). When internal transfer prices and costs differ. MR-307-AF. RAND; GAO (1994).
- Glass, D. V. (1994, June). Pricing policy and maintenance balance. [LMI Issue Paper]. Logistics Management Institute.
- Glass, D. V., Margolis, M. A. & Wallace, J. M. (1994, August). Activity-based management accounting for DoD depot maintenance. PA303R1. Logistics Management Institute.
- Rogerson, W. P. (1995, March). On the use of transfer pricing within DoD—The case of repair and maintenance of depot-level reparable by the Air Force. PA303RD1. Logistics Management Institute.
- Trunkey, R. D. & Choi, J. (1996, March). The defense business operations fund (DBOF): Problems and possible solutions. CRM 95-196. Center for Naval Analyses.
- Brauner et al. (1997) (see footnote 3).
- Baldwin, L. & Gotz, G. A. (1998). Transfer pricing for Air Force depot-level reparable. MR-8-08-AF. RAND.
- Glass, D. V., Dukovich, J. & Wallace, J. (1998, October). A comparison of Air Force and commercial wholesale inventory accounting practices. AF804T1. Logistics Management Institute.
- Keating, E. G. & Gates, S. M. (1999). Defense working capital fund policies—Insights from the defense finance and accounting service. MR-1066-DFAS. RAND.
- Wallace, J. M., Kem, D. A. & Nelson, C. (1999, January). Another look at transfer prices for depot-level reparable—Marginal costs: A revenue perspective. PA602T1. Logistics Management Institute.
- Brauner, M., Pint, E., Bondanella, J., Relles, D., & Steinberg, P. (2000). Dollars and sense, A process improvement approach to logistics financial management. (2000). MR-1131-A. RAND.
- Keating, E. G., Gates, S. Pace, J., Paul, C. & Alles, M. (2001). Improving the defense finance and accounting service's interaction with customers. MR-1261-DFAS. RAND.
- Pint, E. M., Brauner, M., Bondanella, J., Relles, D. & Steinberg, P. (2002). Right price fair credit—Criteria to improve financial incentives for Army logistics decisions. MR-1150-A. RAND.
- Keating, E. G., Gates, S., Paul, C., Bower, A., Brooks, L. & Pace, J. (2003). Challenges in defense working capital fund pricing—Analysis of the defense finance and accounting service. MR-1597-DFAS. RAND.
- Wallace, J. M., Le, H., Nelson, C., & Webster, C. (2000, January). The inventory-as-assets concept—Implementation for depot-level reparable. AF906R1. Logistics Management Institute.

Many of these studies place particular focus on the problems caused by the use of FCR pricing—a topic that economists both inside and outside the DoD have been thinking about for many years. Indeed, in their 1961 classic, *The Economics of Defense in the Nuclear Age*, Hitch and McKean, in their discussion of the emerging use of stock and industrial funds, note that "in order for both managers and customers of funded enterprises to be motivated appropriately, [...] prices of outputs must be set [...] to reflect incremental cost. [...]" (which, as explained later, the FCR approach does not do) (Hitch, C. J. & McKean, R. N. (1961)). The economics of defense in the nuclear age. Cambridge, MA: Harvard University Press). Baldwin and Gotz (1998) also provide references to the relevant academic literature on the transfer pricing problem, with Hirschleifer (1956) being the earliest such reference they provide.



compliance, and the institution of FCR pricing have, on balance, led to practices that, although well-intentioned, have been subtracting rather than adding value for the DoD, that situation should be addressed before the BMMP finalizes the “business enterprise architecture” it is seeking to establish for the Department.

Towards that end, the paper suggests three steps that could be taken to begin the process of fundamentally re-orienting the BMMP so that it will be able, for the first time since it began, to truly begin to add value to and support meaningful transformation in the DoD’s support activities:

- The BMMP needs to shift its emphasis from external financial accounting to the establishment of accurate *management accounting*. As has been pointed out by many, including Harvard’s Robert Kaplan (one of the developers of the activity-based-costing method of management accounting and, not coincidentally, also one of the developers of the Balanced Scorecard, a version of which the DoD has adopted to pursue performance-based management), financial accounting systems able to meet external reporting requirements (of the type required by the CFO Act) are “completely inadequate” for either “estimating the costs of activities and business processes” or for “providing useful feedback to improve business processes.”¹⁴
- Because the CFO Act is law, and many of the most serious CFO compliance problems exist in the DoD’s WCF activities, particularly in the areas of central supply and maintenance, the BMMP needs to undertake a fundamental review of basic operating policies for all the DWCF activities—particularly central supply and maintenance.¹⁵ The goal of such a review would be to determine where and how changing basic financial and operational policies for those activities would help clarify incentives and improve cost visibility, while simultaneously simplifying financial accounting. For some activities, that may involve a return to direct funding and traditional, public-fund budgetary accounting. For others, where the revolving-fund approach does provide needed management flexibility, the review may call for changes in pricing policy (e.g., shifting from FCR pricing to incremental pricing) and/or changes in what are now viewed as necessary accounting practices because of current “business practices” (e.g., treating Depot-Level-Repairable (DLR) components as capital assets rather than as inventory held for sale, and structuring DLR transactions accordingly). These ideas and others have already been explored in the DWCF studies noted earlier, so the BMMP would have the advantage that much of the basic analysis for such a review has already been done.
- Recognizing that the Congress is likely to want an explanation as to why the Department is changing some of the most fundamental assumptions and objectives of the program, the BMMP will need to prepare a high-level report for the Congress that explains why

¹⁴ Kaplan, R. S. & Cooper, R. (1998). *Cost & effect*. Harvard Business School Press. p. 14.

¹⁵ Since 1991, when the DBOF was created, no less than six DoD-level efforts (there have been others at the service level) have been mounted to examine and “improve” DBOF and DWCF processes and procedures. The two most recent were a DoD Business Initiatives Council (BIC) initiative in 2002 (resulting in a Management Initiative Decision—MID 903—see note 35 below) and a Defense Business Board (DBB) Task Group study in 2003 (<http://www.dod.mil/dbb/task-fm.html>). With the exception of the DBB study, all of these efforts have been either led or co-led by Comptroller personnel. If the BMMP does undertake another DWCF review as recommended in this paper, it will be important to ensure that the review is led by an individual or individuals who are independent of the DoD Comptroller’s office.

de-emphasizing the production of external financial statements and pursuing the kinds of initiatives described above will allow the DoD, for the first time since the CFO Act was passed, to begin actively pursuing what (in all likelihood) the Congress intended and wanted the DoD to pursue when it passed the CFO Act in the first place: sensible, responsible, and honest *internal* financial management and accounting that will lead to more effective and efficient support operations within the Department.

A new governance structure has recently been put in place for the BMMP that, in tandem with the 2005 Quadrennial Defense Review, offers DoD leaders the chance to step back and re-evaluate, from first principles, what the BMMP is about.¹⁶ Under the new governance structure, a DoD-wide Defense Business Systems Management Committee (DBSMC), chaired by the Deputy Secretary of Defense and vice-chaired by the Undersecretary of Defense for Acquisition, Technology & Logistics, has been established to provide new strategic direction for the program. Given the high levels of attention and commitment that have been invested in the BMMP, and the challenging political framework within which it is proceeding, re-orienting the BMMP along the lines suggested here will not be easy and will require, for that reason, strong leadership from the DBSMC that goes well beyond “business as usual.”

THE DOD’S BUSINESS MANAGEMENT MODERNIZATION PROGRAM (BMMP)

¹⁶ Quoting from the BMMP website (<http://www.dod.mil/comptroller/bmmp/pages/governance.html>): “On February 7, 2005, the Deputy Secretary of Defense signed the charter that established the DBSMC, which will advance the development of world-class business operations in support of the warfighter. To accomplish its mission, the DBSMC will recommend policies and procedures that:

1. Integrate DoD business transformation.
2. Review and approve the DoD BEA and cross-DoD, end-to-end interoperability of business systems and processes.

The primary role and responsibility of the DBSMC is to establish strategic direction and plans for the Business Mission Area, in coordination with the Warfighting and Enterprise Information Environment Mission Areas.

The DBSMC consists of the following members:

- Deputy Secretary of Defense (Chair)
- Under Secretary of Defense for Acquisition, Technology, and Logistics (Vice Chair)
- Secretaries of the Military Departments and the Heads of the Defense Agencies
- Under Secretary of Defense (Comptroller)
- Under Secretary of Defense for Personnel and Readiness
- Vice Chairman of the Joint Chiefs of Staff
- Commander, U.S. Transportation Command
- Commander, U.S. Joint Forces Command
- Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer
- Director, Program Analysis and Evaluation (Advisory)

The DBSMC will oversee the modernization process, which implements interoperable business solutions for DoD business systems. Because of its governance role and the interdependency of DoD business operations and systems, the DBSMC also guides the strategic direction of transformation efforts within DoD’s Business Mission Area (BMA). These efforts support the business capability improvements that the Warfighting Mission Area needs to better accomplish its missions.”



Before assuming its current name, the BMMP was known as the DoD's Financial Management Modernization Program (FMMP). Initiated in July 2001 by the DoD Comptroller, the FMMP was the DoD's response to the recommendations in an important report, *Transforming DoD Financial Management: A Strategy for Change*. This document was issued in April 2001 by a task force assembled by Secretary Rumsfeld in January 2001 to examine the Department's financial management problems.¹⁷ Led by Stephen Friedman, a former chairman of Goldman, Sachs, and Co., the task force was one of several that Secretary Rumsfeld assembled early in 2001 to help develop ideas on how to go about "transforming" the Department of Defense. As the following passage from their report makes clear, the Friedman task force was asked to examine some longstanding and very difficult problems:

More than ten years ago, the U.S. Congress passed the Chief Financial Officers Act, mandating that the Federal agencies prepare annually a set of auditable financial statements detailing assets and liabilities and the result of their annual operations. Selected agencies, including parts of DoD, were included as pilots for this program. In 1994, Congress passed the Government Management and Results Act, mandating that the CFO Act applies to all agencies. For FY 2000, DoD, once again, was unable to meet the requirements of the CFO Act. Even more troublesome is the awareness that compliance with the CFO Act remains out of reach, far over the horizon.

In the current environment, DoD has a serious credibility problem in financial management. On January 11, 2001, in the confirmation hearing of the Secretary of Defense, Senator Byrd questioned the Defense Department's inability "to receive a clean audit opinion on its financial statements." He went on to say, "I seriously question an increase in the Pentagon's budget in the face of the Department's recent (Inspector General) report. How can we seriously consider a \$50 billion increase in the Department of Defense's budget when the (Department of Defense's) auditors—when the DoD's own auditors—say the Department cannot account for \$2.3 trillion in transactions."¹⁸

The work of the Friedman task force is important because some of its recommendations have not received the attention and emphasis they deserve. In part, this is because the Department has been under substantial pressure from the GAO and OMB to focus on the "operational and system architecture" aspects of its financial-management problems. The GAO had already issued highly critical reports on that subject well before the FMMP and the BMMP were launched, and it has continued to issue similar reports to this day.¹⁹ For whatever

¹⁷ Friedman, S. et al. (2001, April 13). *Transforming Department of Defense financial management—A strategy for change*. [Final Report]. Institute for Defense Analyses. Retrieved from <http://www.defenselink.mil/news/Jul2001/d20010710finmngt.pdf>.

¹⁸ See note 17, p.3, (opening paragraphs in Section 3 entitled "Current Situation"). The comment by Senator Byrd to Mr. Rumsfeld refers to Congressional testimony given on July 20, 2000 by Robert J. Lieberman, Assistant DoD Inspector General for Auditing, on the subject of DoD Financial Management, before the Task Force on Defense and International Relations, House Committee on the Budget—see <http://www.dodig.osd.mil/audit/reports/fy00/00-167.pdf>. In similar testimony (a year later on the same subject), Lieberman noted that the unsupportable accounting adjustments used to assemble the DoD's FY 2000 financial statements still totaled \$1.1 trillion—see <http://www.dodig.osd.mil/audit/reports/fy01/01-120.pdf>.

¹⁹ In the context of the DoD's efforts to meet the demands of the CFO Act, the GAO has been calling on the DoD to establish an "architecture" for dealing with its financial-management challenges at least since 1997, when it first identified Defense Financial Management in its "High Risk Series" of reports (see *Defense financial management*. (1997, February). GAO/HR-97-3, p. 23). The GAO's emphasis on the need for architecture was already strong when the FMMP was launched in the summer of 2001 (for example, see, *Information technology: Architecture needed to guide modernization of DoD's financial operations*. (2001, May 2001). GAO-01-525). As of the time this paper was

reason—response to GAO’s urgings, internal management decisions, advice from contractors, the Friedman task force’s call to develop an architecture (which was also in their report)—the FMMP and the BMMP became totally preoccupied with the building of “architectures.” That caused them to lose sight of what the task force described as “closer-in” management initiatives that they recommended be pursued, in addition to the longer-range actions they also recommended. One “closer-in” effort that the Friedman task force recommended, for example, was to set up activity-based-costing (ABC) projects in the high-value area of logistics²⁰—a recommendation that neither the FMMP nor the BMMP has acted on.²¹ For now, the important point is that the BMMP, which began life as the FMMP, can trace its origins *directly* to the passage of the CFO Act and its call for the production of external financial statements. Given that history, the fact that producing auditable financial statements has been and continues to be the primary objective of the program is an understandable, albeit unfortunate, development.²²

The FMMP-to-BMMP name change occurred in May 2003—finally expressing the fact that the FMMP organizers believed from the beginning that financial management reform and “business-process reform” are linked. As Secretary Rumsfeld himself observed in a speech he gave at the Pentagon on September 10, 2001:

Just as we must transform America’s military capability to meet changing threats, we must transform the way the Department works and what it works on. [...] Our challenge is to transform not just the way we deter and defend, but the way we conduct our daily business. [...] We have committed \$100 million for financial modernization, and we’re establishing a Defense

written, the most recent GAO report criticizing the DoD’s architectural efforts is *DoD’s High-Risk Areas, Successful Business Transformation Requires Sound Strategic Planning and Sustained Leadership*. (2005, April 13). GAO-05-520T. This document is a statement of David M. Walker, Comptroller General of the United States. Retrieved from <http://www.gao.gov/new.items/d05520t.pdf>. For additional background on the GAO’s longstanding enthusiasm for the architectural approach, see *Strategic information planning: Framework for designing and developing system architectures*. GAO/IMTEC-92-51 and *Executive guide, Improving mission performance through strategic information management and technology: Learning from leading organizations*. (1994, May). GAO/AIMD-94-115. For the history of the OMB’s efforts to promote the architectural approach, related to the passage of the Information Technology and Management Reform Act (Clinger-Cohen Act) of 1996, see <http://www.whitehouse.gov/omb/egov/a-1-fea.html>.

²⁰ See note 17 above, p. iv.

²¹ At least insofar as can be determined by examining the BMMP website (<http://www.dod.mil/comptroller/bmmp/pages/index.html>), where searches for “activity-based costing” and “ABC” come up empty.

²² In July 2000 testimony before the Congress on DoD financial management, Robert Lieberman, the Assistant DoD Inspector General, clearly attempts to lodge the idea with his Congressional interlocutors that clean audit opinions on external financial statements are not necessarily the same thing as the provision of useful financial information to government managers. He returns to this theme in his testimony on the same subject a year later, when he notes:

Although the DoD has put a full decade of effort into improving its financial reporting, it seems that everyone involved—the Congress, the Office of Management and Budget, the audit community, and DoD managers—have been unable to determine or clearly articulate exactly how much progress has been made. In my view, this is at least partially caused by the emphasis on overall audit opinions for the year-end statements, as opposed to focus on the status of individual system modernization projects.

Lieberman, R. J. Assistant Inspector General for Auditing. (2000, July 20). Statement on Department of Defense financial management before the task force on Defense and International Relations, House Committee on the Budget.



Business Board to tap outside expertise as we move to improve the Department's business practices.²³

At the time of the name change, the BMMP, which (as the FMMP) had been managed by a Deputy Undersecretary for Financial Management in the DoD Comptroller's office, became a jointly sponsored program under the direction of the DoD Comptroller and the Assistant Secretary of Defense for Networks & Information Integration.

Finally, the BMMP was reorganized in the fall of 2004 and placed under a new governance structure. As described at the BMMP website,²⁴ authorization and direction for the new governance structure are contained in the National Defense Authorization Act (NDAA) for FY 2005 passed on October 28, 2004. The FY 2005 NDAA specifies (as of the time of the writing of this paper) that the chief executive body for the new BMMP governance structure will be a high-level Defense Business Systems Management Committee (DBSMC).²⁵

THE DOD'S EFFORTS TO MAKE ITS SUPPORT ACTIVITIES "BUSINESSLIKE"

Understanding the history of the DoD's efforts to make its support activities "businesslike" makes it easier to understand what is likely to influence managers in those activities to pursue greater efficiencies and what isn't.

The idea that it should be possible to run DoD support activities "like businesses" is almost as old as the Department itself. Following World War II, the National Security Act of 1947 established the Department of Defense, created the Office of the Secretary of Defense, and charged the new Secretary with reorganizing the military services to "eliminate duplication." Within two years, responding to recommendations of the first Hoover Commission (1947-1949) and some of its own committees,²⁶ the Congress amended the 1947 Act and authorized the Secretary of Defense to establish "revolving funds"²⁷ for industrial or commercial-type activities providing "common services" within the Department. The presumption was that the customer-provider/buyer-seller relationships that characterize the revolving-fund approach would lead to

²³ DoD Acquisition and Logistics Excellence Week Kickoff: *Bureaucracy to Battlefield*, a speech delivered by Secretary of Defense Donald H. Rumsfeld at the Pentagon, Monday, September 10, 2001. When making his remarks on the FMMP, Secretary Rumsfeld also predicted that "financial-management transformation will be difficult and will take 8 or more years to complete." His prediction is consistent with current concerns that (expressed by both GAO and the Defense Business Board) that even by 2007, the latest target date, DoD will still not have achieved CFO compliance, a full 17 years after the passage of the CFO Act. <http://www.defenselink.mil/speeches/2001/s20010910-secdef.html>

²⁴ <http://www.dod.mil/comptroller/bmmp/pages/governance.html>

²⁵ See note 16 above.

²⁶ In 1945, for example, the Johnson Subcommittee of the House Committee on Naval Affairs, proposed the idea of using revolving funds to finance industrial-type and commercial-type activities (e.g., shipyards).

²⁷ Revolving funds, or working capital funds as they are now called, are described as "revolving" because the cash they contain (which the activities they support use to pay *their* bills) is replenished on a continuing basis by the cash that comes in from customers as they pay for the goods and services they receive. Funds appropriated by the Congress, of course, are ultimately what must cover virtually all of what the DoD spends every year, so revolving-fund activities are generally expected to function on a "break-even" basis over time, neither making nor losing money. The revolving funds thus "revolve" over time (ideally) as appropriated dollars flow in from customers and then out as the support activities which the funds finance pay their bills. In practice, and not surprisingly, revolving funds have always required periodic infusions of cash from the Congress (e.g., in times when they have to grow to meet expanded demand), and they have also been a source of cash that the Congress has been happy to tap on those occasions when they have accumulated excess cash (e.g., in times of DoD downsizing).

more “businesslike practices” in the provision of such common services, thereby helping to reduce (it was argued) the duplication of services and other inefficiencies that had grown up during World War II.²⁸

The Hoover Commission might have taken a more direct approach to recommend that the Congress and DoD simply reduce the amounts being appropriated and allocated to those activities where duplication existed or unnecessary expenditures were being made. In fact, the Congress *did* reduce real defense budget authority after the war ended: by almost 75 percent from 1946 to 1947, by 7 percent from 1947 to 1948, and by 6.7 percent from 1948 to 1949.²⁹ By 1949 however, when the Hoover Commission was making its revolving-fund recommendations, the Congress was no longer reducing defense budget authority. Indeed, defense budget authority, most likely in response to the new Cold War threats that were beginning to emerge, had begun to increase again—by almost 13 percent from 1949 to 1950, for example. Under those circumstances, it is perhaps understandable why the Hoover Commission, given the continuing public pressure to reduce what was still widely perceived as waste in military spending, rather than calling for yet more reductions in defense spending, would opt instead to recommend the use of revolving-fund mechanisms and their buyer-seller arrangements as the way to keep the pressure on support activities to be efficient, even as defense spending once again began to rise.

In any case, based on the formal authority provided by the National Security Act of 1947 as amended in 1949,³⁰ the use of revolving-fund, buyer-seller relationships in the Department began to expand. In the 1950s, fuel and consumable repair parts became “stock-funded” supply commodities, and in 1958, airlift services became “industrially funded.”³¹ Continuing the pattern, in 1968, all of the Department’s aeronautical depot-maintenance activities, primarily as the result of a push from the DoD Comptroller, became industrially funded.³² In the 1980s, the Navy was the first service to “stock fund” its Depot-Level-Reparable spares (DLRs), starting with ships’ reparables in 1981 and aviation reparables in 1985. The Army and the Air Force followed suit with their DLRs in 1992—just as the DBOF (discussed below) was getting underway.³³

²⁸ This depiction of the post-WWII emergence of revolving-fund financing mechanisms is based on material in a study published by the Office of History of the Military Airlift Command (MAC). See True, J. L. COL & Nawyn, W. E. (1989, February). The airlift service industrial fund 1958-1988: The evolution of an effective management approach. [Special Study] Military Airlift Command (Air Mobility Command) Office of History. Scott AFB, IL: United States Air Force.

²⁹ Historical data on DoD budget authority from the “Green Book” (National Defense Budget Estimates for the FY 2005 Budget). (2004, March). OUSD(C). Table 6-10 (DoD BA by Service). p. 122.

³⁰ The relevant legislation, as amended, is contained in: *United States Code, Title 10. Armed Forces, Subtitle A. General Military Law, Part I—Service, Supply and Procurement. Sec. 2208. “Working-Capital Funds.”*

³¹ See True & Nawyn (1989) note 28 above; Air Force Logistics Command (AFLC), *Revolving funds: Air Force industrial fund and stock fund* (1983); Petersen, J. W., (1966, March 18). Comments on the DoD depot maintenance report. L-5505. RAND.; and Shycoff, D. (1995). The businesses of defense. [private manuscript].

³² The industrial funding of all aeronautical depot maintenance in the DoD began in 1968, two years after a DoD Aeronautical Depot Maintenance Study called for that action. The study was led by Professor Robert Anthony of Harvard University, then serving as the DoD Comptroller. The study team included a program and budget analyst named Donald Shycoff. As he recounts in his book *The Businesses of Defense*, Shycoff (1990), having risen to become the Principal Deputy Comptroller 25 years later and the launch of the DBOF, succeeded in putting in place a system consistent with what Professor Anthony had begun to try to put in place with the industrial funding of aeronautical depot maintenance in 1968, where the idea of average-cost pricing was born.

³³ Defense Management Review Decision (DMRD) 904, *Stock Funding of Depot Level Reparables*, extended to the Army and Air Force what the Navy had done with its DLRs in the 1980s. On November 18, 1990, one year after



The terms “stock funded” for supply activities and “industrially funded” for service activities both refer to the use of revolving-fund financing. Historically, the industrial-fund activities recovered a larger portion of their total operating costs (e.g., all of their labor and other overhead costs) in their prices, whereas supply activities recovered only the direct costs of replenishing stocks—i.e., the incremental costs of buying the stocks themselves and not the (generally) fixed costs for the labor and overhead necessary to manage and operate the supply system. (Supply activities received direct appropriations to pay those costs.)

Then, in the late 1980s and early 1990s, partly in response to the federal deficits of the 1980s and the budget pressures DoD was beginning to feel with the end of the Cold War, senior DoD leaders, again at the urging of the DoD Comptroller, decided to broaden the use of the revolving-fund approach. They did so by merging the separate stock and industrial funds in the services into a single, unified fund—centrally managed by the Comptroller’s office—called the Defense Business Operations Fund (DBOF). The DBOF began in February 1991.³⁴

The plan was to use the DBOF to finance not only all central supply activities, airlift services, and depot-level maintenance operations (shipyards and aeronautical depot maintenance activities), which were already operating under revolving-fund financing, but to finance other support activities as well, including central warehousing and second-destination distribution services, central information-system-design and data-processing services, and central finance and accounting services. (Before being brought under DBOF financing, the latter were directly funded by appropriations.) In addition to adding activities, the DBOF also introduced a new pricing policy requiring that all revolving-fund activities (not just the industrially funded activities) had to begin charging what are called “full-cost-recovery” (FCR) prices for the goods and services they provide. The intent was, as the Comptroller’s office would describe

DMRD 904 was issued, the Air Force distributed a memorandum, *Air Force Final Implementation Plan for the Stock Funding of Depot Level Reparables* (dated October 1990), that explained how the Air Force would respond to DMRD 904. An overview issued by the DoD Comptroller’s office as part of the FY 1992 DBOF budget submission notes that the stock funds in the Army and Air Force assumed financial responsibility for the *procurement* of DLRs on October 1, 1990, and the *repair* of DLRs on July 1, 1991, and that Army and Air Force customers first began being *billed* for DLRs on April 1, 1992, i.e., midway through FY 1992. (The Army and Air Force stock funds received direct funding to cover the DLR procurement expenses they incurred in FY 1991 and procurement and repair expenses in the first half of FY 1992.)

³⁴ The DBOF was officially established by a “Defense Management Report Decision” (DMRD # 971, *DoD Financial Systems*) issued over the signature of the Deputy Secretary of Defense (Donald Atwood) on February 2, 1991. In all, more than 80 DMRD’s were issued by the Office of the Secretary of Defense (OSD) following the release of the “Defense Management Report” (DMR) from the Secretary of Defense to the President in July 1989. The DMR was the implementation vehicle for recommendations made by the President’s Blue Ribbon Commission on Defense Management (the Packard Commission), which had been formed in the second term of the Reagan administration. Although the Packard Commission’s report (*A Quest for Excellence* (June 1986)) and the DMR both offered general principles calling for increased use of “commercial-style” products and practices and the development of new approaches to improve efficiency in the “acquisition process,” neither contained the specific DMRD’s that were to follow. The DMRD’s were written by OSD staff and issued over the signature of the Deputy Secretary with the intent of converting the general recommendations of the DMR into specific actions. All the DMRD’s were issued by the Office of the Comptroller and followed formats similar to those used in the Program Budget Decisions issued each year by the Comptroller at the end of the annual Planning, Programming, Budgeting, and Execution process. The DBOF-related DMRD’s, in particular, reflected the thinking of Donald Shycoff, who served as the DoD Principal Deputy Comptroller during the first Bush administration from 1989 to 1992 and Acting Comptroller in the first year of the Clinton administration from 1992 to 1993. (See Shycoff and *The Businesses of Defense*, note 32 above.)

later, “to focus the attention of all levels of DoD management on the total costs of carrying out certain critical DoD business operations and to manage those costs effectively.”³⁵

Although the DBOF was reconfigured in 1996 to become the fivefold Working Capital Fund (WCF) structure³⁶ that exists today, all the other DBOF policies remain in force, including, in particular, FCR pricing.³⁷ Under FCR pricing, defense working capital fund (DWCF) activities, in their annual budget-build process, are required to compute and set the prices they will charge based on their expected unit costs. Each activity computes its expected unit costs by dividing the total projected cost of operations for the year (i.e., the sum of all direct, indirect, and overhead costs) by the total number of “unit outputs” that the activity expects to produce. “Unit outputs” are defined according to the nature of the activity—e.g., direct-labor hours for depot-level-maintenance activities, dollars of sales for supply activities, number of invoices processed for bookkeeping activities, etc.³⁸ Given these definitions, economists refer to FCR

³⁵ The quote in the text is from an OUSD(C) report: *A Plan to Improve the Management and Performance of the Department of Defense Working Capital Funds* (September 1997) prepared and issued by the DoD Comptroller in response to a demand for such a plan issued by the Congress in Section 363 of the FY97 National Defense Authorization Act.

³⁶ The five WCF “offspring” of the DBOF are the Army Working Capital Fund (AWCF), the Navy Working Capital Fund (NWCF), the Air Force Working Capital Fund (AFWCF), the Defense Working Capital Fund (DWCF), and the Defense Commissary Working Capital Fund (DCWCF). Financial management policy for all five WCFs is governed by DoD 7000.14-R, the Department Defense Financial Management Regulation. The Army, Navy and Air Force WCFs are used to finance support activities operating within and under the management control of those Components—e.g., the Army’s Supply Management Activity (SMA), which operates within the Army Materiel Command in the Army, and the Air Force’s Depot Maintenance Activity Group (DMAG), which operates within the Air Force Materiel Command in the Air Force. DoD activities financed by the DWCF include the Defense Logistics Agency, the Defense Information Systems Agency, and the Defense Finance and Accounting Service. A sixth WCF exists, the Transportation Working Capital Fund (TWCF), but for financial management and budgetary purposes, the TWCF is tied to the AFWCF. The TWCF is used to finance operations at the U.S. Transportation Command, a unified joint command made up of the Air Force’s Air Mobility Command, the Navy’s Military Sealift Command, and the Army’s Military Traffic Management Command.

³⁷ DoD financial-management policy governing the WCFs is contained in several places in the DoD Financial Management Regulation (DoDR 7000.14 R). Volume 2B of the FMR contains the basic policy requiring WCF activities to charge average-cost (FCR) prices (Volume 2B, Chapter 9, Section H, p. 9-12). A DWCF Reform Task Force chartered as part of the Defense Reform Initiative in 1998, however, recommended allowing the Components to propose prototypes in which not all costs were recovered through prices. This recommendation was approved by the Deputy Secretary of Defense in January 2000. Subsequent to the Deputy Secretary’s decision, a new policy statement on “alternative rate development” was placed in Volume 2B in June 2000 (Chapter 9, p. 9-18):

Alternative Rate Development.

Components may propose methods other than the traditional rate per direct labor hour for recovering the full cost of operations. Any alternative pricing methods must be fully documented and justified in the Components Budget Estimate Submission. Any new method must demonstrate that all operating costs are still recovered, provide a comparison of the current method to the method proposed, show the impact to customer funding requirements, and provide a timeline for implementation. Any change in rate structure must be approved in advance by the USD Comptroller and documented in the appropriate activity group’s Program Budget Decision.

In addition to allowing the Components to propose alternative rate structures, an important precedent was set in DoD Management Initiative Decision (MID) 903 (issued on December 3, 2002) which directed that certain fixed costs, militarily unique costs, and DoD-mandated costs *not* be included in the rates charged by DLA and DFAS for certain of the goods and services they provide. MID 903 reflected recommendations made by a DWCF Task Force formed by the DoD Business Initiatives Council (BIC) in 2002 and tasked to examine ways to “improve” DWCF operations.

³⁸ A discussion of the concept of “unit outputs” and the rationale underlying the DBOF’s full-cost-recovery pricing policy can be found at: <http://www.dod.mil/comptroller/center/dwcf/costvisibility.htm>. A cautionary note on the description is in order, however. Although FCR pricing is described on the Comptroller website as being “activity-based costing” (ABC), it is important to understand the perspective underlying the Comptroller’s use of the term



pricing as “average-cost” pricing.³⁹ The latter avoids building any assumptions into the terminology about whether average-cost pricing is the “best” way to proceed when setting prices—an assumption that the DoD Comptroller appears to view as self-evident, at least based on the rhetoric which appears on the DoD comptroller website.⁴⁰ In the DWCF section of the website, the DoD Comptroller asserts, for example, that the DWCF approach “identifies the total or ‘true’ cost of DoD goods and services to Congress, military users (buyers), and those who provide goods and services (sellers), and thereby promotes more efficient and effective allocation and utilization of resources.”⁴¹

The establishment of the DBOF/DWCF structure in the 1990s represents the fullest flowering to date of the DoD’s efforts to make its support activities look and act “like businesses.” A report on the DBOF issued by the DoD Comptroller’s office in 1993, for example, states that “revolving-fund support activities provide support services to the operational forces much like any large business in the private sector” and characterizes the DBOF and its customer-provider arrangements as “the mechanism for establishing a businesslike corporate approach.”⁴²

An irony that appears to have gone largely unnoticed at the time of the DBOF’s creation is that the revolving-fund approach, after having been in use for forty years in the form of the stock and industrial funds, had apparently *not* been very successful in solving, or even truly in reducing, the cost-visibility and cost-control problems in the DoD’s support activities. If it had been, the proponents of the DBOF would not have been able to offer those problems as reasons why the DBOF was needed. So, notwithstanding that the revolving-fund approach had not worked very well in the past, the same approach, this time in the form of the DBOF, was

“activity.” In standard ABC, the goal is to understand the cost drivers *within* an enterprise so as to be able to better manage the costs *within* that enterprise. From the very high-level perspective of the DoD Comptroller, however, the DoD itself is the “enterprise,” and its different support operations are the “activities”—hence, the Comptroller’s statement that FCR pricing is based on “activity-based-costing.” It is *within* the DoD’s different support activities, however, that managers need to understand what the ABC cost drivers are, if they are going to manage their activities effectively; yet, that is information FCR, expected-average-cost approach, does not provide.

³⁹ See, for example, the RAND-Issue Paper by Edward G. Keating, a Senior Economist at RAND. (Keating, E. G., (2001). RAND research suggests changes in Department of Defense internal pricing. IP-216, RAND Issue Paper Retrieved from <http://www.rand.org/publications/IP/IP216/>.) “Transfer pricing” is the general term economists use to describe pricing when buyer-seller relationships have been established *within* the organization. In those circumstances, the decisions about how to structure prices depend on the incentives that managers want to create within the organization as different activities within the organization interact. Transfer prices *within* organizations do not necessarily have to be “full-cost-recovery” prices because activities can also cover some of their costs with budgets directly allocated to them within the organization.

⁴⁰ Since the establishment of the DBOF in 1991, the Comptroller’s office has clearly viewed FCR pricing as the “best” way to set prices. The following statement is made, for example, under the DWCF tab in the “iCenter” area of the DoD Comptroller website, in the section on “Total Cost-Visibility”: “An underlying tenet of the revolving fund system is that the prices set by DWCF Business areas should include *all* of the costs involved in providing those goods and services. Accounting for all of the various support costs provides financial managers with a clearer, ‘truer’ picture of what is required to carry out a particular DoD Activity.” (emphasis in original); see <http://www.dod.mil/comptroller/icenter/dwcf/dwcfintro.htm>.

⁴¹ See *The defense working capital fund handbook*. Chapter I. Introduction. Section on “The benefits of the DWCF,” p. 3. The DWCF Handbook can be accessed electronically at: <http://www.dod.mil/comptroller/icenter/dwcf/background.htm>.

⁴² Defense business operations fund (DBOF) milestone II implementation report. (1993, March 1) 3-5. Retrieved from <http://www.defenselink.mil/nii/bpr/bprcd/vol2/302a.pdf>.



being proposed yet again as the way to address those problems.⁴³ To be sure, the one new wrinkle that came with the DBOF, “full-cost-recovery” pricing, clearly reflected a belief on the part of the DBOF’s proponents that the revolving-fund approach could still work if it were given one more degree of “businesslike” fine tuning: by requiring the use of FCR prices across the board. The problem is that while it is true that businesses in the private sector must charge enough to at least cover their costs—otherwise they most assuredly will, sooner or later, go out of business—that fact of economic life does not apply to the DoD’s DWCF activities.

None of the organic government activities in the DoD’s five “business domains” will ever be allowed to “go out of business” as government activities. This is most clearly the case for activities in the DoD’s acquisition management and human resources management domains because of the inherently governmental nature of much of what they do. But for practical and political reasons, it is true as well for the logistics management, installations & environmental management, and accounting & financial management domains. Indeed, the presumption that activities in the two DWCF domains, logistics and accounting & financial management, must continue to exist as organic government activities is so strong that DWCF FCR pricing policy requires those activities to include a surcharge for recovery of past losses, in order to ensure the continued solvency of their underlying funds. Indeed, the Comptroller requires that prices recover losses but also that customers must pay those prices (one way or the other) by controlling customer obligations as well.⁴⁴

The clearest evidence that the DWCF activities do not operate in a marketplace (but rather under central planning like all other DoD activities) presents itself in the form of Program Budget Decision (PBD) 426, “Costs of Operations and Customer Prices for the Defense Working Capital Funds,” which is issued every year by the Comptroller near the end of the annual programming and budgeting cycle. As its title suggests, PBD 426 specifies *both* the prices that WCF activities will be allowed to charge in the forthcoming budget year and the costs

⁴³ In fact, the public record does show that at least one commentator, Donald Chapin, Assistant Comptroller General and Chief of the Accounting and Financial Management Division of the U.S. General Accounting Office, did try to raise questions about the advisability of proceeding with the DBOF, based on concerns having to do with past problems with the stock and industrial funds. In testimony on April 30, 1991 before the Subcommittee on Readiness of the House Armed Services Committee, Chapin stated:

Our reviews of Defense’s industrial and stock fund accounting systems have disclosed serious weaknesses. Therefore, since cost data to be used by the Fund would be developed from those systems, the accuracy and reliability of that data would be questionable, at best.

(The Subcommittee also heard testimony from Sean O’Keefe, the DoD Comptroller, arguing for the establishment of the DBOF.) Chapin’s testimony is recorded in the GAO Testimony Report, (1991, April 30). *Defense’s planned implementation of the \$77 Billion defense business operations fund*. GAO/T-AFMD-91-5. His testimony is startlingly prescient in its predictions of the severe accounting problems and financial-management-system problems the DBOF would face, and the difficulties it would have producing auditable financial statements—problems that continue to exist to this day, 14 years later. For example, Chapin predicted that because of the very large number of intra-fund transactions that would have to be consolidated, the DBOF would have trouble in the area of intra-governmental eliminations, which the DoD IG has indeed reported, every year for the past four years, continues to be a major deficiency area for DoD financial accounting as required by the CFO Act.

⁴⁴ Volume Chapter 9, Section H on “Full Recovery of Costs and the Setting of Prices,” p. 9-12, contains the policy requiring the inclusion of past losses into FCR prices. As described in note 37 above, MID 903 (2002) has made it possible for some DWCF activities to recover some costs by means other than prices, either by requesting and receiving direct appropriations, or by being allowed to demand and obtain direct aggregate reimbursements from customer organizations for certain costs, subject to Comptroller review. The principle remains the same, however, that all DWCF activities in the DoD will continue to be supported in one way or another by government funding and, thus, will not be allowed to “go out of business.”

it will have.⁴⁵ PBD 426 “controls costs” by controlling spending. Through the use of “unit-cost goals” (UCGs), PBD 426 places limits on the obligations, regulated by current sales, that the WCF activities will be allowed to make when they execute the budget year.⁴⁶ During execution itself, the Comptroller’s office will entertain requests from the WCF activities to deviate from the PBD 426 UCG controls, and they will usually accede to those requests if the WCF activities can make a case that sales are increasing fast enough to justify increased investment by the WCF activities in order to maintain performance. This example still illustrates central planning and control, however. Unlike real businesses in the private sector, DWCF activities have no access to external sources of funding to support growth in advance of sales. In execution, DWCF activities are solely and completely at the mercy of the final decisions made by the DoD Comptroller’s office on what they can obligate, just like all other activities in the centrally planned economy of the DoD. The unavoidable fact is that WCF activities in the DoD do not operate in freely competitive marketplaces, so they are not subject to the same forces that lead private-sector businesses (which do operate in such marketplaces) to work at becoming more effective and efficient. As the Friedman task force put it in their April 2001 report:

Many of the issues uncovered in our interviews and research have been dealt with effectively in private industry, largely because of the competitive forces of the marketplace and the focus on shareholder value. No similar external push exists within DoD. The Department needs change agents and drivers analogous to those agents and forces that have made the private sector competitive and efficient.⁴⁷

When the Friedman task force called for those agents and forces, the DWCF approach had already been in place for 10 years and had manifestly *not* produced such agents or forces; if it had, there would have been no need for the Friedman task force. Because it is focusing on facilitating the DWCF approach, and achieving CFO compliance, the BMMP has not provided, nor will it provide, any new stimuli for the production of those forces and agents—unless it changes its approach.

We will return to revolving funds, the DBOF, and the effects of FCR pricing shortly, with the evidence that they have neither improved cost visibility nor led support activities to become more effective and efficient. Part of the reason for that, however, has to do with the demands the CFO Act has placed on revolving fund activities in order to make them more “businesslike;” so, a review of the CFO Act requirements as they relate to the DoD’s revolving-fund activities is in order.

THE CHIEF FINANCIAL OFFICERS ACT OF 1990⁴⁸

⁴⁵ The role that Program Budget Decision (PBD) 426 plays in governing the financial operations of WCF activities is described in Chapter III, “DWCF Planning, Programming, and Budgeting,” of the DWCF Handbook (see notes 12 and 41 above).

⁴⁶ The theory and use of unit cost goals (UCGs) in the financial management and control of WCF activities is described in the *Unit Cost Handbook*—accessible electronically at: <http://www.dod.mil/comptroller/icenter/learn/uctoc.htm>.

⁴⁷ See note 7 above. This point is also made in Keating, et al. (2001) (see note 13 above), Appendix A. Businesslike behavior from defense working capital fund entities? pp. 35-37. Retrieved from <http://www.rand.org/publications/MR/MR1261DFAS/>.

⁴⁸ See note 5 above.

As discussed previously, the CFO Act is important for the BMMP because achieving “CFO compliance”—i.e., achieving a state of financial accounting capability in the DoD that allows auditable financial statements to be produced—is the primary objective of the program. To better understand why achieving CFO compliance has been so important for the BMMP, we can turn to the CFO Act itself. Language in the Act itself provides insight into the Congress’ assumptions and intentions, and those assumptions and intentions help explain why the BMMP has focused so strongly on achieving CFO compliance.

The following excerpts are from the opening section of the Act on “Findings and Purposes” (Section 102) and from subsequent sections on financial accounting and the requirement for audited financial statements (Sections 303 and 304). Taken together, they clearly imply that the Congress believed that requiring government activities to adopt private-sector-style financial accounting would induce those activities to reduce the occurrence of waste, fraud, and abuse. In the same way, and for the same reasons, the act required adherence to established financial accounting rules (Generally Accepted Accounting Principles—GAAP) and the required periodic submission of audited financial statements in annual reports. These serve to induce and incentivize private-sector enterprises to:

- a) reduce waste and inefficiency, and
- b) avoid engaging in fraud and other forms of financial abuse.⁴⁹

Here is the language from the Act itself:

CFO Act. SECTION 102: Findings and Purposes.

(a) FINDINGS. The Congress finds the following:

- (1) General management functions of the Office of Management and Budget need to be significantly enhanced to improve the efficiency and effectiveness of the Federal Government.
- (2) Financial management functions of the Office of Management and Budget need to be significantly enhanced to provide overall direction and leadership in

⁴⁹ Owners (i.e., stockholders), investors (individual and institutional), creditors and lenders, business partners, analysts, and regulators are among the wide class of external stakeholders in the marketplace who use the information contained in financial statements to help inform their judgments about whether to commit capital to the statement issuers. The presumption is that because managers know that the financial statements they produce must be assembled in accordance with an established set of rules for classifying and recording financial-transaction information (i.e., GAAP), and because they also know that an external, independent auditor will be checking whether they have followed those rules and have “fairly presented” the financial position of their company or enterprise in accordance with those rules, managers are provided with positive incentives to avoid engaging in or allowing waste, and negative consequences if they engage in or allow fraud and abuse to occur in their enterprises—because if they do, that will be reflected in the financial statements over time (either by showing the enterprise is inefficient in comparison to its competition, or because restatements are required when managers are discovered to have committed financial fraud or other forms of financial abuse of the firm’s resources). The key incentive drivers, here, however, are not the financial statements themselves, or even the fact that they are audited, but rather that external participants in the marketplace use the information in the statements to allocate capital. Getting something similar to happen in the government is, in fact, the purpose of the Government Performance and Results Act (GPRA) (passed in 1993)—in effect representing tacit acknowledgement on the Congress’ part that the CFO Act was not going to produce the incentives they thought it would.

the development of a modern Federal financial management structure and associated systems.

(3) Billions of dollars are lost each year through fraud, waste, abuse, and mismanagement among the hundreds of programs in the Federal Government.

(4) These losses could be significantly decreased by improved management, including improved central coordination of internal controls and financial accounting.

(5) The Federal Government is in great need of fundamental reform in financial management requirements and practices as financial management systems are obsolete and inefficient, and do not provide complete, consistent, reliable, and timely information.

(6) Current financial reporting practices of the Federal Government do not accurately disclose the current and probable future cost of operating and investment decisions, including the future need for cash or other resources, do not permit adequate comparison of actual costs among executive agencies, and do not provide the timely information required for efficient management of programs.

(b) PURPOSES. The purposes of this Act are the following:

(1) Bring more effective general and financial management practices to the Federal Government through statutory provisions which would establish in the Office of Management and Budget a Deputy Director for Management, establish an Office of Federal Financial Management headed by a Controller, and designate a Chief Financial Officer in each executive department and in each major executive agency in the Federal Government.

(2) Provide for improvement, in each agency of the Federal Government, of systems of accounting, financial management, and internal controls to assure the issuance of reliable financial information and to deter fraud, waste, and abuse of Government resources.

(3) Provide for the production of complete, reliable, timely, and consistent financial information for use by the executive branch of the Government and the Congress in the financing, management, and evaluation of Federal programs.

Section 303 describes the structure the financial statements required by the Act:

(CFO Act) SECTION 303. FINANCIAL STATEMENTS OF AGENCIES

(a) PREPARATION OF FINANCIAL STATEMENTS:

(1) IN GENERAL—Subchapter II of chapter 35 of title 31, United States Code, is amended by adding at the end the following:

3515. Financial statements of agencies



(a) Not later than March 31 of 1992 and each year thereafter, the head of each executive agency identified in section 901(b) of this title shall prepare and submit to the Director of the Office of Management and Budget a financial statement for the preceding fiscal year, covering—

(1) each revolving fund and trust fund of the agency; and

(2) to the extent practicable, the accounts of each office, bureau, and activity of the agency which performed substantial commercial functions during the preceding fiscal year.

(b) Each financial statement of an executive agency under this section shall reflect—

(1) the overall financial position of the revolving funds, trust funds, offices, bureaus, and activities covered by the statement, including assets and liabilities thereof;

(2) results of operations of those revolving funds, trust funds, offices, bureaus, and activities;

(3) cash flows or changes in financial position of those revolving funds, trust funds, offices, bureaus, and activities; and

(4) a reconciliation to budget reports of the executive agency for those revolving funds, trust funds, offices, bureaus, and activities.

(c) The Director of the Office of Management and Budget shall prescribe the form and content of the financial statements of executive agencies under this section, consistent with applicable accounting principles, standards, and requirements.

(d) For purposes of this section, the term: "commercial functions" includes buying and leasing of real estate, providing insurance, making loans and loan guarantees, and other credit programs and any activity involving the provision of a service or thing of value for which a fee, royalty, rent, or other charge is imposed by an agency for services and things of value it provides.

(e) Not later than March 31 of each year, the head of each executive agency designated by the President may prepare and submit to the Director of the Office of Management and Budget a financial statement for the preceding fiscal year, covering accounts of offices, bureaus, and activities of the agency in addition to those described in subsection (a).

Finally, Section 304 then describes the audit requirements of the Act:

(CFO Act) SECTION 304. FINANCIAL AUDITS OF AGENCIES

(a) IN GENERAL—Section 3521 of title 31, United States Code, is amended by adding at the end the following new subsections:



(e) Each financial statement prepared under section 3515 by an agency shall be audited in accordance with applicable generally accepted government auditing standards—

(1) in the case of an agency having an Inspector General appointed under the Inspector General Act of 1978 (5 U.S.C. App.), by the Inspector General or by an independent external auditor, as determined by the Inspector General of the agency; and

(2) in any other case, by an independent external auditor, as determined by the head of the agency.

As we have seen in the DBOF discussion above, during the Defense Management Review process in the late 1980s and early 1990s, the DoD was publicly announcing that it intended to implement a more “businesslike” approach in its support activities.⁵⁰ Its method for doing that was to establish the DBOF. Hearing those statements from the DoD, and given the high-profile “waste, fraud, and abuse” scandals that had occurred in the DoD and elsewhere in the government in the 1980s,⁵¹ that Congress would decide that revolving-fund activities (which are specially called out in the CFO Act, as the above excerpts show) should start doing the same kind of financial accounting that private-sector businesses are required to do is understandable. From the Congress’ perspective, revolving-fund activities are among the most “businesslike” activities in the government. Because the requirement to do GAAP-based financial accounting⁵² is one of the mechanisms that society uses to encourage business managers to:

- a) reduce waste and inefficiency (because if they don’t, the company’s stock price will fall as capital moves to more efficient uses), and
- b) to avoid engaging in fraud (because if they do lie about their business’ financial position, they and their business will, sooner or later, be caught and punished),

⁵⁰ In 1989, in the first Bush administration (1988-1992), Secretary of Defense Dick Cheney initiated the DoD’s first major business-process reform effort following the end of the Cold War—the “Defense Management Review” (DMR). The DMR was structured very much in line with recommendations that had been made earlier (in 1986) by the Packard Commission—a high-level external group led by Mr. David Packard, the retired co-founder of the Hewlett-Packard Company, whom President Reagan had asked in his second term to examine “defense management” and recommend ways to improve it. At the heart of the Packard Commission’s recommendations for reforming the defense acquisition process was the idea of establishing “management centers of excellence” that would emulate practices in successful commercial organizations. Although the Commission does note in its report that, “it is not obvious that DoD, or any large bureaucratic organization, can follow successfully the management procedures used in private industry” and that “defense acquisition typically differs from (the) commercial model in almost every respect,” the idea that it should be possible to run the DoD in the same way that a successful business is run still emerges very strongly from the Packard Commission report. As the Commissioners chose to put it: “Defense acquisition represents the largest and, in our judgment, the most important *business enterprise* in the world” (emphasis added). Thus, the DMR reflected the Packard Commission’s view that the DoD needed to adopt “good business practices,” a view that set the stage not only for the DMR but for all the business process reform efforts that have been launched in the DoD since, including the BMMP.

⁵¹ For an overview of the “waste, fraud, and abuse” scandals of the 1980s in the DoD (e.g., Ill Wind) and elsewhere in the government in the 1980s, see the GAO “High Risk Series” report, GAO/HR-93-7, at <http://161.203.16.4/d36t11/148225.pdf>.

⁵² The Securities and Exchange Acts of 1933 and 1934, as amended, require all public companies in the United States to follow Generally Accepted Accounting Principles (GAAP) for their financial accounting.



it is understandable that Congress would assume that the same effects would occur in public-sector activities, if indeed the DoD truly was going to be run those activities “like businesses.”⁵³

Of course, unlike the private sector where financial statements are important in determining the flow of capital,⁵⁴ the inability of DoD activities to get their books straight has no effect on the funding they receive every year.⁵⁵ Although the DoD has *never* been able to achieve a full set of unqualified opinions on its financial statements,⁵⁶ no DoD activity has ever been denied funding, or even had its budget reduced, solely because the financial statements were unreliable. The more important question, therefore, is: If the BMMP can bring DoD’s support activities to the point where they all receive unqualified opinions on their statements, will those statements help managers and customers *inside* the Department make better decisions—i.e., decide to do things on either the buyer or seller side that are likely to improve effectiveness and efficiency?

As noted earlier, based on their research on the information that internal managers need to reduce costs and make their businesses more efficient, Kaplan and Cooper (1998) argue that external financial statements of the type required by the CFO Act are “*completely inadequate*” for either “estimating the costs of activities and business processes” or for “providing useful feedback to improve business processes.”⁵⁷ That is, even if CFO compliance *can* eventually be achieved in the DoD, Kaplan and Cooper are telling us that reaching that goal will be pointless, because it will neither improve visibility of costs, nor will it give internal DoD managers information they can use to make their activities more effective and efficient.

Kaplan and Cooper are not unique in holding this view. In his testimony on Defense Financial Management before Congress on May 8, 2001, Robert Leiberhan, Deputy DoD

⁵³ See Peters, K. M. (2004, August 20). Senior defense contracting officer, three others indicted for corruption. Retrieved from GovExec.com; Sheffield, R. (2004, August 20). 5 accused of defrauding pentagon. *Harrisburg Patriot-News*. Both illustrate the story of a former chief lawyer for the Navy Ships Parts Control Center—who was sentenced in 1985 for accepting contractor gifts and also of the Secretary for a company involved in the 1988 Operation Ill Wind scandal that helped set the stage for the CFO Act—who was indicted in August 2004 on charges of defrauding the U.S. government through his company (Vector Systems) on contracts held from 1998 to 2002. The first article notes that the fraud was discovered by Defense Contract Audit Agency auditors who discovered irregularities in the contracting paperwork; so, the fraud was not discovered by DoD IG financial statement auditors.

⁵⁴ See note 49.

⁵⁵ See, for example, Schneider, C. (2005, January 10). *Why federal agencies fumble audits*. Retrieved from CFO.com. Schneider explains, “Since they’re not penalized for poor bookkeeping, the Defense Department, NASA, and other agencies are unlikely to show much improvement, say government experts.”

⁵⁶ As reported by the GAO in December 2004, the DoD again failed to achieve an unqualified opinion on its CFO financial statements, marking the twelfth year in a row that the Department has failed to achieve CFO compliance. In particular, as reported by the GAO, see <http://www.gao.gov/financial/04frusg.pdf>, the DoD has reported to the DoD Inspector General that “its fiscal year 2004 financial statements were not completely reliable. The DoD’s report cites accounting deficiencies in: (1) property, plant, and equipment; (2) inventory and operating material and supplies; (3) environmental liabilities; (4) intragovernmental eliminations and related accounting adjustments; and (5) disbursing activity. The DoDIG stopped attempting to audit all of DoD’s financial statements in FY 2001, electing instead to receive a report from the DoD each year as to whether the statements have become sufficiently reliable to justify the expense of conducting an audit. The OMB’s Program Assessment Rating Tool (PART) approach, rather than looking at financial statements, is attempting to make the link between activity budgets and other, more direct measures of activity performance. For information on the PART effort, see <http://www.pivotal-insight.com/insight/april2005/feature-domain.php>.

⁵⁷ See note 14 above.



Inspector General, noted that, “The various reports to OMB and Congress, the annual financial statement audits, and even supplementary audits cannot substitute for structured, readily accessible, meaningful and frequent internal management reporting.”⁵⁸

What Kaplan, Cooper and Lieberman are saying has been borne out in RAND research as well. In a study for the Defense Finance and Accounting Service (DFAS) based on interviews they conducted in 1999 and 2000 with DFAS customers in the Army, Navy, Air Force, and Defense Agencies at headquarters, regional, command, and installation levels, Keating et al. (2001) report the following:

There appears to be a challenging disconnect between how the GAO and Congress view the CFO Act and how DFAS’ customers view it.

We asked a number of DFAS customers what advantages they would receive if DoD achieved compliance with the CFO Act. The typical answer was “none.” These customers see the CFO Act as a mandated compliance exercise, but nothing that will improve their decision-making. We heard skepticism from both WCF and appropriated fund customers, though appropriated fund customers were perhaps more skeptical, as a group.⁵⁹

In their report, Keating and his colleagues note that DFAS’ WCF customers were interested in having answers to questions like: “What are my true costs of producing this *specific* output at my activity? (as opposed to the costs of producing *other* outputs at the activity—e.g., repairing this component versus that component, or shipping these types of items versus those, or using direct vendor delivery instead of stocking the item ourselves.)” They note that such questions are in the realm of activity-based costing (ABC), which requires an understanding of the incremental costs of production at the activity—not the average costs of production overall.

Perhaps most telling for the BMMP, however, is that the Friedman task force, in their April 2001 report on *Transforming DoD Financial Management* (which led to the FMMP and BMMP efforts) make the following observation:

Current DoD financial, accounting and feeder/operational management systems do not provide information that could be characterized as relevant, reliable, and timely. **Nor is the “support of management decision-making” generally an objective for the financially based information currently developed or planned for future development.**⁶⁰ (emphasis added)

When the Friedman task force made this statement, the DoD had already been working for 10 years to achieve CFO compliance. The task force’s observation, therefore, suggests the task force did not believe the production of auditable financial statements should be the primary objective. Indeed, in the “Vision” statement that immediately follows the statement above, the Friedman task force lists five goals, the *first* of which is: “**Provide visibility to cost incurred** which is a critical underpinning of efficiency improvement” (emphasis in original). That is a call for management accounting, not financial accounting. Indeed, the vision statement associated

⁵⁸ See Lieberman (2001, May) at note 18 above, p. 10.

⁵⁹ Keating et al. (2001), p. 25. See note 13.

⁶⁰ Friedman Task Force report, see note 17 above, Executive Summary, p. i.

with achieving CFO compliance: “Ensure clean audits and routine compliance with Federal financial standards,” is number four on the Friedman task force’s list. And even there they note, “it is possible to reach the goal of reliable financial information and a clean audit opinion and still not have information that is relevant to managers.”⁶¹

In other words, the Friedman task force recognized that achieving clean opinions on CFO financial statements and providing useful information to internal managers are two very different goals.⁶² Four years later, however, the BMMP is continuing to emphasize the former at the expense of the latter. A “pdf” search, for example, of the current “All Views” description (a 101-page document) of the BMMP Business Enterprise Architecture (BEA) reveals that none the following phrases: “management accounting,” “management cost accounting,” “cost accounting,” “activity-based costing,” or “ABC” appear anywhere that document.⁶³

STUDIES HAVE SHOWN THAT EFFICIENCY HAS DECLINED UNDER THE DWCF APPROACH

As noted above, the Friedman task force provided a number of important insights that the FMMP and the BMMP have ignored. The DoD’s use of the DWCF approach has ignored these findings as well. In their discussion of the “Current Situation,” on the issue of “convoluted business processes which fail to streamline excessive process steps,” the Friedman task force has the following to say about the DWCF approach, “Attempts to charge the Services for overhead expenses (i.e., Working Capital Fund and reimbursables), while directionally correct, suffer from bad data and, as a result, add complexity that exceeds benefit.”⁶⁴

In the spirit of that statement, this section summarizes some of the key findings from the large number of studies that have been done over the last fifteen years that suggest the DWCF approach has tended to reduce, not increase, the visibility of support costs in the Department and, in so doing, has led to less, not more, efficient use of the Department’s resources.

Keating (2001) presents original findings on DFAS and notes the similarities with the findings of other DWCF research, which he summarizes as follows.⁶⁵

Research suggests an incompatibility between current WCF pricing policies and the cost structures of DoD providing organizations. Provider organizations have fixed costs, so their incremental costs tend to be less than their average costs. Simultaneously, WCF prices are set equal to their average costs, so customers sometimes make suboptimal decisions as to whether and how much workload to buy from WCF organizations. [...]

⁶¹ See note 60.

⁶² To be fair to the DoD managers who had the job of attempting to implement the Friedman task force recommendations, it is also the case that on page vi of their Executive Summary, in a section on “Significant Challenges,” the Friedman task force lists “developing an integrated system architecture including financial, accounting, and feeder systems” as the “most difficult” challenge to be addressed. Given the GAO’s view that architectures needed to be developed first, it is understandable why DoD managers proceeded as they did down the architecture road, first with the FMMP and then the BMMP.

⁶³ See note 6 above.

⁶⁴ See note 17 above, p. 6.

⁶⁵ See note 39 above, p. 3.

Examples of such fixed costs are computer system development, building maintenance, security, and depreciation. Government employed civilian-labor costs also have considerable rigidity as regulations make it difficult to cut such costs rapidly, [Robbert, Gates, and Elliot, (1997)]. Wallace, Kem, and Nelson (1999) suggest that as much as 80 percent of Air Force Working Capital Fund costs are fixed with respect to the amount of DLR sales. [...]

The existence of fixed cost does not mesh well with current WCF pricing. With expected average cost pricing, revenue falls proportionately with workload, but costs almost certainly do not. Thus, WCF support organizations will almost certainly lose money when workload declines unexpectedly. Indeed, a “death spiral” of rising prices and falling revenue may occur, since current rules also stipulate that future prices must be augmented as an offset if a providing organization loses money in a year. Of course, a WCF activity will not likely die, since it is not a real business and customers often do not have the choice to seek alternative providers. However, this pricing spiral can lead to highly underutilized personnel and facilities.⁶⁶ [...]

Expected average-cost pricing rules can encourage undesirable behavior by warfighting customers. Camm and Shulman (1993), Baldwin and Gotz (1998) and Brauner et al. (2000) present similar portraits of how budget-constrained Air Force and Army warfighting customers have responded to high WCF prices. Specifically, in both services, customers have gone to considerable effort to repair as many items as possible by themselves or by using local contractors instead of buying workload from their respective WCF logistics systems. For instance, Brauner et al. (2000) note how the U.S. Army’s Forces Command (FORSCOM) set up an intra-command redistribution and repair system to reduce the amount of work load it sent to the Army’s already underutilized depot repair system. FORSCOM customers save O&M funds for other uses by not buying as many services from the Army WCF (activities), but these are not necessarily savings from an Army-wide perspective because of the discrepancy between WCF prices and actual variable costs. [...]

Camm and Shulman (1993) note how working capital fund policies give Air Force installations excessive incentive to screen items themselves before sending them to the depot repair system. Also, Baldwin and Gotz (1998) and Wallace, Kem and Nelson (1999) report cases of customers consolidating broken parts on single carcasses sent into the Air Force logistics system. Such consolidation reduces a customer’s WCF expenditures but almost certainly does not save the Air Force money. First, customers make inefficient use of their time by consolidating broken parts and, second, the degraded carcasses are harder for depots to repair, raising average repair costs and thus future prices. [...]

As these reports note, the warfighting customer’s rational response to WCF pricing is likely not optimal for the DoD as a whole. Specifically, the military services have considerable unutilized capacity in parts of their depot/WCF systems. Some of this excess capacity stems from required wartime or replenishment capacity. Other excess

⁶⁶ An example of the DWCF death spiral phenomena is documented for Army arsenals and ammunition plants in Hix, W. M., Pint, E., Bondanella, J., Held, B., Hynes, M., Johnson, D., Pregler, A., Stollenwerk, M. & Sollinger, J. (2003). Rethinking governance of the Army’s arsenals and ammunition plants. MR-1651-A. RAND.

capacity is due to the failure of DoD infrastructure cuts to keep pace with falling demand. [...]

Excess capacity mixes perniciously with expected average cost pricing. Specifically, excess capacity drives up WCF prices, which, in turn further encourages budget-constrained warfighting customers to draw more work away from the depot system; this results in even higher depot prices. (Such spirals can result for other reasons as well. For example, if aging equipment unexpectedly drives up depot system costs, the depots will lose money, and future prices will increase, even if there is no excess capacity in the depot system.

If the issue were simply one of pricing, perhaps the BMMP could handle it without fundamentally changing its approach to an overall operational architecture. Even there, however, it would be necessary to place greater emphasis on developing financial information systems that distinguished between incremental costs and fixed costs. But the “bad data” problems referred to above go beyond the pricing issues; they involve CFO financial accounting as well. The bad data in WCF systems that the Friedman task force refers to are discussed in a 2002 DoD Management Initiative Decision (MID 903) on the Working Capital Fund. This text states:

In the supply business areas, accumulated operating results (AORs) are not accurate. The WCF Task Force will review the financial policies for accounting for the gain and disposal of inventory to determine why the operating results are so inaccurate.⁶⁷

This statement refers to severe data-quality problems that are present in the “Cost of Goods Sold” (COGS) expense lines in the Revenue and Expense Statements (i.e., the Statement of Operations—1307 Accounting Reports⁶⁸), which are one of the CFO Act’s financial statements. As documented by Glass, Dukovich, and Wallace (1998) and Wallace, Le, Nelson, and Webster (2000), the inventory-accounting problems that MID 903 refers to, which are causing the AOR values for DWCF supply activities to be so unreliable, are a consequence of the accounting treatment required under the CFO Act’s financial accounting rules for “inventory held for sale.”⁶⁹ The latter, of course, relates directly to what supply activities now “do” under current DWCF operating rules: they “hold” inventory and “sell” it. As the two studies above explain, if supply activities were to change their basic operating approaches, treating DLR components as capital assets (“non-current operating assets”) rather than “inventory held for sale,” the need for the COGS entry in the expense statements would be eliminated, which would *significantly* simplify financial accounting for the DWCF supply activities. More importantly, this elimination would allow the DWCF supply activities to begin applying “capability-based budgeting” methods to DLRs, which could make it easier to provide needed DLR support to the operating forces when demand is rising and stock levels need to be increased. The current DWCF operating approach does not handle that very well, as a recent

⁶⁷ DoD Management Initiative Decision (MID) 903, *Working Capital Fund*, approved by the Undersecretary of Defense (Comptroller) on December 3, 2002, p. 11. As described in the background section of MID 903, a WCF Task Force was established by the DoD Business Initiative Council (BIC) in the summer of 2002 to review financial practices and policies within the Defense Working Capital Fund (DWCF). As stated in MID 903, “The purpose of the review was to determine if certain policies or practices of the Fund could be more like the private sector, thereby improving financial management.”

⁶⁸ See DoD FMR 7000.14R, Volume 11B, p. DWCF Accounting Report 1307 “Statement of Operations,” p. 70-35. (This is the “Results of Operations” financial statement required by the CFO Act.)

⁶⁹ Glass, Dukovich, & Wallace (1998); Wallace, Le, Nelson, & Webster (2000)

GAO report on materiel shortages in Iraq describes.⁷⁰ The point of this example for the BMMP is that the changes above would represent a very different operational architecture for DoD supply activities than what the current DWCF operational architecture for financial information systems calls for, with DLR stocks treated as inventory-held-for-sale.

The CFO-style expense statements for the DWCF supply activities represent the “visibility of cost” that the DWCF approach provides for the DoD’s central supply activities. As MID 903 acknowledges, that visibility is very poor. Under FCR pricing in the DWCF approach, however, the AOR values in supply become key factors affecting the prices set for spares and repair parts. Because the AOR values for DWCF supply activities are unreliable, so are the prices. The prices that are supposed to reflect the “true cost” of supply support, therefore, do not do that—and incorrect price signals are being sent to customers as a result.

The cost visibility problems caused by the DWCF approach are not just at the level of individual transactions in the field, however. This section concludes with two examples showing how the DWCF approach is reducing cost visibility at the highest levels in the DoD as well, creating the dangerous possibility of misinformed decisions and funding delays at the highest levels in the Department.

The most conspicuous, possibly the most dangerous, and certainly the largest example of how the visibility of DoD support costs has been reduced (rather than increased) under the DWCF regime can be found at the DoD Comptroller website—in the “OSD Comptroller iCenter” section under the DWCF tab at <http://www.dod.mil/comptroller/icenter/dwcf/dwcfintro.htm>. Drilling down from the “Why DWCF?” section to “The Issue of Incentives” discussion, a “Fast Fact” box is displayed that asserts the following: “About 25% (\$98.7 billion) of DoD direct appropriations is financially managed through the Defense Working Capital Fund.”⁷¹

Casual readers of this statement will generally (and understandably) take it to mean that of the roughly \$400 billion in appropriations that DoD was receiving and spending in the year the statement was posted, approximately 25 percent of that amount was the cost of operating all the WCF activities in the DoD in that year. The problem with the \$98.7 billion figure, however, is that it overstates the cost of the WCF activities by a very substantial amount—probably by somewhere between 30 and 100 percent. In other words, the actual cost to the taxpayers of all the WCF activities in the year in question was probably somewhere between \$49 billion and \$76 billion—not \$98.7 billion.

The reason this is the case is because the \$98.7 billion was obtained by simply summing the revenues (either actual or projected—which specifically is not made clear) that each of the individual WCFs reported (as either actual for a completed year, or as projected for the budget year) in their President’s Budget submissions. The figure fails therefore, to take into account

⁷⁰ See *Defense Logistics, Actions Needed to Improve the Availability of Critical Items during Current and Future Operations* (2005, April). GAO-05-275. This document describes funding delays in the Army’s AWCF-Supply Management Activity to obtain spares and repair parts to support Operation Iraqi Freedom. “Capability-based budgeting” is now authorized in the DoD FMR for DWCF capital investments and is being encouraged for use in situations where uncertainty exists about the precise nature of the requirement. Uncertainty is a feature of future spares requirements—particularly in periods of highly volatile demand as can occur in extended contingencies. Volume 2B of the DoD Financial Management Regulation now authorizes the use of “capability based budgeting” for DWCF capital programs. See Chapter 9, p. 9-9 at <http://www.dod.mil/comptroller/fmr/02b/Chapter09.pdf>.

⁷¹ Although there are five WCFs in the DoD, the DoD Comptroller’s office sometimes uses the term “Defense Working Capital Fund” (DWCF) to refer to all of them, as is the case here.

the very substantial amount of “intra-WCF” trade that goes on among the WCF activities (both within and across the service WCF boundaries) in addition to the trade they engage in with appropriated customers. The effect of failing to take the intra-WCF trade into account is that many dollars get counted multiple times when the separate WCF revenue amounts are simply added. As an example of the intra-WCF trade, consider the fact that the WCF supply activities in the Army, Navy, and Air Force all have to pay the WCF depot maintenance activities for the repaired DLRs that the depots repair and provide to the supply activities (which then make those DLRs available for sale to outside customers). At the same time, the WCF depot maintenance activities are also buying the lower-indenture repair parts they use in those repairs *from* the WCF supply activities.

Figure 1 below illustrates the complexities of intra-WCF trade.

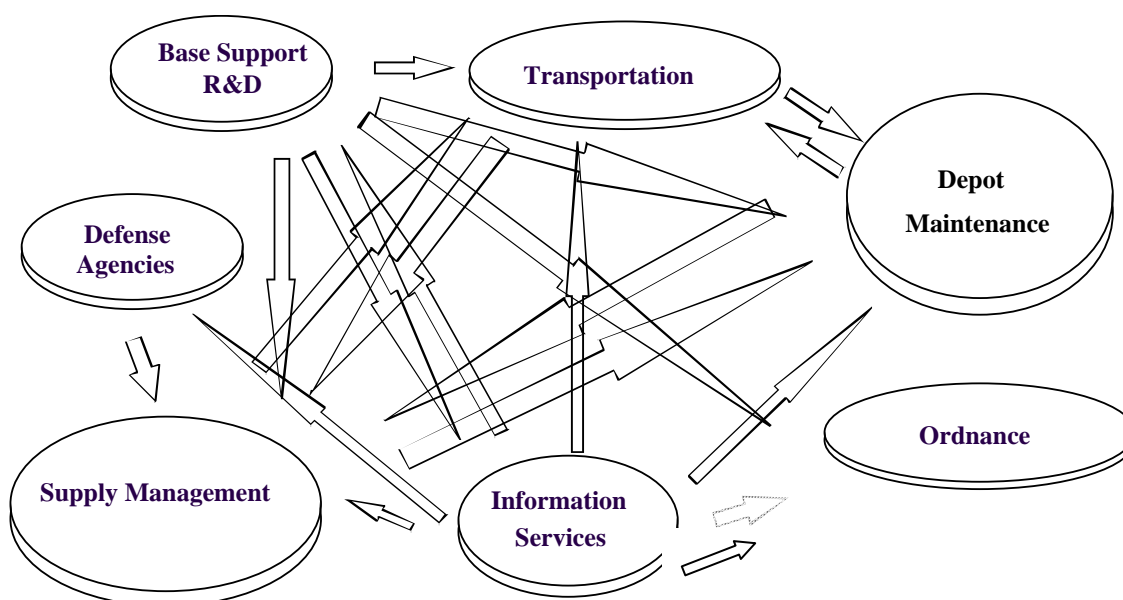


Figure 1. Inter- and Intra-fund Sales Complicate Accounting and “Visibility” of Costs

The estimate that the correct cost figure for the WCF support activities lies between \$49 billion and \$76 billion is based on “Source of Revenue” reports included in the President’s budget submissions which the WCF activities prepare every year. Although they provide enough information on who pays who for what in intra-WCF trade to make the rough estimates above, the Source of Revenue reports are too highly aggregated in many areas to be able to determine exact values.⁷²

To be able to determine precisely how much the WCF activities cost (under the proprietary financial accounting rules that the WCF activities are required to follow under the CFO Act’s financial accounting approach) producing what accountants call a “consolidated revenue and expense statement” for the DWCF (viewed as a single financial entity) is necessary. All of the necessary “eliminating entries” have to be correctly made (so all the double/multiple counting of revenues and expenses has been eliminated) in order to make it possible to see what the true financial position of the DWCF is—as if it were a single, corporate-

⁷² “Source of Revenue” reports are included in the President’s Budget submissions of each WCF activity. They are sometimes identified as “Fund 11” Exhibits.

like business entity (just as the DBOF/DWCF approach says it is). The inability of DoD's accounting systems to be able to produce such a consolidated statement, however, is one of most important reasons why the DoD has not been able to achieve CFO compliance.⁷³

Of course, a much simpler and more direct way to obtain good visibility of what all the DWCF activities cost would be to convert them all back into appropriated activities and simply add their budgets. For that to work, of course, the DoD would need to have good, reliable systems for public-fund budgetary accounting—but achieving that kind of CFO compliance would be much less demanding for the BMMP, from both a conceptual and systems perspective, than preparing the consolidated proprietary statements. Yet, the latter is what the BMMP is currently trying to build an architecture to do. Indeed, this idea is not that far from what the Friedman task force hinted at when it said the DWCF arrangements were more trouble than they were worth, and, that as a way to achieve needed “interim successes,” it would make sense to focus first on the Statement of Budgetary Resources (a financial statement produced under public-fund accounting) and simply work on getting clean opinions on those statements alone.⁷⁴

Finally, the gross inaccuracy of the \$98.7 billion figure for the DWCF activities is dangerous because senior leaders may believe it represents an accurate statement of what the DWCF activities cost; this misunderstanding may lead them to conclude that the DWCF activities cost “too much” and need to be reformed with a major, high-profile and expensive effort—like the BMMP.⁷⁵

Financial management executives in the DoD Comptroller's office undoubtedly understand that the \$98.7 billion figure significantly overstates the cost of the DWCF activities. It is puzzling, therefore, why they are willing to leave such a grossly inaccurate figure posted in a setting where, on the next web page, the DWCF is described as “a financial management strategy that makes sense because it provides for total cost visibility and improved cost awareness.”⁷⁶

Since the establishment of the DBOF 14 years ago, the DoD has been functioning as the de facto financial manager of the DWCF activities, notwithstanding the subsidiary roles played by the service Comptrollers in the WCFs. Now, the U.S. Comptroller General is calling for the establishment of a Deputy Secretary of Management position in the DoD to provide “the strong and sustained executive leadership needed if (business and financial management) reform efforts are to succeed.”⁷⁷ The USD (AT&L), however, has stated publicly that such an idea “would just add an additional layer of management, which is the last thing we need.”⁷⁸ This

⁷³ See “intragovernmental eliminations,” note 56 above.

⁷⁴ See note 17 above, p.13.

⁷⁵ On February 1, 2005, the DoD IG announced the letting of a multiple-award contract with a large group of private-sector accounting firms (including the “Big 4” firms: Ernst & Young, KPMG, Deloitte & Touche, and PricewaterhouseCoopers) to assist the DoD in improving the reliability of its financial statements. The contract is an indefinite-delivery/indefinite-quantity contract that will expend \$977,500,000 over three years, from February 2005 to February 2008.

⁷⁶ DoD Comptroller website <http://www.dod.mil/comptroller/icenter/dwcf/commonsense.htm>.

⁷⁷ See GAO-05-520T at note 19 above, p. 2.

⁷⁸ See GovExec.com, Daily Briefing (from Congressional Daily). (2005, April 14). GAO, *Pentagon at odds over management*. Retrieved from (<http://www.govexec.com/dailyfed/0405/041405cdam2.htm>)

paper has argued the BMMP needs to change its focus towards providing useful cost information to managers *in* the DoD's support activities, not non-useful information (like the \$98.7 billion figure above) to managers at the DoD level who are very far *above* those activities. The USD (AT&L) is correct to express concerns about the call for establishing a Deputy Secretary for Management.

As a second and final example illustrating how high-level cost visibility has eroded (rather than improved) under the DWCF regime, it is instructive to read the exchange that took place between Secretary Rumsfeld and Senator Robert Byrd during Secretary Rumsfeld's testimony on June 21, 2001 before the Senate Armed Services Committee on the subject of the Defense Strategy Review.⁷⁹ Senator Byrd opened his questioning of the Secretary as follows:

SEN. ROBERT C. BYRD (D-WV): I thank you, Mr. Chairman, for your courtesy. And I thank you, Secretary Rumsfeld, for your statement, and I thank you, General Shelton, for appearing here today.

The General Accounting Office—let me say parenthetically once again that I favor the strategic review. I, of course, don't what the results will be, nor do any of the others of us. The General Accounting Office released a report on Monday, June 11, on the Pentagon's use of \$1.1 billion that was earmarked in the FY 1999 Supplemental Appropriations Act to address the critical shortage of spare parts for the military. The GAO found that 8 percent of that money, or \$88 million, was used by the Navy to purchase spare parts. The remaining 92 percent of the appropriations was transferred to the Operations and Maintenance accounts of the military services and thus became indistinguishable from other Operations and Maintenance funds used for activities that include mobilization and training and administration.

While funds in the Operations and Maintenance accounts can be used to purchase spare parts, the GAO report states that the military services, quote, "could not readily provide information to show how these funds were used," close quote, therefore confounding the GAO's attempt to verify that the funds were actually used to purchase the spare parts that were urgently needed.

Now Mr. Secretary, the reason I can't come back here today is because I'm chairing the markup of the Appropriations Committee on the 2001 Supplemental Appropriations Bill. So this question comes at a very important time. I find it shocking that the Pentagon requested funds to meet an urgent need and then is unable to show Congress that it used those funds to address the problem.

Now, while you're not responsible for the department's use of appropriations before you assumed your current position, the FY 2001 Supplemental Appropriations Bill that was submitted to Congress contains \$2.9 billion that will go to the same Operations and Maintenance accounts that lost track of the \$1 billion that was appropriated two years ago.

Now, how can Congress, how can my Appropriations Committee, how can this committee here have any confidence that these funds that are being requested in

⁷⁹ See the exchange between Senator Byrd and Secretary Rumsfeld beginning on p. 10 of <http://www.defenselink.mil/speeches/2001/s20010621-secdef2.html>.

the Supplemental Appropriations Bill which we're making up today will be used as Congress intends them to be?

SEC. RUMSFELD: Senator Byrd, you know better than most anybody that the financial reporting systems of the Department of Defense are in disarray; that is to say, they are perfectly capable of reporting certain things, but they're not capable of providing the kinds of financial management information that any large organization would normally have.

At your suggestion in my confirmation hearing, we have asked—we had a team of people take a look at the financial reporting systems. They've reported to the new comptroller general, Dr. Dov Zakheim. He has begun the process of finding ways to see that the ability to track transactions is improved.

The team Secretary Rumsfeld refers to, of course, was the Friedman task force. The point to be made about the above exchange with regard to cost and spending visibility is that the reason 92 percent of the \$1.1 billion of the FY 1999 Supplemental that was earmarked for spare parts went into the O&M accounts is because that is the way things *had* to be done under the current DWCF “operational architecture” for spare parts. Under the DWCF approach, central supply activities are required to recover all of their costs from revenues collected from customers, so it was necessary for the supplemental funds to be given to those O&M customers, who would then order new spares from the central-supply providers, who are the ones whose job it is to actually bring new spares into the logistics system.⁸⁰ The reason the GAO had difficulty tracking whether the funds were actually used to buy spare parts is that it: first, would have been necessary to show the O&M customers obligated their newly received O&M supplemental dollars to the supply activities, and second, would have been necessary to show that the supply activities then went out and spent the funds to buy more spare parts.

Later in the exchange, General Shelton, the Chairman of the Joint Chiefs, attempted to explain the foregoing to Senator Byrd, but Senator Byrd would have none of it; he insisted that when the Congress earmarks funds be spent for a particular purpose (the way the regular appropriated budgets work), that's how the money should be spent and accounted for. That becomes much more complicated to do when the DWCF approach—involving the use of revolving-fund financing, CFO Act financial accounting, and FCR pricing—is being used to run logistics support activities “like businesses.”

CONCLUSION

This basic conclusion of this paper is that the BMMP needs to be fundamentally reoriented if it is to succeed at accomplishing its *fundamental* goal, which is to establish a framework for collecting and reporting financial information in the DoD that will give managers *inside* DoD support activities the cost information *they* need to do their jobs. That information is different from the non-value adding (for the DoD) financial-statement and “full-cost-visibility” information that managers *above* those activities have been pursuing for the last 15 years.

⁸⁰ Ever since revolving fund activities have existed, they have regularly had to ask the Congress for “cash infusions” when the cash corpus of the underlying fund has experienced losses and thus has gotten too low to be certain of being able to meet its obligations. This was probably not done in this case, because of rules regarding how supplemental appropriations can be spent. Had the Department wanted to ask for a cash infusion of \$1.1 billion for the supply activities in the WCFs to buy spare parts, however, they would probably have had to have done it during the regular budget cycle, which might have taken too long if the spare parts shortages were severe.

Towards that end, the three steps below should be considered by the Defense Business Systems Management Council as a way to begin the reorientation of the BMMP:

- The BMMP needs to shift its emphasis from external financial accounting to the establishment of accurate *management accounting*. As has been pointed out by many, including Harvard's Robert Kaplan (one of the developers of the activity-based-costing method of management accounting and, not coincidentally, also one of the developers of the Balanced Scorecard, a version of which DoD has adopted to pursue performance-based management), financial accounting systems able to meet external reporting requirements (of the type required by the CFO Act) are "completely inadequate" for either "estimating the costs of activities and business processes" or for "providing useful feedback to improve business processes."
- Because the CFO Act is law, and many of the most serious CFO compliance problems exist in the DoD's WCF activities, particularly in the areas of central supply and maintenance, the BMMP needs to undertake a fundamental review of basic operating policies for the DWCF activities—particularly in central supply and maintenance. The goal of such a review would be to determine where and how changes in basic financial and operational policies for those activities would help to clarify incentives and improve cost visibility, while simultaneously simplifying financial accounting challenges. For some activities, that may involve a return to direct funding and traditional, public-fund budgetary accounting. For others, where the revolving-fund approach does provide some needed management flexibility, it may call for changes in pricing policy (e.g., shifting from FCR pricing to an incremental pricing approach) and/or changes in what are now viewed as necessary accounting practices because of current "business practices," (e.g., treating Depot-Level-Reparable (DLR) components as capital assets rather than as inventory held for sale, and structuring DLR transactions accordingly). These ideas and others have already been explored in the DWCF studies noted earlier, so the BMMP would have the advantage that much of the basic analysis for such a review has already been done.⁸¹
- Recognizing that the Congress is likely to want an explanation as to why the Department is changing some of the most fundamental assumptions and objectives of the program, the BMMP will need to prepare a high-level report for the Congress that explains why de-emphasizing the production of external financial statements and pursuing the kinds of initiatives described above will allow the DoD, for the first time since the CFO Act was passed, to begin actively pursuing what in all likelihood the Congress intended and wanted the DoD to pursue when it passed the CFO Act in the first place: sensible, responsible, and honest *internal* financial management and accounting that will lead to more effective and efficient support operations within the Department.

⁸¹ For additional suggestions for alternative possible DWCF operating approaches in logistics, see HQ USAF, Deputy Chief of Staff Installations & Logistics, Directorate of Innovation and Transformation (HQ USAF/ILI). (2003, October). *Future financials: Creating the path forward to enable our re-engineered logistics business processes*. [A United States Air Force White Paper].

Cost as an Independent Variable (CAIV): Front-End Approaches to Achieve Reduction in Total Ownership Cost

Presenter: Michael Boudreau, Colonel, US Army (Ret), has been a senior lecturer at the Naval Postgraduate School since 1995. While an active duty Army Officer, he was the Project Manager, Family of Medium Tactical Vehicles, 1992-1995. He commanded the Materiel Support Center, Korea, 1989-1991 and the Detroit Arsenal Tank Plant, 1982-1984. COL Boudreau is a graduate of the Industrial College of the Armed Forces; Defense Systems Management College; Army Command and General Staff College; Long Armour-Infantry Course, Royal Armoured Corps Centre, United Kingdom; and Ordnance Officer Basic and Advanced courses. He holds a Bachelor of Mechanical Engineering degree and Master of Business Administration degree from Santa Clara University, California.

EXECUTIVE SUMMARY

During the latter half of the 1980s and throughout much of the 1990s, budget constraints were increasingly tight, resulting in Defense budget reductions (measured in constant dollars); these reductions commenced in FY 1986 and extended through FY 1997—the only increase being FY 1991, corresponding to Operation Desert Storm. In an attempt to squeeze every penny from required resources, DoD leadership emphasized the necessity of controlling cost of new warfighting systems—not only the cost of development and production, but also the cost of sustainment. In 1995, Dr. Paul Kaminski, the Under Secretary of Defense for Acquisition and Technology (USDA&T), introduced the term “cost as independent variable (CAIV),” in recognition that resources were tight and that weapon system costs—lifecycle costs—would have to be managed and controlled through tradeoffs that occur during the developmental process.

As one who is familiar with policy change in the DoD might expect, decisive change did not result immediately. Nevertheless, a group of Pilot programs were identified within each Service that would provide lessons for Reduction in Total Ownership Cost (R-TOC).

Furthermore, a relevant series of OSD and CJCS regulatory changes were published in 2003 and 2004, which were intended to Support CAIV and contribute to R-TOC. Now, it seems, is the time to gauge emerging changes. This research effort proceeds by seeking answers to the following questions:

- Has the DoD put into place policy and implemented guidance to support CAIV as a practice in the acquisition of the DoD’s warfighting systems?
- Has the DoD established the necessary processes and tools to monitor and control CAIV?
- Has DoD leadership exhibited the will and determination to control Total Ownership Costs of its warfighting systems?
- In the meantime, has the focus on CAIV and Reduction in Total Ownership Cost somehow changed?

Using Data available from a variety of DoD sources and interviews with DoD personnel participants, this paper highlights changes in policy, process, and practice aimed at reducing



system lifecycle cost. The paper will point out new or remaining obstacles to the application of Cost as an Independent Variable (CAIV) and Reduction in Total Ownership Cost (R-TOC). The focus is the “front end” of the process—that is, we will examine practices during Concept Refinement, Technology Development, associated JROC reviews, and acquisition Milestones A & B.

A. Has the DoD put into place policy and implementing guidance to practice CAIV in the acquisition of DoD’s warfighting systems?

The Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) published new acquisition policy and guidance, beginning on 12 May 2003 with publication of DoD 5000.1, *The Defense Acquisition System*, and continuing with DoDI 5000.2, *Operating the Defense Acquisition System*. The companion *Defense Acquisition Guidebook*, containing discretionary best practices, was placed on-line in the fall of 2004.

The Chairman of the Joint Chiefs of Staff first published CJCS Instruction 3170.01D, *Joint Capabilities Integration and Development System (JCIDS)* and the accompanying CJCS Manual 3170.01A, *Operation of the Joint Capabilities Integration and Development System* in June 2003 and then updated both directives on 12 March 2004.

In combination, these directives, together with the on-line Guidebook, address the requirement of affordability analysis and attention to Total Ownership Cost or system lifecycle cost during the following processes: Concept Refinement, Technology Development (in such activities as preparation of the Initial Capabilities Document (ICD)), conducting the Analysis of Alternatives (AOA), writing the Capability Development Document (CDD), progressing through JCIDS reviews, and preparing for acquisition Milestones A & B. Collectively, these regulations influence the work of sponsors, users, developers, staff overseers, leaders, and decision makers.

B. Has DoD established the processes and tools to monitor and control CAIV?

The R-TOC Pilots—The R-TOC Pilot programs have yielded numerous processes that are useful to control lifecycle cost. Many lessons have been reported from this effort, which began in October 1999. Additionally, the need for improved cost databases and cost estimating tools has resulted in numerous initiatives in each of the Services and with defense contractors. Unfortunately, the R-TOC pilots currently do not include any programs that are early in their developmental cycle: that is, prior to Milestone B. There are obvious, prominent choices for designation as CAIV pilot programs in each of the Services that might yield valuable lessons-learned for the acquisition community. Without CAIV pilot programs, the DoD may lose valuable lessons which would add to the difficulty of determining whether current guidance provides the desired benefits during pre-acquisition and the early development of new warfighting systems.

C. Has the DoD leadership exhibited the will and determination to control Total Ownership Costs of its warfighting systems?

In general, there is considerable pressure on programs to prepare early cost information. In some instances, the pressure has been intensified through the use of Key Performance Parameters (KPP) written by the sponsors or users into requirements (ORD) or capability documents (CDD). Additionally, there is indication of at least one program specifying early cost targets in its acquisition strategy document.



JROC emphasis on TOC has the latitude to question cost or affordability, but the role of the JROC is reportedly more focused on other issues (such as interoperability and joint use), and less concerned about cost. The JROC's lack of emphasis on affordability seems to be an opportunity lost, wherein users might be more strongly encouraged to take an active interest in setting ownership cost targets.

Milestone Decision Authority emphasis on Cost—For various reasons, acquisition milestone decision points may offer a better opportunity than the JROC process to address and influence warfighting system cost. Much of the pressure on cost comes from required independent cost estimates (ICE) that precede milestone reviews.

Service leaders (within and outside acquisition) may be reluctant to demand lifecycle *cost targets* leading into system development, out of concern that incorrectly specified cost targets could increase program risk from “outside.” Such an error could result in unfavorable attention to a critically needed warfighting system, possibly resulting in its termination.

Service leaders also may lack confidence in lifecycle cost estimates until systems have been sufficiently tested and are poised for production and fielding.

D. In the meantime, has the focus on CAIV and Reduction in Total Ownership Cost somehow changed?

Sec. 811. Rapid Acquisition Authority to Respond to Combat Emergencies—This law provides for relief from applicable law and regulation in acquiring critical materiel where combat fatalities have occurred.

In a *wartime* environment, when US Armed Forces personnel are operating in harm's way, TOC necessarily should become secondary to safety and survivability. An obvious example, up-armoring HMMWVs and other trucks in Iraq, illustrates the point. An obvious outcome of up-armoring vehicles, albeit one that seems to attract little notice, is the armoring's significant impact on O&S costs—system lifecycle cost.

Other Changes in Focus. Two other major acquisition initiatives may increase pressure on TOC and possibly compete against CAIV during the “front-end” analysis of an emerging warfighting system. The first is spiral development, which almost assuredly adds logistical burdens to the acquisition process. The other is the possibility of cost errors during the Performance-Based Logistics (PBL) determination—resulting in out-sourced logistics that are more expensive than estimated. Both spiral development and PBL have potential effects on TOC that need further study.

Plenary Panel—Contracting for Deployed Forces

Thursday, May 19, 2005	Plenary Panel—Contracting for Deployed Forces
1:00 p.m. – 2:45 p.m.	<p>Chair: Stan Soloway, Professional Services Council</p> <p>Discussants:</p> <p>Rear Admiral Martin Brown, Office of the Assistant Secretary of the Navy (Research, Development & Acquisition)</p> <p>Commander Gary Broadwell, Joint Staff Logistics Directorate</p> <p>Papers:</p> <p><i>“The Yoder Three-tier Model for Optimal Planning and Execution of Contingency Contracting”</i> Elliott Cory Yoder, Naval Postgraduate School</p> <p><i>“Joint Contingency Contracting”</i> Major Ken Johnson, US Army, Naval Postgraduate School Captain Bryan Paton, US Marine Corp, Naval Postgraduate School Captain Kurt Threat, US Army, Naval Postgraduate School Lisa Haptonstall, Defense Contract Management Agency, Naval Postgraduate School</p> <p><i>“Contractors on the 21st Century Battlefield”</i> Richard L. Dunn, University of Maryland</p>

Chair: Stan Soloway—President of the Professional Services Council, the principal national trade association representing the professional and technical services industry. PSC is known for its leadership in the full range of acquisition/procurement and outsourcing and privatization issues. Mr. Soloway assumed the presidency in January 2001.

PSC’s member companies provide expertise in areas such as defense, space, environment, energy, education, health and international development that is used to assist virtually every department and agency in the federal government. PSC’s members also have extensive business relationships with state and local governments and commercial and international customers. All told, the professional and technical services sector performs more than \$400 billion in service nationally, including more than \$100 billion annually in support of the federal government.

Prior to joining PSC, Mr. Soloway served nearly three years as the deputy undersecretary of defense (acquisition reform) and concurrently as director of Secretary of Defense Cohen’s Defense Reform Initiative. As deputy undersecretary, he was the department’s senior official responsible for the development and implementation of far-reaching reforms to the DoD’s acquisition processes and policies. As director, DRI, Mr. Soloway led significant department-wide re-engineering and reform initiatives in areas as diverse as privatization and outsourcing, electronic commerce, financial management reform, logistics transformation, and quality of life for troops.



In recognition of his leadership at the DoD, in April 2000 Mr. Soloway was awarded the Secretary of Defense Medal for Outstanding Public Service and, in December 2000, was awarded the Secretary of Defense Medal for Exceptionally Distinguished Public Service, the highest civilian award of its kind.

Before his appointment to the DoD, Mr. Soloway was a public policy and public affairs consultant for nearly 20 years and a highly regarded expert in, and frequent lecturer on, acquisition, privatization, and out-sourcing issues. He served on the Policy Committee of the Council of Defense and Space Industry Associations, was co-founder of the Acquisition Reform Working Group, chairman of the Industry Depot Coalition, and founding member of the Government Competition Coalition. Additionally, he has produced local, national, and international television projects and has consulted on more than a dozen campaigns for the U.S. Congress and Senate.

Mr. Soloway earned a degree in political Science from Denison University in Ohio, where he was elected to the National Men's Journalism, National Men's Leadership, and National Political Science honorary societies.

Discussants:

Rear Admiral Martin Brown—Deputy Assistant Secretary of the Navy for Acquisition Management for the Assistant Secretary of the Navy (Research, Development and Acquisition). He advises the Navy's Senior Acquisition Executive on business matters concerning Navy and Marine Corps programs and provides policy and oversight for the Navy's procurement system, which comprises over 600 activities conducting approximately two million transactions annually worth more than \$40 billion.

Rear Adm. Brown also serves as the Competition Advocate General of the Navy. As such, he ensures that the Navy and Marine Corps maximize competition to obtain the best value for their procurements.

He previously served as Special Assistant for Joint and Operational Logistics, Naval Supply Systems Command, Arlington, Va., from 2002 to 2004. His other tours include Force Supply Officer for the Naval Surface Force, US Pacific Fleet, from 2000 to 2002, Acquisition Business Management Deputy for Program Support in ASN (RDA) from 1998 to 2000. From January to July 1999, he served in Sarajevo, Bosnia, as NATO's Theater Head of Contracts.

Rear Adm. Brown received his commission through the NROTC program from the University of Notre Dame in 1977. Following Supply Corps School, he was assigned as Supply Officer of *USS Andrew Jackson* (SSBN 619). From 1980-1982, he was a Navy Acquisition Contracting Officer at the Navy Regional Contracting Center in Long Beach, California. From 1982 to 1984, he served as Supply Officer of Submarine Squadron Four in Charleston.

From 1984 to 1986, he attended UCLA's Graduate School of Management, receiving his MBA in Finance and Public Management. From 1986 to 1989 he served as Business Review Officer and New Construction Contracts Officer at the Supervisor of Shipbuilding, Conversion and Repair in San Diego. Following that tour, he was Assistant Supply Officer of *USS McKee* (AS 41).

Rear Admiral Brown served as Deputy Director of the Missiles, Systems and Avionics Contracts Division at the Naval Air Systems Command in Washington, DC, from 1991 to 1993. He received a Master's of Science degree from the Industrial College of the Armed Forces and also graduated from the Defense Acquisition University's Senior Acquisition Course in 1994.

From 1994 to 1996, he was assigned to the Joint Staff International Logistics Division. For his contributions to operational logistics in Haiti and Bosnia, then Commander Brown was recognized as the Logistics Directorate's Action Officer of the Year in 1996. From 1996 to 1998, he was Supply Officer of *USS Tarawa* (LHA 1), completing two western Pacific deployments.

Rear Adm. Brown's awards include the Legion of Merit, the Defense and Navy Meritorious Service Medals, the Joint Service Commendation Medal, and the Navy Commendation Medal with three gold stars.



Commander Gary Broadwell—Joint Staff Logistics Directorate, graduated from the University of Oregon with a Bachelor's of Science in Business Management and obtained his commission as a Surface Warfare Officer (SWO) through the Officers' Candidate School in March of 1984. As a SWO, he served as Damage Control Assistant and later Navigator on USS MOUNT HOOD (AE 29) and as the Combat Information Center Officer on USS ARKANSAS (CGN 41). After selection for lateral transfer to the Supply Corps, he returned to sea as the Supply Officer on USS CHANDLER (DDG 996) and later the Assistant Supply Officer on USS BELLEAU WOOD (LHA 3) homeported in Sasebo, Japan.

During his first shore tour, he earned a Master's of Science (Acquisition & Contracting) from the Naval Post Graduate School in Monterey, California and reported to the Naval Air Systems Command as a Contracting Officer supporting the Program Executive Officer for Cruise Missiles & Unmanned Aerial Vehicles. During this tour, he worked one of the first contracting ventures with the former Soviet Union procuring the target variant of the AS-17 Krypton supersonic sea-skimming missile, earned two awards for acquisition streamlining, Acquisition Professional Community (Level III) membership, and Certified Professional Contracts Manager (CPCM) certification.

He later earned Joint Professional Military Education (JPME) Phase I qualification from the USAF Air Command & Staff College and JPME Phase II qualification from the Armed Forces Staff College prior to reporting as Program Analyst with the Assistant Secretary of the Navy (Research, Development and Acquisition). During this tour his team was awarded the Secretary of the Navy Competition & Procurement Excellence Award for their innovative award of a performance-based \$330 million contract for the Navy Recruiting Command. From here, he served a joint tour at the United States Military Training Mission, Riyadh, Saudi Arabia overseeing the Royal Saudi Naval Forces Foreign Military Sales program.

CDR Broadwell was recently selected for Captain and is currently assigned to The Joint Staff, Directorate for Logistics (J4) where, among other sustainment issues, he focuses on circumstances and policy affecting contractors accompanying the force. Most recently, he has drafted overarching US Department of Defense policy to address *Contractor Personnel Supporting Contingency Operations*. He is married to the former Julia Cupani and lives in Alexandria, Virginia.



The Yoder Three-tier Model for Optimal Planning and Execution of Contingency Contracting

Presenter: Commander (Ret) Cory Yoder, is a faculty member of the Naval Postgraduate School's Graduate School of Business and Public Policy (GSBPP). Assigned to NPS in July 2000, he accepted an appointment as Academic Associate (Program Manager) for the 815 (MBA) and 835 (MSCM) programs in December 2002. Commander Yoder has accepted a civilian position at NPS/GSBPP as Lecturer and Academic Associate (Program Manager). Cory has strong acquisition and contracting experience, combined with several challenging acquisition, logistics, industrial, headquarter, and combat support operations assignments.

Commander (Ret) Yoder entered the United States Naval Service in 1984. Since his commission, he has performed in numerous assignments, including, but not limited to: Director and Chief of Logistics, Headquarters, Allied Forces Southern Command (AFSOUTH), Naples, Italy (logistics, contracting, finance within NATO); Post Commander and Support Group Commander, Kosovo Verification Coordination Center (KVCC), Kumanovo (Skopje), Macedonia; Officer-in-Charge, Fleet and Industrial Supply Detachment, Long Beach, California; Stock Control Officer, USS TARAWA (LHA-1); Aviation and Surface Stores Officer, USS TARAWA (LHA-1); Naval Acquisition and Contracting Officer (NACO) internship, Naval Regional Contracting Center (NRCC), Washington, DC; Supply Officer, USS FANNING (FF-1076).

CDR (Ret) Yoder holds the following degrees: a MA in National Security and Strategic Studies, Naval War College (NWC), Newport, Rhode Island, 1997; a MS in Management, Naval Postgraduate School, Monterey, CA, 1993; a BS in Business Management, Indiana University "Kelly" School of Business, 1983.

CDR (Ret) Yoder is DAWIA Contract Level III certified, a Direct National Member of the Institute for Supply Management (ISM), and a member of Beta Gamma Sigma international honor society for graduate degree holders.

CDR (Ret) Yoder has published several articles in acquisition and contracting, including, but not limited to: "Contingency Contracting Operations—Achieving Better Results," "The Naval Postgraduate School's Defense-Focused Master's Programs in Acquisition and Contracting," "Lessons for Contingency Contracting, Humanitarian Operations in Uzbekistan," "Creating Something from Nothing," "Engagement versus Disengagement: How Structural & Commercially-Based Regulatory Changes have Increased Government Risks in Federal Acquisitions."

ABSTRACT

Contingency efforts in Iraq, Afghanistan, and several other countries in the last few years have been subjected to close scrutiny and critique. Contingency Contracting operations are increasingly the major source of support and provisioning in forward theaters, especially in light of reductions in organic (non-contracted) support capabilities. Recently, theater combatant commanders have come to rely on contingency contracting officers to support coalition forces, and concurrently, to achieve a transformation of the economic landscape essential for achieving theater objectives. But, critics of recent operations cite deficiencies in DoD's ability to effectively and efficiently conduct a coordinated contracting support effort that integrates the combatant commander's theater objectives with the myriad stakeholders deemed essential for success. Can we, the military, achieve better results? The author contends that with proper understanding of integrated planning and execution, contingency contracting operations can, and will, provide significant leverage for achieving the combatant commander's objectives.



The author formally presented, on August 7th, 2003, a Yoder three-tier model for contingency contracting operations to the faculty of the Naval Postgraduate School.¹ Subsequent to the NPS faculty presentation, the author published a synoptic “interest” article in the *Army AL&T Magazine*’s January-February 2004 edition, entitled, “Contingency Contracting Operations—Achieving Better Results.”²

Because of continued interest in the Yoder three-tier model expressed by academics, force planners, and contracting offices from several agencies, the author believes a more comprehensive write-up of the Yoder three-tier model is appropriate. The NPS Acquisition Symposium provides the in-depth coverage, broad dissemination and recognized avenue for open dialogue of the model and its potential efficacy.

As such, this paper proposes the Yoder three-tier contingency contracting officer model structure for Army, Navy, Marine Corps, and Air Force support of theater contingency contracting operations. The creation of this Yoder three-tier model and its employment will allow for better planning and coordination; likewise, it will allow for better tactical, operational, and theater objective support.

INTRODUCTION

I. Backdrop and Purpose:

Contingency efforts in Iraq, Afghanistan, and several other countries in the last few years have been subjected to close scrutiny and critique. Contingency Contracting operations are increasingly the major source of support and provisioning in forward theaters, especially in light of reductions in organic (non-contracted) support capabilities. Recently, theater combatant commanders have come to rely on contingency contracting officers to support coalition forces, and concurrently, to achieve a transformation of the economic landscape essential for achieving theater objectives. But, critics of recent operations cite deficiencies in DoD’s ability to effectively and efficiently conduct a coordinated contracting support effort that integrates the combatant commander’s theater objectives with the myriad stakeholders deemed essential for success. Can we, the military, achieve better results? The author contends that with proper understanding of integrated planning and execution, contingency contracting operations can, and will, provide significant leverage for achieving the combatant commander’s objectives.

The author formally presented, on August 7th, 2003, a Yoder three-tier model for contingency contracting operations to the faculty of the Naval Postgraduate School.³ Subsequent to the NPS faculty presentation, the author published a synoptic “interest” article in the *Army AL&T Magazine*’s January-February 2004 edition, entitled, “Contingency Contracting Operations—Achieving Better Results.”⁴

Because of continued interest in the Yoder three-tier model expressed by academics, force planners, and contracting offices from several agencies, the author believes a more

¹ (Yoder, 2003a).

² (Yoder, 2004, pp. 95-97).

³ (Yoder, 2003a).

⁴ (Yoder, 2004, pp. 95-97).



comprehensive write-up of the Yoder three-tier model is appropriate. The NPS Acquisition Symposium provides the in-depth coverage, broad dissemination and recognized avenue for open dialogue of the model and its potential efficacy.

As such, this paper proposes the Yoder three-tier contingency contracting officer model structure for Army, Navy, Marine Corps, and Air Force support of theater contingency contracting operations. The creation of this Yoder three-tier model and its employment will allow for better planning and coordination; likewise, it will allow for better tactical, operational, and theater objective support.

II. Areas of Focus:

This working paper is divided into two major sections. The first section provides an overview of the unique contingency contracting requirement. It covers several topics vital to understanding why the Yoder three-tier model is appropriate. The second section then defines and presents the Yoder three-tier model. This portion provides in-depth coverage of the three contingency-contracting models proposed by the author.

As the successful creation and utilization of this conceptual model entails contracting, acquisition, personnel planners, and logisticians, the broadest dissemination and integration of this Yoder three-tier model is proposed.

III. Major topical areas addressed include:

Section One: The unique contingency contracting requirement:

- I. “Contract” definition
- II. Functions of a contract
- III. “Contingency contract” definition
- IV-VII. Real-world examples

Section Two: The Contingency Contracting Officer Yoder three-tier Model:

- I. Calls for better planning and coordination
- II. The Yoder three-tier model for contingency contacting:
 - A. Ordering Officer model
 - B. Leveraging Contracting Officer model
 - C. Integrated Planner and Executor model
- III. Moving from theory to practice—the “who cares” test
- IV. Recommendations and conclusion

SECTION ONE: THE UNIQUE CONTINGENCY CONTRACTING REQUIREMENT



I. Definition of Contract:

A contract is nothing more, or less, than a mutually binding legal relationship. To be binding, a contract must have six elements:

- Offer,
- Acceptance,
- Consideration,
- Execution by Competent Parties,
- Legality of Purpose, and
- Clear Terms and Conditions.⁵

In the United States, these six elements are derived from the Uniform Commercial Code (UCC), State and Federal Law. For DoD Agencies, the concepts are manifest through the Federal Acquisition Regulation (FAR) and implementing regulations and guidance, such as the Defense Federal Acquisition Regulation (DFAR).

While operating within the United States, and, to a large degree, with other international systems, contracting officers will find the six elements are nearly universally recognized. However, the contingency contracting officer may also find that these universal parameters are subject to varied interpretation; therefore, they may be valued as tenets in a significantly different manner than what may be considered customary by domestic and developed international standards.

II. Contract Functions:

Contracts perform a variety of functions. These functions include, but may not be limited to, five areas:

- Evidentiary—a record of the binding agreement,
- Administrative—delineating terms and conditions, payment processes, management, etc.,
- Risk allocation—contract type, monetary and non-monetary incentives, unique conditions,
- Payment—payment criteria and administration, and
- Motivation—positive and negative.⁶

The importance of these functions, especially in the context of the contingency contracting environment, cannot be over-emphasized.

III. “Contingency Operations” defined (statutorily and operationally):

A contingency is an event which requires the deployment of military forces in response to natural disasters, terrorist or subversive activities, collapse of law and order, political

⁵ (Cibinic & Nash, 1998, pp. 203-260).

⁶(203-260).

instability, or other military operations. Contingencies, by nature, require plans for rapid response and procedures to ensure the safety and readiness of personnel, installations, and equipment.

There are three types of “disasters” to which the international community (including the military) may be called to respond: natural disasters, technological disasters, and complex humanitarian emergencies. According to the United Nations Department of Humanitarian Affairs, complex humanitarian emergencies are defined as, “a humanitarian crisis in a country or region where there is total or considerable breakdown of authority resulting from internal and/or external conflict which requires an additional response that goes beyond the mandate or capacity of any single agency.”⁷

Contingencies may exist across the full spectrum of war and during military operations other than war (MOOTW). These could include, but are not limited to: major theater wars, small scale contingencies, domestic and international disaster relief, peace-keeping operations, nation building, stability operations, and other humanitarian operations.

IV. Declared Contingencies—Effects of Declaration:

Contingencies may be officially “declared” in accordance with statute.⁸ In accordance with Title 10USC(a)(13), a declared contingency may be:

- designated by the Secretary of Defense when members of the armed forces may become involved in military actions against an enemy of the United States, and/or
- designated by the President or Congress when members of the uniformed services are called on active duty under Title 10 USC, or any provision of law during a declared war or national emergency.

A “non-declared” contingency includes all operations of the Department of Defense other than those described under the aforementioned Title 10. Normally, in the international arena, the State Department declares emergencies which may or may not require official declaration.

The distinction between officially-declared and non-declared contingencies is significant in its impact on contingency-contracting operations. Under officially-declared contingencies, many provisions of the Federal Acquisition Regulations (FAR) and most service regulations and policies are relaxed, streamlined, or even eliminated, making the contracting processes of supporting operations in contingent environments potentially more efficient and effective.

Examples of this streamlining include, but are not limited to:

- Invoking the Defense Production Act/Defense Prioritization and Allocation System (DPPS) which requires U.S.-contracted suppliers to place Government contracts at a priority over all others,
- Possible waiver of the unique provisions of the Competition in Contracting Act (CICA),

⁷ (United Nations Dept of Humanitarian Affairs, 2003).

⁸ 10 USC (a) (13).



- Allowance for “extra-ordinary” contract actions under FAR Part 50 (adjustments, etc.), and special expediting actions to include the following:
 - Exclusion of synopsis (advertisement) if outside the United States,
 - Utilization of Simplified Acquisition Procedures (SAP) up to \$5 million,
 - Elimination of U.S. socio-economic laws and regulations (outside the U.S.),
 - Award of contracts prior to the resolution of protest actions, and
 - Waiver of over 100 statutes relating to Federal contracting.

Whether declared or non-declared, contingencies may exist across the full spectrum of war and during military operations other than war (MOOTW). The varying degrees of contingencies may include, but are not limited to: major theater wars (Iraqi Freedom for example), small-scale contingencies, domestic and international disaster or emergency relief, peace-keeping operations, nation building, stability operations, extraction and/or evacuation operations, and other humanitarian operations.⁹

V. The Nature of Contingent Contracting Environments:

Contingent contracting environments may be classified as either mature or immature. Mature environments have sophisticated infrastructure capable of supporting and sustaining operations. Generally, mature environments have host-nation support agreements, legal frameworks, financial systems able to support complex transactions, robust transportation networks, business capacity and capability, and willing participants. Immature environments, in contrast, have little to no supporting infrastructure. Immature environments may require grooming to bring the infrastructure to desired operational standards, or workarounds (such as bringing a capability into theater) to leverage capabilities.

Most contingencies where military force is required, the “complex humanitarian emergencies” as defined by the United Nations, are in immature environments. In such cases, usually a breakdown of leadership and social order negatively impacts host-nation capabilities, financial systems, transportation systems, business capacity and capability, and willingness of potential participants.¹⁰ By nature, these immature environments, whether immature by nature or by other means, present unique business dynamics and challenges to effective and efficient conduct of business. For instance, underground networks for food, shelter, safety and security, and a loss of traditional motivators to which many domestic businesses are accustomed may create a potentially-difficult situation. Lack of planning can exacerbate problems and degrade mission effectiveness.

VI. Multi-faceted Operations in Contingent Environments:

Within the contingent environment, several key functions may be accomplished. Among prominent functions are diplomatic negotiations, humanitarian relief, refugee support, economic restoration, security and de-weaponization, democratization, and provision of essential services for food, shelter, safety, security and medical needs, as indicated in Figure 1, below.

⁹ Joint Publication 01-02.

¹⁰ (United Nations Department of Humanitarian Affairs, 2003).

What organizations actually perform these missions? Not just the military! Non-Governmental Organizations (NGOs) and Private Volunteer Organizations (PVOs) are vital sources of relief in immature environments as well. The difference between NGOs and PVOs is as follows: NGOs are defined by the International Red Cross as non-governmental, national and international, and constituted apart from the government in which they are formed. Private Volunteer Organizations are defined by the United States Agency for International Development (USAID) as tax-exempt, non-profit organizations working towards international development, and which receive some portion of annual funding from the private sector.

Figure 1. Multi-Faceted Operations



(Yoder, 2003a)

Generally speaking, most nations prefer the Red Cross definition and, therefore, the NGO designator for defining both NGOs and PVOs.

Several, if not hundreds, of organizations (NGOs and PVOs) may be at work within a contingent environment. The United Nations alone may send the UN Department of Human Affairs (UNDHA), the UN High Commission for Refugees (UNHCR), the UN International Children's Emergency Fund (UNICEF), the UN Development Program and UN Department of Peacekeeping Operations. Other international organizations that may be involved include the World Food Program (WFP), the World Health Organization (WHO), and humanitarian organizations such as Doctors without Borders.

VII. Contingency Contracting Phases (with characteristics):

Development of the Yoder three-tier contingency contracting model requires an understanding of the functions and skill sets to perform successfully.

There may or may not be a formal Operations Plan or Plans (OPLANs) for a given contingency; if not, one should be drafted to include relevant support plans, concept of operations, liaison requirements, and security plans. Surprisingly, the overarching OPLAN for

Operation Iraqi Freedom did NOT include contracting plans in sufficient detail to provide any meaningful concept of operations or direction to contingency contracting support personnel.¹¹

Four phases of major operations are adapted from joint publication doctrine for analytical purposes. Understanding the nature of contracted support during the four phases is imperative for defining the functional requirements of any manning model designed to support those functions.

A. Phase I: Mobilization and Initial Deployment:

- initial 30-45 days of operations
- main emphasis on basic life support and security items, including the creation or establishment of:
 - food and water
 - shelter
 - utilities
 - transportation
 - fuel
 - sanitation
 - interpreters and guides, and
 - security
- Liaison with host nation, USAID, local politicians, etc.

B. Phase II: Build-Up and Stabilization:

- commences after Phase I, normally day 45+
- continued priority for basic life support and security items, with additional priority for:
 - construction and infrastructure
 - habitability
 - “quality of life” items (sports, canteens, etc.)
 - establishment of a solid and reliable vendor base
 - contracting control and administration
 - normally, shift from a “push” to a “pull” support strategy
 - greater numbers of mission personnel supported by the contingency contractor

C. Phase III: Sustainment (Post-buildup until Termination):

Phase III may be considered the long-haul event. The duration may range from weeks to months or years, and may become stabilized to the point of resembling a state-side base

¹¹ (Anderson & Flaherty, 2003).

operation. Contingency contracting operations are robust and standardized, and include the following:

- continued priority for basic life support and security items
- all aspects of Phases I and II, with the addition of:
 - establishing Indefinite Delivery type contracts, Blanket Purchase Agreements (BPAs), etc.
 - improving and refining internal controls
 - increasing competition in vendor base
 - utilizing “pull” contracts for services not available in that particular theater
 - planning and contracting for termination of operations
 - creating “dormant” contracts for contingent or “extra-ordinary” events

D. Phase IV: Termination and Redeployment:

Phase IV continues all of Phases I, II and III, but shifts emphasis to those functions required to terminate operations in an orderly and expeditious manner. This is a particularly challenging phase of operations. There must be a clearly defined “end-state” in order for planners and executors to know how best to organize and execute functions. Phase IV functions include the continued emphasis and requirement for:

- continued priority for life support and security items
- phasing-out earlier priorities with a shift towards:
 - packing and freight services
 - transportation
 - contract termination
 - contract closeout
 - securing audit and accountability prior to exit
 - complementing the overall exit strategy

Identifying a clear and orderly end-state and hand-off to other players, whether those players are the host nation or other agencies including NGOs and PVOs, may be characterized by a return of security, a stabilized economy, and NGOs and PVOs at liberty to exercise their operations and functions. Certainly, less orderly hand-offs have occurred in recent years, including the Somalia situation (*Black Hawk Down* scenario) where an ambiguous end-state was the result of unclear mission requirements and little effective military coordination with NGO and PVO players.

SECTION TWO: THE YODER CONTINGENCY CONTRACTING YODER THREE-TIER MODEL



I. Calls for better planning and coordination:

Several notable calls for better planning, coordination and integration of contracting operations with broader theater-support elements—with intent to more efficiently and effectively accomplish theater objectives—have been postulated. A few of the more prominent calls for better planning and integration include, but are certainly not limited to: first, the Presidential Decision Directive (PDD) 56 entitled, “Managing Complex Contingency Operations”; Rand Report on Civil and Military Cooperation; and several Naval Postgraduate School thesis projects including two supervised and advised by this author.^{12,13}

PDD 56 was issued by President Clinton in 1997. This directive determines the integration of planning and execution among Federal Agencies called to perform in contingencies. The problem with PDD 56 is two-fold. First, PDD 56 is not embraced by the current administration. Second, PDD 56 does not apply to combat operations (where the use of military force is required, including peace-keeping and stabilization).

The Rand Report entitled *Civilians and Soldiers—Achieving Better Coordination* proposed greater integration, and identified stakeholders in contingent operations.¹⁴

II. The Yoder Three-tier Model for Contingency Contracting Operations:

The author proposes three models of employment for contingency contracting officers. Each tier performs unique functions, requires specific education, developed skill sets, and unique personnel and manpower characteristics. Each tier is co-dependent, or integrated in hierarchal manner, on the other tiers. The Yoder three-tier model maximizes effectiveness and efficiency of theater contingency contracting operations, and directly links operations to Combatant Commander (COCOM) broad objectives through integrative planning and execution. (See Figure 2.)

A. Ordering Officer Model. The most basic and simplistic model is the “ordering officer” model. This is the most rudimentary of contracting support, which includes functions such as placing orders against existing theater contracts. By nature, this requires little interactive engagement in the environment, and is best suited for warranted junior officers and enlisted personnel.

B. Leveraging Contracting Officer (LCO) Model. The next higher-level model is the “leveraging contracting officer” model. This level includes the basic ordering functions of the ordering officer model, but includes leveraging the capacities and capabilities of the local and regional economies in the contingent theater. As such, there may be a reduced need for organic service and material support. The practitioner in the leveraging model clearly will be engaged in interfacing with local and regional businesses, creating business processes, and potentially coordinating with higher military, Non Governmental Organizations and Private Volunteer Organizations NGO/PVO and political organizations. With this in mind, only higher-level, more qualified and capable practitioners should perform in the leverage model. A shortfall

¹² (Coombs, 2004).

¹³ (Anderson & Flaherty, 2003).

¹⁴ (Pirnie, 1998).

of this model is that the CCO (Contingency Contracting Officer) operation may or may not be integrated with the broader goals of national and theater objectives. In the worst case, some of the tactical execution may actually be counter to those higher-level goals.

C. The Integrated Planner and Executor (IPE) Model. The highest-level model is the “Integrated Planner and Executor” (IPE) contingency contracting officer. This model takes the leveraging contracting officer function one giant step forward. In this model, well-educated and qualified CCOs are integrated into the operational-planning phases of contingencies, often before actual troop deployment; they then make the transition to operations. The hallmark of the IPE CCO is that contingency contracting operations may be planned and subsequently executed to meet National Strategic and theater objectives. Additionally, the myriad NGOs and PVOs—which, in many if not most cases, are essential to the overall efficiency, effectiveness, and, ultimately, the success of operations—can be integrated into the planning and execution of contingency operations. While this integration requirement may seem painfully obvious, the integrated planning and execution among warfighters, contingent contracting officers, and the NGOs and PVOs is not, and does not occur on a regular and recurring basis.¹⁵

The author proposes that Integrated Planner and Executor CCO (IPE CCO) be utilized in a broader planning-and-execution environment. The Contingency Contracting Officer, with higher-level certification, education and experience, should be integrated within J-4 and J-5 Logistics and Planning/Operations and Exercise organization structure. Integration is essential to achieve desired synergies between the myriad organizations involved in and participating in contingency environments. Concurrently, operational planners can leverage integration of all theater players (military, NGOs/PVOs, and contractors) to achieve harmony between National Security Strategy (NSS), Combatant Commander (COCOM), and significant NGOs’ and PVOs’ objectives, through integrated planning, exercising, and, ultimately, execution. This integrative planning, exercising, and execution may: help in eliminating competing (and often conflicting) demands of the participants, closely marry acquisition support with stated objectives, allow for the creation of robust Contingency Contract Support Plans, and integrate such plans into broader operational plans in support of theater operations. The higher-order IPE calls for the most highly-educated and seasoned planners and operational/theater-level planners. Figure 2 highlights the integrative functions among stakeholders that are a hallmark of the IPE. The Yoder Three-tier models described herein are summarized in Table 1.

¹⁵ The author recommends NPS thesis by Anderson & Flaherty.

Figure 2. Integrated Planner and Executor Model



¹⁶ S.W.O.T. is Strength, Weaknesses, Opportunity, and Threat. S.W.O.T. is a methodological model for analysis of strategic requirements, found in several management forums, originally presented to the author by Dr. Nancy Roberts, NPS.

Table 1. Yoder Three-Tier Model for Contingency Contracting Operations

Model Tier Level & Model Title	Functions/Education/Rank	Highlights and Drawbacks
Ordering Officer—Tier One	<ul style="list-style-type: none"> • basic ordering • some simplified acquisitions • training: DAU CON 234 • DAWIA Certified CON Level I or II • junior to mid-enlisted, junior officers, GS-7 to GS-9 1102 series civilians 	<ul style="list-style-type: none"> • simple buys • little integration • no operational planning • no broad liaison functions
Leveraging Contracting Officer—Tier Two	<ul style="list-style-type: none"> • leverages to local economy • reduces “pushed” material support • training/education: • DAU CON 234, recommended higher education • DAWIA Certified CON Level II or III • senior enlisted, junior to mid-grade officers, GS-11+ 1102 series civilians 	<ul style="list-style-type: none"> • better local operational planning • some integration • more capability for the operational commander • no planned theater integration • no broad liaison functions • may perform to optimize local operations at the detriment to theater ops
Integrated Planner and Executor (IPE)—Tier Three	<ul style="list-style-type: none"> • highest level of planning and integration—joint • linked/integrated with J-4 and J-5 • creates and executes OPLAN CCO strategy • provides direction to tier two and one • links operations strategically to theater objectives of COCOM • education: Master’s degree or higher and, JPME Phase I and II • DAWIA Certified CON Level III, and other DAWIA disciplines (LOG, ACQ, FIN, etc) • senior officers (O-6+), senior civilians, GS-13+ or SES 	<ul style="list-style-type: none"> • performs operational and theater analysis, integrates results into OPLAN • link between COCOM and OPLAN to all theater contracting operations • coordinates theater objectives with best approach to contracted support • can achieve broader national security goals through effective distribution of national assets • includes planning, communication, coordination, and exercising with NGO and PVO in theater

(Yoder, 2004)

III. Moving from Theory to Practice—the “Who Cares” Test.

What organizations might benefit from integration of planning and execution of contingency contracting with broader operational and theater planning?

First, Combatant Commanders (COCOMs) would benefit. These soldiers are generally interested in getting in theater, accomplishing the mission, and getting out! The premise is that without integration, they are not effectively or efficiently utilizing all players and assets capable of providing leverage for their mission achievement. Clearly, they can benefit from integration.

Second, the Joint J-4 and J-5 staffs, which have traditionally focused on “logistics” rather than integrative contracting and logistics, can better achieve logistical support through integration of all theater assets, including contracting.

Third, personnel planners and assigners have a stake in the model. The integrative planner and executor CCO (IPE CCO) inherently demands highly-educated and experienced personnel to fully integrate effectively into the higher-level planning organizations. The IPE CCO could clearly benefit from Master’s-level education in at least one specialty, such as Contracting, and concurrently with JPME Phase I and II. This level of qualification is undoubtedly not for everyone. Creating the ICE CCO position within organizations will have a significant impact on the personnel pipeline, including the requirement for higher education, joint qualification, and significant practitioner experience in the joint environment.

Fourth, NGOs and PVOs would benefit from the ICE CCO model. These organizations could develop a better understanding and dialogue with their military counterparts—something that is currently lacking. NGOs and PVOs are sensitive and dedicated to maintaining a perception and often the reality of being wholly detached from a particular government or military. Any close association could damage their “neutrality” and adversely affect their ability to deliver services and supplies. However, they are often inescapably dependent on the military to provide the secure framework, logistics support, and contracting for the conduct of their business. Meshing, or creating harmony of operations, may be a better moniker than integration. Nonetheless, national strategic objectives, theater, and operational objectives of both the military and the NGOs and PVOs require coordination to achieve maximum synergies and the desired efficiencies and effectiveness to meet the collective end-state.

SECTION THREE: RECOMMENDATIONS AND CONCLUSIONS:

The Yoder three-tier model addresses a significant shortfall in current contingency contracting operation support: integrative planning and execution. As is demonstrated in the Anderson and Flaherty project, comprehensive planning in the joint environs of the Combatant Commander’s J-4 (logistics) and J-5 (planning and exercising) is currently not being accomplished to any significant degree¹. Instead, what the acquisition and contracting community is providing the COCOM is a sub-optimized, ad hoc approach to providing contracted theater support.

The Yoder three-tier model calls for the cultivation and utilization of senior officers and civilians with sufficient education, joint qualification, multi-discipline Defense Acquisition Workforce Improvement Act (DAWIA) certifications and other professional qualifications to

¹ (Anderson & Flaherty, 2003).

perform at the highest integrative-planning and execution levels. At the highest level, the Integrative Planner and Executor (IPE) is the essential and critical linch-pin allowing for the development of a comprehensive Contingency Contracting Support Plan (CCSP) that integrates contracting with the broader theater objectives in the Operation Plan (OPLAN).

The IPE, being integrated at the J-4 level, will plan, exercise, and call for adequate theater contingency contracting personnel provisioning (which may vary depending on the phases of the contingency operation) to effectively and efficiently meet theater objectives.

The *primary recommendation* is that the Yoder three-tier model be reviewed and implemented across all services. In order to effectively accomplish this, the author recommends that senior leadership, including at the secretariat level, take pro-active measures to implement the model. Such review and implementation considerations include the following (secondary/implementation recommendations):

- Mandate service implementation of the Yoder three-tier model,
- Fully fund educational and career-development programs which are the hallmark of the Integrated Planner and Executor (IPE) and the Leveraging Contracting Officer (LCO),²
- Ensure the services create career incentives for personnel choosing to take positions in support of the Yoder three-tier structure,
- Mandate that the J-4 structure include the IPE, top-level integrative planner and executor, and
- Mandate Joint Professional Military Education (JPME) Phases I and II for personnel at the IPE and LCO model levels.

With increasing demands placed on the contracting community to provide service and theater support, it is imperative that the structures called upon to provide this assistance are effectively designed and staffed to accomplish optimized reinforcement of theater (COCOM) objectives. It is nearly impossible to believe, in any way, that the reactive, ad hoc manner in which theater contracting support is being conducted creates such optimal support. The fact is that little to no contracting planning and tiered execution is conducted. Embracing and implementing the Yoder three-tier model will allow the best structure possible to achieve the synergies necessary to accomplish today's and tomorrow's theater objectives.

It's time to create better planning, execution, and integrated contingency contracting operations!

² The Naval Postgraduate School has several career-enhancing master's degrees in fields specifically designed for upwardly-mobile acquisition and contracting officers and civilians.

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Joint Contingency Contracting

Presenter: Major Ken Johnson graduated from the University of Virginia with a BA in Psychology. He obtained his commission in the US Army as a 2nd Lieutenant in May 1992. MAJ Johnson began active duty as an Armor officer and soon attended the US Army Armor Basic Course located in Fort Knox, KY. He then served in the following operational assignments in the 1st Battalion, 66th Armored Regiment at Fort Hood, TX: tank Platoon Leader, Company Executive Officer, Battalion Maintenance Officer, and Battalion Assistant Operations Officer.

Upon completion of that duty in Texas, MAJ Johnson attended the Armor Advance Course at Fort Knox, KY and the Combined Arms Services Staff School at Fort Leavenworth, KS. Following that his operational assignments were with the 1st Brigade, 1st Armored Division at Fort Riley, KS as a Brigade Assistant Operations Officer (Plans), and then as a Company Commander in the 2nd Battalion, 70th Armored Regiment.

MAJ Johnson was accessioned into the US Army Acquisition Corps in January 2001. He then served in the Digital Force Coordination Cell (DFCC) at Fort Hood, TX. While in the DFCC MAJ Johnson was the Mounted Maneuver Coordinator and later became the Dismounted Maneuver Chief. His duties included monitoring the status of the Force XXI Battle Command Brigade and Below (FBCB2) systems being fielded to the 4th Infantry Division as they trained to become the Army's First Digital Division.

His next Acquisition Corps assignment was in the Requirements Integration Directorate (RID) at Fort Monroe, VA. This directorate was part of the US Army Training and Doctrine Command (TRADOC). MAJ Johnson served as a Combat Development staff officer and coordinator. His duties included leading Integrated Product Teams to facilitate TRADOC's role in the Unit Set Fielding of Army Force XXI heavy divisions.

MAJ Johnson is currently attending the Naval Postgraduate School in Monterey, CA and will graduate in June 2005 with a MBA in Systems Acquisition Management. In addition, he will meet the curriculum requirements to receive Defense Acquisition University (DAU) certifications from the MBA Acquisition and Contracting Management program. He is Level I certified in Program Management. His awards include the Army Meritorious Medal, Army Commendation Medal, and the Army Achievement Medal. He has also earned the Parachutist Badge.

Presenter: Lisa Haptonstall is a Program Integration Specialist with the Defense Contract Management Agency (DCMA) assigned to Northrop Grumman's Airborne Ground Surveillance and Battle Management Systems (AGS&BMS) facility in Melbourne, FL. She has been with DCMA since March 2000, when the agency was created. When in Melbourne, she is responsible for two US Air Force (USAF) major defense acquisition programs: Joint Surveillance Target Attack Radar System (Joint STARS) and E-10A Multi-Sensor Command and Control Aircraft (MC2A); the USAF's next generation ground surveillance and battle-management weapon system.

Past assignments within the Department of Defense (DoD) include:

- DCMA Northern Europe—United Kingdom (Bristol): Program Integration Specialist, Industrial Specialist and Quality Assurance Specialist
- Defense Contract Management Command (DCMC) Dallas: Quality Assurance Specialist
- Defense Contract Administration Services Region (DCASR) Atlanta, Puerto Rico: Quality Assurance Specialist
- Defense Personnel Support Center (DPSC), Philadelphia: Quality Assurance Specialist

In addition to her work with the DoD, Mrs. Haptonstall's private sector experience includes positions with International Playtex, and she served as a Texas Quality Award examiner from 1993 to 1996.

Mrs. Haptonstall has a BS in pre-veterinary medicine from Delaware State College. She is a graduate of the Defense Acquisition University Advanced Program Managers Course, Simmons Graduate



School of Management Program for Developing Managers, and the Defense Logistics Agency (DLA) Mid-Level Development Program. She is currently matriculated in the Naval Postgraduate School MBA Acquisition and Contracting Management program.

Lisa Haptonstall is a certified acquisition professional and is Level III certified in Program Management and Level II in Production, Quality and Manufacturing. She also holds DLA certifications in Quality Systems in the aircraft, electronics, mechanical, and clothing and textile commodities. Her professional certifications granted by the American Society for Quality include: Quality Engineer, Quality Auditor and Mechanical Inspector.

Presenter: Captain Bryan Paton

Presenter: Captain Kurt Threat

EXECUTIVE SUMMARY

Contingency Contracting has been performed in one shape or another in every war the United States has fought. That being said, are the Department of Defense (DoD), military services, and DoD agencies conducting contingency contracting the best way? Are there areas that can be improved? If so, exactly what area could use improvement? These questions are the backdrop as to why the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN(RDA)) requested a team investigate and analyze the means by which Contingency Contracting Officers (CCOs) can effectively operate in a Joint contingency environment. In addition, this team has gained information that will assist US Army, Navy, Marine Corps, Air Force, and DCMA's Contingency Contracting Officers (CCOs) in their ability to effectively prepare for contingency operations.

There are many definitions for the word contingency. Specifically, the Contingency Contracting Student Handbook (CCSH) defines a contingency as, "an emergency involving military forces caused by natural disasters, terrorists, subversions, or by required military operations." Since most contingencies are unforeseen events that often require the quick deployment of troops, Contingency Contracting Officers (CCOs) are sent to support them. Saudi Arabia, Kuwait, Bosnia, Kosovo, Iraq, Afghanistan, and Djibouti are some of the many places where the United States (US) has deployed troops since 1990.

Within the Joint, multi-Service, and multi-National areas, CCOs are responsible for acquiring or procuring elements that help to provide combat support, combat service support, and other logistical support to deployed units. Since they are fundamentally contracting officers, they are the only authorized personnel who can obligate government funds. One of the vital ways CCOs get the information they need to execute their part of the mission is from the Contingency Contracting Support Plan (CCSP). The CCSP is the vehicle that describes the support required when troops are rapidly deployed. Part of our research focused on the use of the CCSP at the Service-Component and Combatant-Command (COCOM) levels.

We utilized data collected from a literature review of US Joint contingency contracting policies and guidelines, library information resources, websites, books, and magazines. The researchers also conducted personal interviews with representatives from Joint Staff J4, Office of the Secretary of Defense for Acquisition, Technology, and Logistics (OSD(AT&L)), Secretary of the Air Force (Acquisition), Army Contracting Agency (ACA), ASN(RD&A), Headquarters, Marine Corps, Defense Contract Management Agency (DCMA) Headquarters Combat Support Operations Center (CSOC), DCMA International District (DCMAI), US Central Command



(CENTCOM), and US Pacific Command (PACOM). While the focus of this research was on preparation for contingency operations, we also have recommendations on how the DoD can improve manning, experience, and structure to accomplish contingency contracting operations; one recommendation is creating a Joint Contingency Contracting Command within the DoD to serve as a central point for all contingency contracting.

There are some other key issues we discovered during our research on contingency contracting. (1) There is contingency contracting guidance from the DoD *and* each service; a combined Joint publication would be useful; (2) Each service and most DoD agencies collect information on lessons learned, some of which is put into the Joint Uniform Lessons Learned System (JULLS), but some components do not make a review of this requirement before a person deploys on a contingency; (3) Some Service Components and COCOMs may not have contracting officers who are fulfilling their proper roles, given the correct responsibilities, or who have adequate education to sufficiently conduct and manage contingency contracting operations; (4) The current structure/organization of Service Components and COCOMs in terms of contingency contracting may need to be altered to better support the warfighter; (5) DCMA CSOC and DCMAI are critical participants on the contingency-contracting team and need clear contingency entrance and exit criteria.

This report covers many issues dealing with joint contingency contracting, but there is still much research that could be done in this area. Options for future projects are: (1) Conducting a more thorough analysis of joint publications and Service-specific information on contingency contracting, (2) Reviewing the background as to why the DCMA was asked to perform contract administration at the beginning of Operation Iraqi Freedom, (4) Conducting a critical analysis on why the DCMA needs clear contingency contracting entrance and exit criteria, and (4) Conducting an analysis as to how each Service and the DCMA can ensure that, for contingency contracting, the right person is put in the right job and has the right education.

KEY WORDS: Contingency, Contracting, Contingency Contracting, Joint Contingency Contracting.



Contractors on the 21st Century Battlefield

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ABSTRACT

Victory in the Cold War brought reduced military budgets and lower end-strengths. Contemporaneously, operations' tempo rose dramatically. This, plus government policies favoring outsourcing, led to a growth in importance of contracted support for military operations, and, correspondingly, an increasing prevalence of contractor personnel in proximity to combat.

This paper reviews the legal status of civilian contractors in proximity to combat; control, discipline and force protection of such personnel, and the impact and cost effectiveness of contract support on combat operations.

Particular attention is paid to the contracting process and its impact on the effective delivery of combat support. The adequacy of traditional contracting policies and processes for combat support functions and the need for possible changes are examined.

The research found there had been a lag in updating policy and doctrine based on lessons learned and that on occasion a "business as usual" approach has decreased the efficiency of contracted contingency support. Serious deficiencies in organization and training for contingency contracting in support of joint operations persist. Contracting in a stressful environment has demonstrated the inadequacy of certain government contracting procedures.

I. INTRODUCTION

The closing years of the 20th Century and the first years of the 21st Century brought new national security challenges to the United States. The Department of Defense contributed to the "peace dividend" occasioned by victory in the Cold War by reducing its force structure and its proportion of the Federal budget. The defense industrial base shrank and consolidated as well. Simultaneously, deployments of military forces in combat and non-combat (military operations other than war) situations reached high levels even before the September 11th attacks and the military interventions in Afghanistan and Iraq. The continuation of the Global War on Terror, initiated after the September 11th attacks, and an elevated operations tempo are likely prospects for the coming years.

The downsizing of the military occurred at the same time as a government-wide trend toward moving the performance of certain (usually excluding "inherently governmental") functions formerly performed by government employees to the private sector for performance, with the government retaining management responsibility. These two trends have contributed greatly to an increase in the military's reliance upon private contractors to perform roles critical to the success of combat operations.



Certain risks and concerns have traditionally been raised in connection with reliance on contractors in support of combat operations. Policy responses to those perceived risks have been and are continuing to be developed. Related policies (e.g., competitive sourcing, focused logistics, and a reliance on increasingly high technology systems) also impact the prevalence, costs, and effectiveness of contracted combat support.

Some of the traditional concerns with “contractors on the battlefield” include the domestic and international legal status of civilian contractors in proximity to combat, control of contractor operations and discipline of contractor personnel, contractor security and force protection, and the impact and cost effectiveness of contract support on combat operations. Combat in Iraq and Afghanistan (as well as other recent deployments of military forces) provides opportunities to do an up-to-date assessment of these traditional concerns.

The contracting process itself has an impact on the effective provision of combat support functions. This paper examines whether combat operations tend to stress or undermine historic principles of government-contract management. A corollary question is whether recent experience suggests some traditional contract rules and policies should be abandoned or modified in favor of a new approach in order to achieve the desired benefits.

II. BACKGROUND—21ST CENTURY WARFARE

With the downfall of Saddam Hussein coming a little over a decade after the Coalition victory in “Operation Desert Storm” or the first Gulf War, the prospects for world peace brought about by American arms seemed almost palpable to some optimistic observers. Ralph Peters wrote in April, 2003: “The basic lesson that governments and militaries around the world just learned was this: Don’t fight the United States. Period. This stunning victory did more to foster world peace than a hundred treaties could do.”¹ The title of the article in which Peters wrote these words suggested that we had entered a new age of warfare. Subsequent events have confirmed that we are indeed in a “new age,” as far as warfare is concerned, but not the sanguine period of Peters’ prediction.

The announcement of an end to major combat in Iraq on May 1st, 2003, permitted many Americans to look forward to the establishment of peace and democracy in that country. Unfortunately, violence and bloodshed seemed to accelerate with the end of combat between national armies. The new enemy, whether remnants of the former regime or foreign fighters, engaged in unconventional warfare and targeted non-combatants as well as combatants. For some military theorists who observed and commented upon the evolving nature and growing prevalence of so-called Fourth Generation Warfare, this turn of events was not entirely unexpected.²

President George W. Bush has characterized military operations against the Taliban regime in Afghanistan and its Al Qaeda allies, as well as Saddam Hussein’s regime in Iraq, as part of a Global War on Terror. Some view the primary adversaries in this war as terrorist political subcultures within Islamic society. A less hopeful view suggests: “these groups represent a broader insurgency within Sunni Islam. This is a true civilizational insurgency in the

¹ Peters, R.. (2003, April 10). A new age of warfare. *The New York Post*, 1.

² Hammes, T. (2004). *The sling and the stone. On warfare in the 21st century*. St. Paul, MN: Zenith Press. Hammes credits Mao with originating 4th Generation Warfare and traces the evolution of its politico-military style of struggle through Viet-Nam, to the Palestinians, and Al Qaeda.



sense that it is a conflict over the civil-religious basis of all Muslim societies”³ Whatever the exact nature of this insurgency, it certainly has global implications extending from the US homeland to Europe, Africa, the Middle East and distant parts of Asia.

The decade before September 11th, 2001 saw American forces deployed in so-called low-intensity conflicts and “operations other than war,” including various peacekeeping or humanitarian missions from the Balkans to Africa and the Middle East. Logistic support was provided to other nations that led similar operations (e.g., East Timor). The case has been made that these deployments are often occasioned by the inherent instability in certain countries and regions that are not integrated into the global economy.⁴ If this premise is correct, the US military will continue to have far flung commitments into the foreseeable future.

The potential location of future conflicts and deployments in areas far from the old Cold War battlegrounds, especially in unstable, under-developed areas, means our military must be prepared to adapt to operations in a wide variety of cultural conditions. At a minimum, our military will need the ability to understand the local customs and particularly the language. It may need the ability to hire linguists to aid in the interrogation of prisoners, for communications intelligence, or merely to communicate with the local population and indigenous military forces. The employment of local labor and resources in support of military operations in these under-developed areas may serve the dual purpose of accomplishing mission objectives while also ameliorating some of the economic deprivation.

The national security challenges that have already appeared in the “new age” (as well as others that are not difficult to imagine occurring in the future) will require a variety of skills and abilities that are not necessarily the strong points of our military as currently structured. If some variety of Fourth Generation Warfare or other unconventional threat is to be the order of the day, nation building, infrastructure improvement and reconstruction, and communicating to the local populace may become important skills. Other needed skills may include the detection, containment, and clean-up of biological, chemical, or radioactive agents used in attacks abroad or in our homeland. Attacks on infrastructure, such as government or commercial venues, transportation, and pipeline facilities, may affect both civil society and military capabilities. Attacks may be carried out on ships or aircraft, military or civilian, at home or abroad using conventional or unconventional tactics. Some of these examples additionally illustrate that the “battlefield” of the new age may be within our own borders and even when overseas may be somewhere other than at the “front” or “forward line of own troops” (especially given the proliferation of long-range ballistic missiles).

The future is always uncertain and 21st-Century Warfare will undoubtedly have plenty of surprises for us. That truism suggests that the United States will need a military that is very flexible and capable of meeting unanticipated challenges. While conventional military challenges cannot be ruled out, events already evident indicate that a protracted War on Terror, perhaps focused on what some suggest may be a relatively broad Muslim insurgency, is likely. Numerous deployments to regions of instability are also probable. The rapid acquisition of skills

³ Vlahos, M. (2002). *Terror's mask: Insurgency within Islam*. Laurel MD, John's Hopkins University, Applied Physics Laboratory, 7. Vlahos' specific view may not necessarily be widely held, but other experts have identified “militant Islam” as the source of a number of potential future conflicts. (2004, December). Transition to and from hostilities. *Defense Science Board* (DSB 2004 Summer Study), 5.

⁴ Barnett, T. (2004). *The Pentagon's new map*. New York: Putnam.



and capabilities to address unexpected contingencies will probably be necessary in the evolving threat environment of the future.

The foregoing picture of 21st-Century Warfare, while necessarily hypothetical, strongly suggests flexibility is a key element to be included in future military capabilities. Whether contracted support enhances or degrades military flexibility and effectiveness, thus, becomes a fundamental issue—which raises the question: are current policies, contract management techniques and contracting methods the optimum ones for future operations?

III. POLICIES AND FACTORS DRIVING RELIANCE ON CONTRACTED COMBAT SUPPORT

The active duty military and the reserve forces are much smaller today than at the beginning of the last decade of the 20th Century. From a peak of about 2.1 million, the active force shrank to less than 1.4 million by the year 2000.⁵ A similar decline was also reflected in employment in the defense industry and to a lesser extent among DoD civilian employees.⁶ Despite events since September 11th, 2001, recent military personnel strength figures are only slightly greater than in 2000, and prospects for large increases are unlikely.⁷

Given the reality of shrinking military end-strengths during the 1990's, a reassessment of the force mix was in order. The shrinking military opted to emphasize the fighting "tooth" rather than the supporting "tail" in the new force mix.⁸ This decision in turn suggested the additional measure of providing for necessary surge support for military contingencies by contracting in the non-warfighting areas. The US Army actually initiated a policy calling for Army components to plan and contract for logistics and engineering support services for worldwide contingency operations in the mid-1980's.⁹ The first request for contract support under this "Logistics Civil Augmentation Program" (LOGCAP), construction and maintenance of a pipeline and fuel distribution system in southwest Asia, came in 1989. In the mid-to-late 1990's, the Navy initiated a "Construction Capabilities Contract" (CONCAP) and the Air Force a "Contract Augmentation Program" (AFCAP) confirming the trend toward establishing contract programs that could be activated to support contingency operations.¹⁰

⁵ Department of Defense, Washington Headquarters Services. "DoD's active duty military personnel strength: Fiscal Years 1950-2002." Retrieved from <http://whs.osd.mil/mmid/military/ms8.pg1>.

⁶ Gansler, J. (1995). *Defense conversion*. Cambridge, MA: MIT Press, 5. (Figure 1.1 "Defense Employment levels 1965-2001," graphic representation based on Office of Technology Assessment data).

⁷ Bruner, E. (2004, May 28). Military forces: What is the appropriate size for the United States? *Congressional Research Service Report*. In 2004, the Bush administration proposed temporary increases in troop strength as opposed to legislated permanent increases. Various proposals have been made, generally limited to increases in the Army and Marine Corps. Actual increases in authorized end strength for FY 2005 were limited to 20,000 for the Army and 3,000 for the Marines (sec. 401, *National Defense Authorization Act for Fiscal Year 2005*, P.L. 108-375).

⁸ St. Onge, R., Maj. Gen. (USA, ret.). (2005, January 28). George Washington University conference. *Contractors on the battlefield: Learning from the experience in Iraq*. (hereafter cited as GWU conference). Also Bruner, 2004--see note 7.

⁹ U.S. Army Material Command (AMC). (2003, August).. Logistics civil augmentation program (LOGCAP). Pamphlet No. 700-300), 4. LOGCAP was initiated as a program by Army Regulation (AR) 700-137 in December 1985. Contracting actions did not begin until several years later.

¹⁰ Higgins, P. (2003, January-February). Civilian augmentation of joint operations. *Army Logistician*, 35(1). The article contains a description of each service's program (LOGCAP, AFCAP and CONCAP).



While a shrinking military and a decision to have a force mix with more “tooth” and less “tail” was one force driving the DoD toward an increase in contracted logistics and combat support functions. It was not the only one. A half-Century ago, President Eisenhower established that it was “the policy of the Government of the United States to rely on commercial sources to supply the products and services the government needs. The Government shall not start or carry on any activity to provide a commercial product or service if the product or service can be procured more economically from a commercial source.”¹¹ In 1966, this policy was incorporated into Office of Management and Budget (OMB) Circular A-76. The policy was honored in a somewhat desultory manner, receiving more or less emphasis from one Presidential administration to the next and in differing manners among the various agencies. In the last decade, the A-76 policy (as well as its process of “public-private competitions”) has gained momentum. Some have suggested that this might be the result of issuance of a substantially revised A-76 “Cost Comparison Handbook” in 1996.¹² But, as noted below, this also may be part of a broader private-sector concern over optimizing business operations and supply chain management that transcends public-sector concerns. Moreover, formal competitions under A-76 have been a tiny minority of “contracting out” actions in the DoD.¹³ In any event, an increase in contracting for military logistics and combat support has been, in broad terms at least, consistent with a long-established government policy.

At the same time that military force structure and the procurement budget were in decline, the relative importance of DoD contracting for services was increasing.¹⁴ This was part of a government-wide trend.¹⁵ Increased contracting for combat support services thus is not an isolated phenomenon, but part of a broad trend within the Department of Defense.

For industry, “make or buy decisions” and “contracting out” are not new business strategies. What has changed in recent years is the tempo and nature of “out-sourcing.” By some estimates, out-sourcing in the United States grew “at an annual compound rate in excess of 30 percent” during a five-year period spanning the turn of the Century.¹⁶ Moreover, while out-sourcing was once confined to non-core (sometimes called “tactical” or “nonessential”) parts of a business, allowing an organization to concentrate on its “core business” or “core competencies,” that has begun to change as well. A relatively new phenomenon is “strategic outsourcing” where core activities like manufacturing or logistics are contracted out. An example

¹¹ Bureau of the Budget Bulletin No. 55-4 (1955, January). The Department of Defense initiated a “contracting out” program in 1952. Executive Branch policy has been relatively consistent in support of the policy but with varying levels of vigor. Congressional actions have been mixed—swinging from pushing the executive for more action to legislative restrictions or prohibitions on contracting out.

¹² Dempsey, D. (2001, Spring). Best value proposals under OMB Circular A-76. *Proposal Management*. 47.

¹³ Gansler, J., Undersecretary of Defense for Acquisition, Technology and Logistics. (2000, Dec. 26). Testimony, US Senate, Armed Services Committee, Senate Report 106-53.

¹⁴ Rush, J. (2003, May). Performance-based service acquisition. Presentation at 2003 Business Managers Conference, Defense Acquisition University. Rush states, by the year 2001, service contracting increased to well over 50% of DoD’s total procurement; Lieberman, R. (2000, March 16). Assistant Inspector General, Department of Defense. Testimony, US House of Representatives, Subcommittee on Government Management, Information and Technology. Lieberman states, between FY 1992 and FY 1999, DoD procurement of services increased from \$40 billion to \$52 billion.

¹⁵ Bruner, (see note 7) noting that by 2001 services accounted for 60% of total government procurement.

¹⁶ CNETNew.com. (2002, September 29). Why out-sourcing is suddenly in. Retrieved February 2005, from www.marketwatch-cnet.com.com/why+outsourcing+is=suddenly+in/2009-1001_3-959785.html.



of this was IBM's decision to out-source (to Sanmina-SCI) the manufacture of its desktop PC—once the core of its business.¹⁷

It seems unlikely that the trend to out-sourcing in private industry is a fad; nor is it based on a philosophical preference for contracting out. The reason for the increase in out-sourcing is that it makes business sense and contributes to efficiency and the bottom line. In government there is indeed a philosophical bias in favor of out-sourcing functions and products available from the private sector (“a government should not compete against its citizens”); but, increases in out-sourcing (as well as a trend toward “competitive sourcing”—in which increased efficiency, whether in- or out- of house performance results, is the goal) also has a strong financial component.¹⁸ The Office of Federal Procurement Policy has estimated annual savings from competitive sourcing, if fully implemented, could amount to \$5 billion.¹⁹

The Army initiated a policy requiring its components to plan for contracted engineering and logistic support for contingency operations in 1985.²⁰ This was prior to the end of the Cold War, or major declines in defense spending and force structure. This timing suggests such a policy had merits even in an era prior to those declines. The policy and practical considerations reviewed above reinforced that notion in the context of an evolving national-security environment. The trend to out-source is countered to some degree by a Congressionally-based policy embodied in law (10 U.S.C. 2464) that certain “core logistic functions” be retained for in-house performance; however, the terms of the law primarily addresses CONUS-based depot functions and are not specific to combat support or contingency operations.

The potential exists for a contracted supply chain to extend from “factory to foxhole.” Even if it is (as some profess) inadvisable to extend contracted support to that degree, contractors can perform vital functions in the battlespace²¹; and the DoD and its components have developed various policies addressing the use of contractors in support of military operations.²² Important questions about the proper role for contractors in combat situations involve high-level policy issues and are likely to remain controversial. They color any discussion of the general subject area, including the focus of this research.

To summarize: “The combined effects of defense budget cuts, force reductions, reengineering initiatives, the privatization of duties historically performed by military personnel, the introduction of increasingly complex technology, and increased mission requirements and operational tempo have shifted the [contractor-government] mix of support needed to carry out

¹⁷ CNETNew.com. (2002, September 29).

¹⁸ Gansler, J. (2003, June). Moving toward market-based government: The changing role of government as the provider. IBM Center for the Business of Government. “Competitive sourcing” chapter contains a general discussion of competitive sourcing and examples of savings.

¹⁹ Safavian, D. (2005, January 25). Administrator, Office of Federal Procurement Policy. Correspondance to Richard B. Cheney, President of the US Senate. [no subject].

²⁰ See note 9.

²¹ General Accounting Office. (2003, June). Contractors provide vital services to deployed forces but are not adequately addressed in DoD Plans. GAO-03-695. Hammes, Thomas (GWU conference, note 8) commented that one contract to support the Iraqi Army actually specified ammunition was to be delivered to company level.

²² Department of Defense, Joint Chiefs of Staff. (2000, April 6). Doctrine for logistics support in joint operations. Joint Publication 4.0; Continuing essential DoD contractor services during crises. (1990, November 26). DoD Instruction 3020.37.; Contractors on the battlefield. (2000, March 26). Army Field Manual No. 100-21. (superseded on Jan. 3, 2003 by Field Manual 3-100.21, same title) and, other publications.



mission objectives in a theater of operations. The supported combatant commanders and the services are beginning to recognize the extent of their reliance on non-uniformed support.”²³ See Appendix I for examples of services contracted in support of contingency operations.

The following sections review the critical issues impinging on contract performance in proximity to combat. An assessment of contract management, contract oversight, and the policy and regulatory regime-controlling contractors in recent combat-support operations will be made and the implications for future policy developments discussed.

IV. CONTRACTOR ISSUE REVIEW

In the 1990 motion picture *Dances with Wolves*, Lt. John Dunbar (Kevin Costner) is accompanied to his post on the mid-19th Century American frontier by a civilian wagon driver. The wagon contains the weapons, ammunition, subsistence and other supplies necessary to maintain a deployed military force. On the return trip, the civilian teamster encounters a hostile force of Indians and is killed. The empty wagon is left abandoned and the horses captured.

Unanswered by the film were some of the kinds of questions that arise when contractors venture to dangerous places. Were there troops available that might have escorted the wagon both on its outbound and return journey? Was the trip even recognized as dangerous? Would the driver have refused to go if he understood the risk? Did the driver receive premium pay or some special compensation for undertaking hazardous duty? Who pays for the lost wagon and horses? Did the Indians target the driver because of his association with the military or was his mere presence on their land sufficient cause to attack him? Did it make good sense to use a civilian driver under the circumstances?

The kind of support provided by the civilian driver in *Dances with Wolves* is not fundamentally different than contracted transportation services that have supported military operations before and since. Issues inherent in the questions mentioned above also retain their currency even if they are only exemplary of a broader range of issues.

The teamster in *Dances* is an example of what it has become common to call a “theater support contractor.” The other principal categories of combat support contractors are “external support contractors” and “systems contractors.” These categories²⁴ are merely descriptive and in no way definitive or all-inclusive, but for purposes of this paper they are conceptually useful. They are introduced here because the issues discussed below may apply more critically to one category of contractor compared to another.

The theater support contractor provides services to deployed forces to meet the immediate needs of the operational commander with contracting typically conducted under the authority of the theater commander. The support provided is typically “house-keeping” and quality-of-life support for the troops, as well as minor construction, port operations, transportation and security.

²³ McPeak, M. & Ellis, S. (2004, March-April). Managing contractors in joint operations: Filling the gaps in doctrine. *Army Logistician*, 36(2).

²⁴ Hamontree, S. (2002, June). Contractors on the battlefield. *Armed Forces Journal* (one of many examples discussing the three categories). Fortner, J. & Jaekle, R. (1998, November-December). Institutionalizing contractors on the battlefield. *Army Logistician*, 31(6) (an example where theater support and external support contractors have been lumped together as contingency contractors, reducing the categories to two).

External support contractors support deployed forces by augmenting military capabilities through contracts administered outside the theater. These may include pre-placed umbrella contracts (such as LOGCAP, CONCAP and AFCAP) that can be activated on short notice. In some cases the type of support under contract is similar to that just described for the theater support contractor. In that case, the principal distinction between the two is the source of contract authority rather than the type of services provided. In other cases (e.g., Civil Reserve Air Fleet or commercial sealift), the type of support provided is distinct from any available in-theater. While both the theater and external support contractors are “contingency contractors,” for the purposes of this paper they are sufficiently different to be accorded separate status.

Systems contractors provide support to weapons systems and other systems usually under contracts with the relevant system program manager. Mission-enhancing and mission-essential maintenance and operations services are typically provided. These contracts often involve sophisticated technical expertise unavailable or of limited availability within the uniformed military.

A. INTERNATIONAL LEGAL STATUS

International law, specifically the Law of Armed Conflict (Law of War),²⁵ and, primarily, Geneva Conventions dealing with prisoners of war (Geneva, III) and civilians on the battlefield (Geneva, IV) have profound implications for contractor personnel serving in or near the battlespace. The Geneva Conventions deal primarily with international conflicts between national states. However, certain of their provisions deal with internal conflicts as well. Given the nature of 21st-Century warfare and recent experience in Iraq and Afghanistan—where international conflicts evolved into insurgencies—this is a distinction worth noting.

So-called “common article 3” (it appears in each) of the Geneva Conventions applies to internal conflicts, and gives a protected status to non-combatants. Persons protected by article 3 are entitled, at a minimum, to humane treatment if they fall into enemy hands.

Uniformed military personnel (except chaplains and medical personnel) are legitimate combatants. They may carry arms and legitimately engage in combat. They are legitimate targets for the enemy. If captured, they are entitled to prisoner-of-war status.

In general, properly-identified contractors are non-combatants who may accompany military personnel into hostile situations but not “take up arms” (engage in combat). They must carry an identity card in a format established by the convention that identifies them as a civilian authorized to accompany the force and confirms their noncombatant status. United States policy regarding these identity cards is found in DoD Instruction 1000.1, “Issuance of Identity Cards Required by the Geneva Conventions.” If captured, an authorized civilian accompanying an armed force is entitled to prisoner-of-war status.

²⁵ Kentucky University. AMDOC: Documents for the study of American history. Retrieved January 2005 from, www.ku.edu/carrie/docs/geneva.html. This document contains a compilation of relevant treaties making up much of the International Law of Armed Conflict (Law of War). Newton, M. (ed.). (1998). *Operational law handbook*. Charlottesville, VA: The Judge Advocate General's School. This book contains a compilation of references to relevant documents with full citations as well as a discussion (in chapters 7-11) of the Geneva Conventions and other general principles. Zamperelli, S. (1999, March). Contractors on the battlefield: What have we signed up for? AU/AWC/254/1999-04. Air War College Research Report, 18-23. This text contains a discussion of international law issues specific to contractors.



In addition to combatants (recognized by international law) and non-combatants, the activities of some persons on the battlefield may result in them becoming illegal combatants. A combatant who violates the laws of war can become an illegal combatant and subject to criminal prosecution. A civilian contractor who engages in combat without authorization becomes an illegal combatant. Such persons are not privileged to engage in combat and; by doing so, their acts constitute crimes (murder, assault, destruction of property etc.) recognized in national and international courts. If captured, they are not entitled to prisoner-of-war status and may be tried as criminals in the courts of the country capturing them.

Civilians accompanying the force have traditionally been viewed as non-combatants subject to the proviso that they may not “take up arms.” Here the situation starts to become murky. Carrying a sidearm exclusively for purposes of self-defense is allowed.²⁶ Use of the weapon in an unauthorized manner, rather than its possession, becomes the determinant of legality.

Another pitfall is the proximity of civilian personnel to military personnel in combat situations. An army guide for civilians states: “civilians who accompany military forces into a theater of operations lawfully may do so, but are likely to be considered by enemy forces as combatants. Depending on their function or actions, they are subject to attack or capture.”²⁷

Another area where distinctions become blurred is battlefield support for weapons systems. A contractor that provides support for a weapon system when it is in actual use in combat may well be considered a combatant. Other activities that directly support the use of weapons systems, such as the collection and dissemination of surveillance data, intelligence, and targeting information, may also cross the line.²⁸ Army guidance suggests that over the recent past: “the concepts of ‘combatants’ and ‘noncombatants’ have evolved[,] and their applicability to the realities of today’s contingency and warfare settings have made them somewhat outdated.”²⁹ As the technology of military forces has increased, so has the number of civilians with the force. The army guidance asserts the status of civilians with the force has not been adequately addressed in the Law of Armed Conflict and that their “precise status and the actions they are entitled to take remain unsettled.”³⁰ The unfortunate consequence of this perceived lack of precision is that, depending on their actions, not only may civilians supporting combat operations be considered combatants by the enemy, but also they may become illegal combatants under international law.³¹

Sending contractor employees into situations where they are likely to become illegal combatants not only seems to invite serious risk for the employees and their companies but also

²⁶ DoD. (1992, April). Emergency-essential DoD US citizen civilian employees. DoD Directive 1404.10, para. 6.9.8 (although applicable to civilian employees, the policy positions taken regarding international law are applicable to contractor employees as well).

²⁷ U.S. Army Material Command. (undated). Civilian deployment guide. Retrieved January 2005, from, “www.Amc.army.mil/amc/pe/html/civdeploy.html (addressed to civilian employees but relevant to contractors accompanying the force).

²⁸ McCullough, J. & Pafford, A. (2002, June). Contractors on the battlefield: Emerging issues for contractor support in combat & contingency operations. Briefing Papers (02-7). West Group, 14.

²⁹ See note 27.

³⁰ See note 27.

³¹ See note 28.

may be inconsistent with United States' obligations under international law. One seemingly obvious answer is to simply designate contractors at such risk as combatants. This was the position taken some years ago not only by the United States but also by the United Kingdom, Australia and Canada.³² Unfortunately, this position is not tenable under international law. The International Committee of the Red Cross (ICRC), the international organization that administers the Geneva Conventions, has taken the position that even if contractors meet three of the four criteria for a legal combatant under the third Geneva Convention, they fail to meet the requirement to be under "responsible command."³³

The ICRC position is that there is no "responsible command" within a corporation and, moreover, that respect for the Laws of Armed Conflict is a state responsibility rather than a corporate one.³⁴

The discussion above suggests that those responsible for writing the statements of work of contracts for combat support (as well as the rules of conduct or other general guidance for contractor personnel in a combat theater) need to have a clear understanding of US obligations under the Laws of Armed Conflict. Sensitivity to the serious risks that may befall contractor employees who are directed to engage in activities that constitute "taking up arms" under international law is also essential. The foregoing comments, however, apply fully only in inter-state conflicts governed by the Geneva Conventions. In insurgencies where captives are mutilated and beheaded and even workers engaged in purely humanitarian efforts are murdered, it may be that a more robust posture for contractor employees is in order.

In addition to overarching international law, certain multi-lateral and bi-lateral international agreements and foreign laws may impact contractors. The United States has entered into Status of Forces Agreements (SOFA) with a number of countries. These govern the role of the forces of the sending nation and the host or receiving nation. Generally SOFAs deal with the status of the military personnel, civilian employees and their dependants of the sending force, but some also apply to contractor personnel as well.³⁵ SOFAs typically deal with routine matters such as entry and exit of personnel and their belongings, applicability of labor laws and exemption from taxation. Another important area covered by SOFAs is the allocation of civil and criminal jurisdiction between the states concerned. Contractor personnel in a country without a SOFA or with a SOFA that does not address contractors will be subject to the criminal jurisdiction of that country. Further mention of criminal jurisdiction will be made under the section on control and discipline issues below. Absent SOFA coverage (or some other provision limiting local jurisdiction), contractors are generally subject to the laws of friendly host countries. In zones where no national authority is recognized (conquered territory before reestablishment of civil authority), contractor personnel may be subject to certain US laws that have extra-territorial effect but too little other legal authority.

³² See note 27. The British have partially dealt with this issue by a policy of "sponsored reservists" whereby deployment contractors are required to employ reservists who will occupy key deployment positions (Chiefs of Staff. (2001, December). Contractors on deployed operations. Joint Doctrine Pamphlet 4/01. United Kingdom: Ministry of Defense.).

³³ Kruesi, A. Legal issues and liabilities. Presentation at GWU conference (note 8).

³⁴ see note 33.

³⁵ McCullough (note 26), 5. Newton (note 28), chapter 12, contains a general discussion of SOFAs and other international agreements. See also, "Contractor Deployment Guide." Department of the Army Pamphlet No. 715-16, Feb 27, 1998.



B. CONTROL AND DISCIPLINE OF CONTRACTORS

Historically, the main criticism against obtaining combat support from contractors was that when the going got tough, the contractors would go too—and leave the military in the lurch. In a letter to Congress in 1818, Secretary of War John C. Calhoun spoke of contractors “subject to no military responsibility” and upon whom there was no hold other than “the penalty of a bond.” He went on to assert “it is often the interest of the contractor to fail at the most critical juncture.”³⁶

Echoes of Calhoun’s concern still exist. A DoD instruction on continuation of contractor services during crisis enjoins commanders to conduct contingency planning to deal with a failure in contractor performance.³⁷

The most basic form of control and discipline is the sanction of criminal law. Congress provided for application of military law to persons accompanying the armed forces overseas in the original enactment of the Uniform Code of Military Justice, but this provision was overturned by the US Supreme Court.³⁸ This lack of jurisdiction has long proved troublesome,³⁹ and a few years ago Congress attempted to address the problem by enacting the Military Extraterritorial Jurisdiction Act of 2000 (MEJA).⁴⁰ This provides that a person accompanying the armed forces outside the United States, including a contractor employee, who commits an act that is punishable under US law by imprisonment for at least a year may be tried for the offense in US federal district court. Yet, this is hardly a panacea as far as the discipline of contractor employees is concerned. The decision to prosecute does not rest with the military commander and, while the provision may be utilized for very major offenses, the requirement to have a trial in a US district court when the offenses occurred and the witnesses and evidence are overseas suggests such trials would be logistically difficult. Minor offenses, less than a year in prison (even a whole series of such offenses), are not even covered. This statute appears to be more of a gesture than a serious vehicle to assert control over civilian contractors accompanying the force.

Given the structure and probable ineffectiveness of MEJA as a tool for the discipline of contractor employees, the commander is left where he was before the enactment of MEJA with no direct command relationship to contractor employees. The sole recourse for the discipline of individual contractor employees is an indirect one through the contract and their employer.

Since MEJA or other laws with extraterritorial effect may actually be invoked for major crimes (murder, treason, significant crimes of theft or property destruction, etc.) the real concern would seem to be with mid-level crimes and repeated minor offenses. Contract terms should assure that the operational commander can declare individual employees *persona non grata* for cause and have them removed from the theater. Likewise, commanders should be able to deny

³⁶ As cited in Nagle, J. (1992). A history of government contracting. Washington, DC: George Washington University, 109.

³⁷ DODI 3020.37 (see note 22)

³⁸ Reid v. Covert, 354 U.S. 1 (1954).

³⁹ Gibson, S. (1995.) Lack of extraterritorial jurisdiction over civilians: A new look at an old problem. 148 Mil. L. Rev. 114.

⁴⁰ Public Law 108-523, 114 Stat. 2488 (2000) codified at 18 U.S.C. 3261-3267.



specific contractor employees' privileges, generally afforded such employees, when warranted by abuse of privileges or in order to correct inappropriate behavior.

The very limited (virtually non-existent) authority of a military commander over contractor employees as discussed in the preceding paragraphs seems to demonstrate that the position of the ICRC discussed in the international law section is correct. The only "chain of command" for a contractor employee is in the employee's company, an entity that neither is nor can become a party to the Geneva Conventions.

Secretary Calhoun's criticism of contractor performance was not so much directed at the dereliction of individual contractor employees as it was at the prospect that companies would default on performance when difficulties in performance and the profit motive dictated that it was more economic to forfeit a performance bond than to continue delivery under the contract. The existence of the bond referred to by Calhoun is strong evidence that the supply contracts he was objecting to were fixed-priced, completion contracts. In this sense, Calhoun's comments are somewhat outdated compared to much of current practice. Nonetheless, in emphasizing the performance of the contract, rather than the misconduct of individuals, Calhoun's letter directs us to a key point.

In contrast to Calhoun's objections to contracting in the War of 1812 and the Indian Wars, modern contracting has a number of contracting techniques available to reduce the contractor's risk of significant or even catastrophic losses in uncertain and high-risk situations. These include cost-reimbursement contracting with various forms of fee arrangements (Federal Acquisition Regulation, FAR 37.602-4). Also potentially available is indemnification under Public Law 85-804. If a contractor is reimbursed for the legitimate costs incurred, has a potential for some profit, and if the threat of catastrophic liability is removed, a contractor has little financial incentive to default on his contract. Obviously, if these conditions are not met and a contractor faces open-ended and undefined financial risks, the relative incentive to perform or default may be different.

Combat support contracts are typically service contracts. One expert has said: "Service contracts are hard to write and difficult to manage."⁴¹ Combat support contracts are critical to the needs of the combatant commander and, yet, management and control of contract performance is often vested in officials outside the chain of command of the operational commander or even the theater commander. How can such a system be made to work?

In our highly regulated federal procurement system,⁴² it is sometimes easy for onlookers to overlook the fact that it is supposed to be a system of *contracting*. The essence of contract law, as it emerged in its modern form in the 19th Century, was *freedom of contract*; and the very definition of a contract was that of legally enforceable *promises*.⁴³ In contracting, individuals (on behalf of themselves or the organizations they represent) freely make promises in a manner that creates legal obligations—creates law—between them. This creates a *relationship* among the people affected by the contract, particularly in service contracting. Inter-personal relationships

⁴¹ Schooner, S. Remarks at GWU conference (note 8).

⁴² Nagle (note 36) mentions the "burdensome mass and maze of procurement regulations" found by the Commission on Government Procurement (pp. 510-511) and asserts, despite many commissions and attempts at reform, things have remained "remarkably the same" (p. 517).

⁴³ Mallor, et al. (2000). *Business law*. McGraw-Hill, 198-200.

and the identification of a community of interest may play a key role in the successful management and control of contract performance in contingency operations.

Part 1 of the Federal Acquisition Regulation (Title 48 Code of Federal Regulations, 48 C.F.R. Parts 1-53, generally referred to as FAR) makes reference to an acquisition “team” (FAR 1.102-3&4). The FAR mentions “cooperative relationships” between the government and contractor and suggests the “contractor community” follow a pattern specified for the “government acquisition team.” The concept of a team, teamwork and cooperative relationships may allow for exactly the kind of community of interest, inter-personal relationships, and flexibility to make combat-support contracting work well.

Parts 1 and 2 of the FAR establish the primacy of the contracting officer in making key decisions in government contracting—and particularly in obligating public funds. The contracting officer has the sole authority to execute modifications to the contract (FAR 43.102). The FAR also states the contracting officer should be “allowed wide latitude in exercising business judgment” (FAR 1.602-2). However, prior to this is the requirement for the contracting officer to “ensure that all requirements of law, executive orders, regulations and other applicable procedures, including clearances and approvals have been met” (FAR 1.602-1(b)). Recalling the discussion of the various types of combat support contractors and that contracting authority (the contracting officer and those superiors from whom the contracting officer may need to seek various approvals and clearances) may reside outside the theater, suggests the question of how effectively regulatory requirements support a team/relational concept for maintaining control of contract performance in a battlefield environment.

In the final analysis, a combat-support service contractor has the similar incentives to perform as any other contractor. These include profit, the general reputation of the company in the business community, and the hope for repeat business from the government. Disincentives include unknown or open-ended financial risks, and the undue risk of death or harm to contractor employees. In addition to the normal incentives to perform, there is considerable evidence that many contractors, and particularly their employees (often ex-military personnel), currently engaged in combat-support work do so out of a sense of patriotism (and, therefore, are not likely to “bail out”).⁴⁴

C. CONTRACTOR SECURITY AND FORCE PROTECTION

A second concern about contracted combat support is that the presence of contractor employees in a combat-support role may negatively impact military capabilities by diverting available troops in order to provide protection to contractors. Under joint military doctrine, force protection for contractor employees is considered a contractor function.⁴⁵ Service guidance, however, recognizes that in certain cases it is the responsibility of the cognizant commander to ensure protection for contractor personnel.⁴⁶

Intuitively, it seems correct that the presence of contractor personnel in proximity to combat may require military forces to provide additional protection (beyond what is already

⁴⁴ Taylor, C. (Vice-President, Blackwater USA). Remarks at GWU conference (note 8).

⁴⁵ JCS “Doctrine...” (see note 22).

⁴⁶ Contractor support on the battlefield. (1999, August 4). *Army Field Manual* 100-10-2; Secretary of the Air Force (2001, February 8). Contractors in the Theater. Interim Policy Memorandum.

provided for the military). Upon reflection, however, this is clearly not always the case. Contractor personnel serving aboard a combatant vessel or exclusively in a compound under military protection do not constitute an addition burden as far as force protection is concerned. On the other hand, a supply convoy traversing potentially hostile terrain may need military escort whether supply truck drivers are military or contractor personnel.⁴⁷

Even in instances where force protection measures specific to contractors must be taken, the appropriate question seems to be whether the value added by the presence of such personnel justifies the military burden imposed. Moreover, requirements for force protection may be mitigated by certain contract terms that direct contractors provide self-defense capabilities and various protective measures for their employees.

Whether traditional concerns in the area of contractor force protection are a major negative factor in widespread use of contractors in proximity to combat or whether appropriate policies, planning, and management considerations can address these concerns is a subject for further review.

D. OTHER ISSUES

As mentioned earlier, and documented in a number of the notes accompanying this text, the DoD has developed and continues to develop policies and doctrine related to contractors and contingency operations. At a high level, the controlling policy states: “The DoD components shall rely on the most effective mix of the total force, cost and other factors considered, including active, reserve, civilian, host-nation, and contract resources to fulfill assigned peacetime and wartime missions.”⁴⁸ This begs the question of what is “the most effective mix” and whether current doctrine, policies, planning, and, management techniques and procedures result in that most effective force mix, in terms of cost and other factors.

Policy development concerning contractors in contingency operations has occurred at different rates at the DoD level and among the military departments. DoD policy is currently under revision;⁴⁹ among the services, policy exist in various states of maturity and completeness.⁵⁰ As was noted in the case of force protection, joint doctrine and service guidance are not always consistent.⁵¹

From August 2002 to April 2003, the General Accounting Office (now Government Accountability Office) conducted a review of contractor support in a number of locations in the

⁴⁷ Schumacher v. Aldridge, (C.A. 86-2015-LFO, D.C. 1987). The US District Court found that civilian members of the Merchant Marine during World War II suffered a higher casualty rate than any of the uniformed services except for the Marine Corps. Merchant ships were armed (sometimes with civilian gun crews) and escorted. The “force protection” was provided to safeguard the ships and their cargoes and, incidentally, the crews. After the attack on the U.S.S. Cole, according to Chris Taylor (GWU conference, note 8), the Navy sought the assistance of a private security firm to train its personnel in force protection. The same private company, rather than the military, provided security for Ambassador Bremer and officials of the Coalition Provisional Authority in Baghdad.

⁴⁸ DODI 3020.37 (see note 28).

⁴⁹ Wynne, M. Acting Undersecretary of Defense for Acquisition, Technology and Logistics. (2004, June 24). Prepared statement, US House of Representatives, Committee on Armed Services; Contractors accompanying a deployed force. (2004, March 23). Notice of Proposed Rule Making. *Federal Register*, 69(56).

⁵⁰ McCullough (see note 28) notes much of recent service guidance. See also notes 22, 26 and 46.

⁵¹ GAO (see note 21).

Persian Gulf region and the Balkans.⁵² As of the close-out date of that report, the GAO found only the Army had developed substantive guidance for dealing with contractors. GAO found that DoD acquisition regulations do not require specific contract language to cover overseas deployments or possible changes in deployment locations for contractor employees. Of 183 contractor employees preparing to deploy to Iraq to support an Army Infantry Division, some did not have deployment clauses in their contracts. At sites visited in Bosnia, Kosovo, and the Persian Gulf, GAO found contract oversight generally adequate; but noted inadequate training among staff responsible for overseeing contractors, and a limited awareness by some field commanders of contract activities taking place in their area.

The GAO review found that DoD could not quantify the totality of support that contractors supply to deployed forces around the world. GAO also found that, with a single exception, DoD and its contracting activities had not identified those contractors that provide mission essential services and, where appropriate, developed back-up plans to ensure essential services would continue if the contractor should become unavailable (despite the fact that DoD Directive 3020.37 requires a risk analysis/mitigation planning process).

This review of traditional concerns and some recent developments in the area of “contractors on the battlefield,” while hardly comprehensive, should provide a basis for assessing some of the concerns expressed about civilian contractors in proximity to combat in the light of recent experience. The remainder of the paper will review selected examples of recent contracting experience and attempt to determine if traditional concerns are valid and what additional issues may have become important. This will be followed by an analysis of the most pertinent contracting issues.

V. RECENT EXAMPLES

This section collects examples, some in the form of short case studies and others as issue briefs or discussions, in an attempt to assemble sufficient data to support identification of pertinent issues and as a basis for meaningful analysis and recommendations.

A. IRAQ

1. Contractor Reliability

One of the chief traditional concerns with contract support for military operations is that contractors will abandon their contract work under difficult conditions. The author has been unable to find a single example of a combat support contractor abandoning its contract in Iraq. However, there are a wide variety of other contracts in place in Iraq (including those for Iraqi reconstruction) placed under the auspices of various US Government agencies (DoD included), the former Coalition Provisional Authority (CPA) and the Iraqi government. While reconstruction contracts do not directly support US troops, they are important to the long-term success of US involvement in Iraq and are currently being performed in a hostile environment similar to combat support contracts.

⁵² GAO (see note 21).



In December 2004, Contrack International, Inc., an international construction company, suspended its performance under a major Iraqi government contract.⁵³

Work was suspended according to the company because “the original scope of work [...] could not be executed in a cost effective manner under present circumstances.” The contract, awarded in March 2004 by the CPA, had a potential value of \$325 million. The work was spread throughout Iraq and involved rebuilding airports, highways, ports, bridges and railroads. The contract was structured as an indefinite-delivery, indefinite-quantity (ID/IQ) contract. Specific projects are specified in task orders that in construction contracts are typically fixed price. Contrack joined a small number of non-profit groups and small contractors that requested cancellation of their reconstruction contracts. In the case of Contrack, it was paying more for security than the actual cost of construction.⁵⁴ Despite continuing concerns about security and insurance issues among Iraqi reconstruction contractors, as of this writing there have been no additional pullouts.⁵⁵

Among the American citizens employed by combat-support contractors, virtually all are volunteers. According to some reports, field service representatives who work along side soldiers in the field are motivated not only by financial incentives, but by pride and patriotism.⁵⁶ In other cases, such as the truckers who transport supplies from Kuwait to Baghdad, high pay is their primary motivation for service in Iraq.⁵⁷ Truckers employed by Kellogg, Brown & Root (KBR) perform reliably, despite as many as one in three convoys coming under attack, and the death of several of their comrades.⁵⁸ Security concerns have resulted in delays, and adjustments in security arrangements have been required, but these have generally been handled amicably between the contractor and the Army.⁵⁹

In contrast to the reliability of the KBR truckers, a platoon of an Army Reserve Quartermaster Company refused to take their trucks on an assigned supply mission.⁶⁰ Apparently there were some extenuating circumstances since the soldiers involved received non-judicial punishment rather than courts-martial.⁶¹ Still the contrast seems stark as the soldiers’ company had been in Iraq ten months without suffering any casualties while, as noted above, KBR truckers had come under attack on numerous occasions, and suffered a number of casualties.

The record of contractors and contractor employees in Iraq to date does not predict future events. From general news reports, one can see the security situation in Iraq remains

⁵³ Contrack backtracks from Iraq contract. (2005, January 5). *The Government Contractor*, 47(1).

⁵⁴ Nichols, R. (2005, February 2). Iraq reconstruction. Presentation. Washington, DC: West’s Government Contracts Year-In-Review Conference. Also *Conference Briefs* (same conference), 3-15.

⁵⁵ Iraq reconstruction contracts geared toward short term; No word on further contractor pullouts. (2005, January 26). *The Government Contractor*, 47(4).

⁵⁶ Wilson, J. (2004, July). Sharing the risk. *Armed Forces Journal*, 26.

⁵⁷ Truckers in Iraq. (2004, September 27). *The New York Times*, 1.

⁵⁸ Truckers in Iraq. (2004, September 27). *The New York Times*, 1.

⁵⁹ Soloway, S. President, Professional Services Council. (2005, February 17). [e-mail exchange with author]. Edgewater, MD.

⁶⁰ Lumpkin, J. (2004, October 16). Unit refused Iraq mission military says. *Associated Press*.

⁶¹ Garwood, P. (2004, December 7). US reservists who refused duty escape courts-martial. *Associated Press*.



tense and is one of several challenges to doing business in Iraq. It remains to be seen whether current contractors will renew their contracts or compete for additional work, and whether new contractors will consider Iraq a good place to do business.

2. Abu Ghraib

In May 2004, the public became aware of a prisoner abuse scandal at Abu Ghraib prison west of Baghdad.⁶²

Subsequently, there were numerous media reports as well as official investigations (Fay and Jones investigations) and scholarly inquiries (including a paper by Prof. Steven Schooner) into the physical abuse and sexual degradation that occurred.⁶³ A minority of the allegations of the abuse involved the employees of two contractors performing tasks at the prison. While this incident provides an example of control and discipline problems among contractors and contractor employees, it should be kept in mind that most of the abuse occurred at the hands of government personnel, and the various official investigations found major deficiencies in leadership, lines of authority, and training among the military and non-military government personnel involved. Without excusing the conduct of either government or contractor personnel, a review of the investigations and documentation relating to the situation at the prison (number of detainees, lack of facilities and properly trained personnel, etc.) suggests conditions there were, at times, extremely difficult and verging on chaotic.

There were two pertinent contracting vehicles involved in the Abu Ghraib scandal. One was a pre-planned contract to provide linguists to support current and contingency intelligence operations. This contract was awarded by Army Intelligence Command to Titan Corp. in 1999. The second consisted of a series of delivery orders awarded under a Blanket Purchase Agreement (BPA) between the National Business Center/Dept. of the Interior and CACI under a General Services Administration (GSA) schedule contract for various information technology professional services (this connection is not as odd as may first appear—the National Business Center contracting office, a fee-for-service organization, and the Army Intelligence School that trains interrogators are co-located at Ft. Huachuca, Arizona). Rather than information technology services, the delivery orders were actually used to obtain interrogator and other intelligence services. The Commander, Joint Task Force-7, was the requiring and funding activity; but, as stated in General Fay's investigation, "it is unclear who, if anyone, in Army contracting or legal channels approved the use of the BPA."⁶⁴ The Deputy General Counsel of the Army later determined the delivery orders should be cancelled as exceeding the scope of the GSA contract. In addition, a CACI employee, aided an Army official in drafting the statements of work for the delivery orders in possible violation of FAR 9.505-2.

The Army's investigation into Abu Ghraib found that intelligence activities and related services should be performed by military or government civilian personnel whenever feasible. It

⁶² Hersh, S. (2004, May 5). Torture at Abu Ghraib. *The New Yorker*.

⁶³ Jones, A. LTG. "AR 15-6 investigation of Abu Ghraib Prison and 205th Military Intelligence Brigade." Fay, G. MG. "AR 15-6 Investigation of Abu Ghraib Prison and 205th Military Intelligence Brigade." Schooner, S. (2005). "Contractor atrocities at Abu Ghraib: Compromised accountability in a streamlined, outsourced government." *Stanford Law and Policy Review*, 16(2).

⁶⁴ Fay (see note 64) Likely because of this incident, interagency contracts were recently placed on GAO's list of high risk contracting situations (Schooner, S. (2005, April 6). Risky business: Managing interagency acquisition. *The Government Contractor*, 47(14)).



also recognized that it might be necessary to contract for such services under urgent or emergency conditions. The report noted that if it proved necessary to contract for intelligence services, the most effective way to do that and maintain a direct chain of command would be to award, administer, and manage the contract with Army personnel.

The Army's investigation found that the Titan contract had been widely used (contract ceiling of approximately \$650 million) to provide hundreds of linguists worldwide, generally with positive results. Since the contract provided only for translator services, and employees were not required by contract to conduct interrogations, the linguists at Abu Ghraib were apparently not required to read or sign the prison's rules of engagement for interrogations. Titan linguists did participate in interrogations.

The Titan and CACI employees that were suspected of committing offenses at Abu Ghraib were potentially subject to criminal prosecution under MEJA. The Army's investigation noted, however, that there were also contractor employees on site employed under non-DoD government contracts. These employees might not be subject to MEJA if not deemed to be "accompanying the Armed Forces."

The Army's report contained recommendations that the cases of certain Titan and CACI employees be forwarded to the General Counsel of the Army for possible referral to the Attorney General under MEJA. To date, there have been no prosecutions. Whether this is because allegations of abuse were not verified or because of other reasons is not clear. The lack of civilian criminal action is in contrast to several courts-martial and other disciplinary actions taken against soldiers.

In addition to other leadership and management lapses at Abu Ghraib, on-site contract monitoring by government employees was inadequate. The Officer-in-Charge of interrogations never received any guidance or parameters on how to use CACI personnel. She was not aware of any contracting officer's representative (COR) and considered her point of contact CACI's on-site manager. Military personnel were apparently unaware the Government could reject unsuitable contractor personnel. Apparently there was no attempt made to familiarize the users of CACI's services with the terms or procedures of the contract.

Several personnel who testified during the Army's investigation indicated that contractor personnel were "supervising" military personnel and *vice versa*. This type of relationship (contractor supervision of military personnel) even appeared on organization charts.

The confusion of organizational relationships was not confined to Iraq. According to media reports, an Army spokesman in Washington stated civilian contractors at Abu Ghraib and elsewhere "fall in line with the current command structure" and are treated just like regular Army personnel.⁶⁵ CACI made a similar statement: "All CACI employees work under the monitoring of the US military chain of command in Iraq."⁶⁶ These statements are at odds with Army policy (AR 715-9, "Contractors Accompanying the Force") that states: "contractor employees are not under the direct supervision of military personnel in the chain of command."

⁶⁵ Worden, L. (2004, June 15). Army may be misusing contractors. *The-Signal.com* (quoting Lt. Col. Pamela Hart). Retrieved February 2005 from www.The-signal.com/News/ViewStory.asp?storyID=4845.

⁶⁶ See note 65.



The confusion of organizational relationships at Abu Ghraib went beyond contract management. The Army report notes confusion between military intelligence and military police functions and further notes that the Federal Bureau of Investigation (FBI), Central Intelligence Agency (CIA), and other investigative components were also on-site. The CIA was involved in interrogations and directing certain interrogation techniques.

Poor training did not merely extend to confusion about roles and responsibilities, but some CACI employees were not well trained for their duties as interrogators. As noted above, linguists who were not trained or required by contract to participate in interrogations did so. Little (if any) training was given on the Geneva Conventions.

The Fay investigation concluded “no credible exercise of appropriate oversight of contract performance” occurred at Abu Ghraib. This was due to lack of training and a failure to assign an adequate number of CORs with consequent lack of adequate contract monitoring and management. This put the Army at risk of being unaware of poor contract performance and possible contractor employee misconduct.

3. LOGCAP in Iraq

LOGCAP support for Iraq is provided under the third competitively-awarded umbrella contract (LOGCAP III).⁶⁷ In effect since early 2002, LOGCAP III was awarded to KBR and provides support in Kuwait, Afghanistan, Djibouti, Republic of Georgia, and Uzbekistan in addition to Iraq. The contract was competitively awarded by the Army Material Command (AMC) on a best-value basis. It is an ID/IQ contract. The contractor is not paid merely because of contract award but as the need for services arise and task orders are placed against the contract. Task orders placed under the contract may be priced as cost-plus-award-fee (CPAF), cost-plus-fixed-fee (CPFF), or firm-fixed-price (FFP). Generally, CPAF task orders are used in contingency operations when performance parameters such size of the order, location and field condition of the supported troops, are not known precisely or are subject to change.

Combatant commanders in Iraq, or other supported customers, such as the Coalition Provisional Authority or the Iraqi Survey Group (in 2003-2004), develop requirements for support based on their operational plans. These “customers” examine the various means for addressing support requirements such as active or reserve components, host nation support or LOGCAP.

If LOGCAP is the most viable alternative for support, a decision often driven by compressed timelines and operational exigencies, the customer writes a statement of work (SOW) with the assistance of LOGCAP planners. The SOW is forwarded via the Army Deputy Chief of Staff, Logistics, to AMC’s Army Field Support Command (AFSC) LOGCAP contracting office.

After compliance reviews, the procuring contracting officer (PCO) sends the SOW to the contractor and requests a technical execution plan and rough order of magnitude cost estimate. After cost and technical approach are accepted by the PCO and customer, and upon receipt of

⁶⁷ Kern, P. GEN. (2004, March 11). Contracting in Iraq. [prepared statement]. US House of Representatives, Committee on Government Reform. (Gen. Kern’s statement is the basis for the description of the LOGCAP contract in the first part of this section).

funding authority from the customer, the PCO issues a notice to proceed to the contractor. This process can be completed in 72 hours under urgent circumstances.

The resulting undefinitized contractual action subsequently is priced through the submission of a detailed contractor cost estimate, Defense Contract Audit Agency (DCAA) audit, and PCO/contractor negotiations. The first task order to support base operations was awarded in April 2002 for work in Uzbekistan. In the following two years, task orders grew in number to 76, with exactly half in support of Operation Iraqi Freedom.

In addition to logistic support for deployed forces, LOGCAP was utilized in the immediate post-major-conflict period to prepare for Iraqi reconstruction—specifically, the pre-positioning of personnel and equipment to restore Iraqi oil fields. Subsequent efforts in this arena were managed by the Army Corps of Engineers.

The PCO's contract management function is supported by the Defense Contract Management Agency (DCMA) in addition to DCAA. DCMA acts as administrative contracting officer (ACO) under authority delegated by the PCO and performs a variety of on-site oversight responsibilities, including review of contractor use of the government supply system. In addition to reviewing cost proposals, DCAA reviews the contractor's estimating and accounting systems, and also reviews incurred costs and vouchers prior to submission for payment.

General Paul J. Kern (former AMC commander) informed Congress in 2004 that in the “first phases of supporting our troops, the focus and priority has been on responsiveness, but all within the framework of the Federal Acquisition Regulation.”⁶⁸ He went on to state that despite some delays in definitizing task-order pricing, and the challenging environment that “hindered the implementation of robust business management systems,” progress had been made by both the government and KBR.

General Kern assured Congress that KBR had an incentive to control costs. The negotiated estimated cost was the baseline on which the award fee would be determined. The maximum fee was three percent, with a base fee of one percent—leaving two percent as the potential award fee. General Kern specifically identified this fee structure as equating to KBR's “projected profit.” In addition, he stated KBR had an additional incentive to control costs because evaluations for award of future government contracts would include an assessment of the contractor's past cost control.

In July 2004, the GAO issued a report that reviewed DoD's extensive use of logistics support contracts.⁶⁹ LOGCAP funding in support of operations in Iraq had risen to \$5.6 billion by May 2004, and the GAO report made a number of findings and some of its recommendations based on contract support in Iraq. DoD concurred the GAO's recommendations and, thus, implicitly endorsed its findings.

The GAO found that Central Command planning for the employment of LOGCAP in Iraq began late—not until May 2003. This is contrary to LOGCAP policy calling for early planning. In contrast, European Command began the planning process (to support a planned entry into Iraq via Turkey) in September 2002. GAO also noted ineffective planning when it became likely that

⁶⁸ See note 67,

⁶⁹ General Accounting Office. (2004, July 21). DoD's extensive use of logistic support contracts requires strengthened oversight. GAO-04-854.



the stay in Iraq would be longer than initially anticipated. There was some indication of a lack of detailed planning for the use of LOGCAP both at the theater level and by the divisions employed in the early operations. Tasks orders in Iraq and Kuwait had to be frequently modified.

The GAO report listed a number of task orders under LOGCAP where definitization had been long delayed. Not among the oldest but the largest was Task Order 59 for Iraq. This was a \$3.9 billion task order issued in June 2003 originally scheduled to be definitized by December 2003. Action to definitize this task order did not begin until May 2004.

A general comment in the GAO report not specifically related to Iraq, but possibly reflecting the contract administration problems arising from delays in fixing the estimated costs of task orders, related to the award fee process. The contract called for an award fee board to meet every six months to review performance and fix the award fee. From early 2002 until the close out of GAO's report in mid-2004, the board had not met.

GAO called oversight of logistics support contracts "generally good." Despite this assessment, GAO found the available personnel were insufficient for proper oversight.

General Kern's assessment was that LOGCAP in Iraq "met its intended goals" and proved "it has greater potential than originally expected."⁷⁰ He referred to an unprecedented level of contractors on the battlefield and quantified them "as more than a division's worth of contractors working side by side with our troops."

General Kern spoke of a need to continually improve LOGCAP. He indicated an attempt would be made to transition from cost-type task orders to performance-based, fixed-price orders when feasible and to provide incentives for the contractor to perform in as efficient and effective manner as possible. He saw the need to ensure "policies and systems are in place to take care of our total force, including our contractors."

General Kern's assessment of LOGCAP in Iraq can only be considered positive. GAO's July 2004 report might be considered relatively positive, but containing tempered criticism of LOGCAP in Iraq, compared to other logistic support umbrella arrangements and the management of LOGCAP in other theaters.

Other critics have not been as kind as the GAO and General Kern. Representative Henry Waxman of the Committee on Government Reform, US House of Representatives noted, many "questions have been raised about the Iraq contracting process" and "seemingly inflated prices charged by Halliburton [...] and Halliburton's admission of kickbacks."⁷¹ Halliburton is KBR's parent company and was once headed by Vice-President Richard Cheney (causing some to suspect that Waxman's criticism is politically motivated).

By the beginning of 2005, KBR's LOGCAP task orders in support of Iraq had risen to \$8.3 billion; Representative Waxman pointed out that the growth of the value of Halliburton's (he invariably uses the parent company name) contract work had occurred despite "extensive

⁷⁰ See note 67.

⁷¹ Waxman, H. (2004, December 9). Iraq Contracting. Retrieved February 2005 from <http://democrats.reform.house.gov/investigations.asp?issue=iraq+contracting>; Waxman, H. (2004, December 9). Halliburton Iraq contracts pass \$10 Billion mark. Retrieved February 2005 from YubaNet.com www.yubanet.com/cgi-bin/artman/exec/view.cgi/6/16071.

problems” with billings and “criminal investigations” of company officials. A decision by AFSC not to impose a fifteen percent withholding on KBR invoices was said to be the “Bush Administration’s” continued rejection of “recommendations of its auditors that 15% of Halliburton’s LOGCAP reimbursements be withheld.”⁷²

The validation of criticisms raised by Representative Waxman and others will have to await the conclusion of legal and administrative proceedings. Meanwhile, some high government officials have rejected publicized allegations of contract mismanagement and over-billing in Iraq’s stressful environment. Deidre Lee, Director of Defense Procurement, has recounted her personal experiences in a visit to Iraq and explained how a much-publicized allegation of KBR over-billing for meals served in Baghdad was based on a failure to understand the realities of the situation (this view was seemingly substantiated when in April 2005 the Army reached a settlement highly favorably to KBR).⁷³ In a similar vein, Ambassador Paul Bremer (former CPA Administrator) rejected in the strongest terms the report of the Special Inspector General for Iraq Reconstruction.⁷⁴ The Inspector General criticized CPA management of contracts for Iraq reconstruction that included some KBR work that was also the subject of Representative Waxman’s criticism. Bremer characterized as a “major flaw” the Inspector General’s “failure to understand and acknowledge” the context in which the CPA operated.

Whatever the exact quality of KBR’s work, a few points stand out. First is General Kern’s assessment that LOGCAP met and even exceeded expectations in Iraq. Second, KBR’s work on LOGCAP and its smaller companion “Restore Iraq Oil” contract was not merely expensive but constituted a massive undertaking.

A year after entering the theater, KBR had 24,000 employees and subcontracted personnel working in Iraq and Kuwait.⁷⁵ In one six-month period, KBR delivered and installed 34,000 living container units, 10,000 toilets and 10,000 showers to accommodate 80,000 soldiers. In less than a year it opened 64 dining facilities and served 40 million meals. It annually processed a million bundles of laundry, disposed of 1.5 million cubic meters of trash, transported and delivered 13 million pounds of mail, moved one million equipment and supply containers from Kuwait to Iraq and transported 1.8 billion liters of fuel. In order to accomplish its transportation function, KBR had to hire, mobilize and train 1,500 certified heavy truck drivers. These figures provide a far from complete picture of LOGCAP work in Iraq but are illustrative of the magnitude of the effort.

4. Industry Perspectives

Companies with membership in the Professional Services Council (PSC) are heavily involved in Iraq contracting (KBR is a PSC member) and, in conjunction with AMC officials, presented a joint briefing to General Paul Kern, AMC commander, on lessons learned from contracting in Iraq.⁷⁶ Another industry association, the International Peace Operations

⁷² Waxman “Halliburton...” (see note 71).

⁷³ Lee, D. GWU conference (see note 8). (2005, April 6). All things considered; Report on National Public Radio. (Army paid 95% of KBR’s disputed costs originally assessed as 40% over-billed). Same report, Representative Waxman complained about the settlement.

⁷⁴ Special IG faults CPA oversight of \$8.8 Billion. (2005, February 9). *The Government Contractor*, 47(6),.o

⁷⁵ Halliburton successes: Improving the lives of soldiers and Iraqis. (2004, March 18). Halliburton press release.

⁷⁶ Professional Services Council. (2004, September 30). Iraq contracting lessons learned. The author wishes to acknowledge the assistance of Stan Z. Soloway, President of the PSC, in providing the author a copy of the briefing

Association (IPOA), represents “private security companies” and with some of its member companies supported a conference on learning lessons from contractors on the battlefield in Iraq.⁷⁷ Unless otherwise noted, the “industry perspectives” presented here are based on presentations from those forums.

In general, PSC representatives thought core military support contracting was highly effective but was significantly challenged by the volume of contract actions and a constantly changing threat environment. The evolution from war to “nation building” changed the nature and structure of some contract relationships, but was not accounted for. Lack of doctrine for an environment in the aftermath of the Iraqi regime’s collapse wrought inconsistencies. The highly politicized nature of contract oversight had significant adverse impacts on the environment, mission execution and cost of contracting.

The application of FAR requirements involved significant limits and costs that were not always understood—particularly by the oversight community. Requirements for subcontracting with US small business, Iraqi businesses, and Coalition partner businesses created execution difficulties, audit problems and security challenges. Lack of authority to waive certain socio-economic clauses that made no sense under the circumstances caused problems. Small businesses that had the availability and capability to contract in Iraq were limited. The risks of contracting under conditions like those in Iraq are magnified for a small business. The prevalence of undefinitized contract actions and DCAA insistence on immediate audits caused significant problems.

PSC companies found that the requirements-definition process was too decentralized, and especially in the early phases, was unclear or even missing. Requirements definition was often disconnected from the contracting and contract-administration process. Performance requirements and execution times were often unrealistic and not synchronized with the government’s capability to support contractor deployments. The “customer” was not always closely connected to contract execution and established roles and responsibilities.

Difficulties were encountered in contract type (time and materials, fixed price, and cost type) determinations. The highly publicized and politicized nature of Iraq contracting brought pressure for FFP contracting, especially in construction, when the Iraq environment clearly required cost-type contracting. This also emphasized the cultural difference among the various government contracting organizations (e.g., Corps of Engineers requirements for FFP contracting) that resulted in inconsistencies and challenges for contractors. The incremental funding process and definitization of task orders created confusion and an “auditing nightmare.”

Deployed contracting officials often lacked authority that was retained by PCOs and ACOs in the United States. Contractors found that the terms and conditions of their contracts often dealt inconsistently or erroneously with worker- and workplace-security requirements. The change-order process was slow due to lack of local ACO authority and distances involved. Companies often received conflicting and contradictory directions from their local customer and the official COR/CO.

materials, meeting with the author and Dr. Jacques S. Gansler to discuss the issues covered in the briefing and in answering follow-up questions.

⁷⁷ GWU conference (see note 8).



Where the government had a local program office, staffed with authorized senior managers, many of the inconsistencies and coordination problems were overcome. This was found to be the exception, however. In general, the government had inadequate program management and contracting capabilities in Iraq. Contractors perceived there were more local oversight personnel than contracting professionals. While acknowledging the need for appropriate auditing, contractors feel the current auditing process is in “overdrive.”

Contractors believed that the oversight community was not well versed in mission realities. The oversight “overdrive” has real effects. To some contractors, government personnel seem not only to fear making a mistake but are fearful of making a decision! This causes real execution problems, causes delays and costs money.

There have been problems in the area of pay and benefits. The Iraq security environment and competition for available skills often results in a salary premium of 55% or more for Iraq work, but DCAA has capped such premiums at 50%. There seems to be a limited government understanding or acknowledgement of contractor compensation realities, particularly by the oversight community, that sometimes takes disallowance actions after the fact. There also seems to be an assumption of pay norms (40 hours/5 days) that are not applicable in Iraq.

Personnel security problems continue to persist. There seems to be confusion over who provides security and in what circumstances. Army security policies are at odds with some contract security requirements. Contractors perceive that a focus on “contractors accompanying the force” misses the point that all contractors in Iraq are “on the battlefield.”

Given the nature of operations in Iraq, there are many other security issues. It is now routine to authorize contractors to be armed. This creates potential legal liabilities as well as status concerns. There are concerns about the extent to which the flow of private security forces into Iraq includes qualified personnel. By one estimate, 20% of every contract dollar goes for security—and this does not include indirect costs resulting from delays, shut downs and evacuations due to security concerns, or costs like being driven to work. There is a general and mutual lack of sharing of situational intelligence between contractors and government.

PSC companies have other concerns that deal less directly with their contract relationship with the government but that are considered important. These include the lack of a SOFA in Iraq and the uncertain future of contractor personnel status, should a future Iraqi government modify the SOFA-like protections provided by CPA Order 17. Another key issue is insurance. This is a legal requirement under the Defense Bases Act, but very expensive and sometimes unavailable as a practical matter. A variety of other issues (deployment-processing log jams, various personnel requirements, inconsistency between contract requirements and export control limitations, and others) are vexing to PSC companies.

In reviewing the PSC’s list of concerns, one might be struck by repeated references to excessive oversight and auditing. These concerns might be dismissed by saying contractors always want less oversight and fewer audits. However, Prof. Steven Schooner, Co-director of George Washington University Law School’s government contracts program, has commented on the business climate in Iraq, pointing out that the country has virtually no banking system. Banking is done in Kuwait. Contractors must bring boxes of cash under armed guard into the country in order to subcontract with local firms and individuals. The lack of banking is only one



of many infrastructure deficiencies in Iraq. According to Professor Schooner: “You can’t audit to Federal regulatory standards in that environment.”⁷⁸ Another expert in government contracts has noted that the requirement for firms to have government cost-accounting systems is a *de facto* limitation on competition at a time when Congress has expressed a concern over the lack of competition in Iraq contracts.⁷⁹ One can only surmise that the critics who complain about a lack of competition (“no-bid contracts”) are referring to task orders under LOGCAP and other competitively-selected contracting vehicles.

Representatives of the private security firms that were members of IPOA had a rather different perspective on contracting in Iraq. Their contracts were typically with US government agencies (other than the DoD), with multi-national organizations or non-governmental organizations.

Rather than less regulation, representatives of the private security industry felt a need for responsible regulation and a better definition of their legal and operational parameters. Their concerns revolved around liability, accountability, and security. Their primary issues were not with the government or their customers, but related to the uncertain legal environment in which they operated, and the uncertain business risks they faced. They had no problem with transparency or opening their books to customers, and hoped contracting agencies would conduct due diligence to avoid contracting with unethical or unprofessional firms.

The representative of one company stated he knew who his contracting officer was, who controlled the resources and requirements applicable to his contract, and had no difficulty communicating with them. He had no problem with the terms and conditions of his contract, or the rules of engagement under which he operated. His concerns related to the potential applicability of local law if CPA Order 17 was rescinded, the uncertainty of MEJA, and the potential jurisdiction of the International Court of Justice.

The representative of a company that provided security for Ambassador Bremer and officials of the CPA said that daily things go on “outside the scope of the contract. Reality meets the terms of the contract and they don’t match.” His company would “provide a flexible solution.” He emphasized the give and take needed to make the contract work effectively, stating it was not a used-car deal.

A Marine Colonel who served in Iraq and was familiar with the operations of the company that supplied security for Ambassador Bremer stated that the company “did its job of protection very well but contributed to the insurgency by pissing people off.”⁸⁰ The Colonel related that many Iraqis, as well as he himself, had been driven off the road by the contractor’s high-speed convoys ferrying Ambassador Bremer from place to place.

⁷⁸ Schooner, S. Remarks at GWU conference (see note 8).

⁷⁹ Nichols (see note 54) conference presentation (*de facto* limitation) and *Conference Briefs*, 3-17 to 3-20 (concern about competition).

⁸⁰ Hammes, T. COL. Remarks at GWU conference (see note 8). The company involved (Blackwater Security Consulting) engaged in a major shoot out with Shiite militia at Najaf in April 2004. A handful of Blackwater employees (aided by a Marine and a couple soldiers) held off overwhelming numbers of Iraqis attempting to overrun the CPA headquarters at Najaf. During the course of hours of fighting, the Americans were re-supplied with ammunition by a Blackwater helicopter. Blackwater firepower and the skill of its ex-special forces employees were credited with saving the day.

In one respect, the private security contractors encountered experiences similar to the PSC companies. There is no central contracting body or gateway for contracting in Iraq. Instead, there are a variety of contracting authorities with different cultures and even different rules. The private security companies dealt with the CPA program management organization, US Army Corps of Engineers, and other contracting entities. One reason the private security companies may be less concerned about audits than the PSC companies is that they do relatively little contracting under the FAR. While the FAR and its supplements number thousands of pages, including extensive cost principles and unique accounting requirements, CPA Order No. 87 that governs CPA and Iraqi government contracts is just fifteen pages long.⁸¹

B. AFGHANISTAN

1. The Long Supply Line

Military operations in Afghanistan were of a very different character than in Iraq. There was no equivalent of heavy forces driving to Baghdad. Initial in-country operations, beginning in October 2001, involved Special Forces and the mobilization of indigenous allies. Supported by air power, ground forces drove the Taliban from power and caused Al Qaeda to abandon its camps and seek shelter in caves and remote regions.

Once US and allied forces established operating bases inside Afghanistan, the problem of sustaining those bases came to the fore. Land -ocked and mountainous, Afghanistan presents real transportation problems. Airlift could solve part of the problem but was not the final solution.

Some of the US forces operating against the Taliban were initially based in Uzbekistan. Indigenous fighters of the Northern Alliance received some of their supplies from across the Uzbekistan border. Once bases were established in the northern cities of Mazar-e-Sharif and Bagram, they were primarily supplied via Uzbekistan.

While one supply route led through Karachi and other Pakistani ports and then overland to southern Afghanistan, another route involved shipments by ocean carrier to Bremerhaven, Germany, then thousands of miles by rail across Europe and Asia to Karshi-Khanabad Air Base in Uzbekistan.⁸²

Long as the northern supply line was, problems had hardly begun once the supplies reached Uzbekistan. The troops that needed support were hundreds of miles away. The sustainment of forces inside Afghanistan by ground transportation was undertaken by the 507th Logistics Task Force and 164th Transportation Contract Supervision Detachment.⁸³ The 164th orders vehicles, coordinates passes, documents cargo, escorts trucks and assists customers.

In December 2001, contract truck shipments to Mazar-e-Sharif began. The 164th contracted for local 20-ton Super Kamas trucks because of the size and capacity of these trucks. Despite poor road conditions, climbs as high as 6,000 feet and, snow drifts that

⁸¹ Nichols (see note 54).

⁸² Cintron, D. (2002, September-October). MTMC surface shipments sustain troops in Afghanistan. *Army Logistician*, 34(5).

⁸³ See note 82.



sometimes blocked tunnels and roads there were 38 successful supply convoys to Mazar-e-Sharif in the first month of operation, with only three delays.

With the first truck convoys arriving at Mazar-e-Sharif, the 164th began planning for the more difficult route to Bagram. Through careful planning, it was determined that the heavier trucks were unsuitable for the Bagram run due to bridge capacities and other reasons. Ten-ton Kamas trucks were suitable for this route and readily available in the region. An initial trip with two of the contracted trucks proved successful after a 40-hour run. The first ten-truck convoy followed, and by mid-April 600 contracted trucks had delivered 4,200 tons of supplies to Bagram.⁸⁴

The style of contracting undertaken by the 164th appears to be quite different from that under pre-planned umbrella support contracts. Local contractors in Uzbekistan and Afghanistan are far from “full service” operations. This leaves it to the contracting detachment to be active in the planning, coordinating, and facilitating of the trucking operation. This approach apparently brought good results on Afghanistan’s northern frontier.

2. Death at Asadabad

In June 2004, an indictment was issued by a federal grand jury in the Eastern District of North Carolina. What was unusual was that according to the indictment the alleged crimes occurred in Afghanistan.⁸⁵

David A. Passaro, a former Army special forces soldier, former police officer, and Army civilian employee took a leave of absence from his job to work under contract for the Central Intelligence Agency in Afghanistan from December 2002 to September 2003.⁸⁶ There he engaged in paramilitary operations.

According to the indictment, on June 19th and 20th, 2003, Passaro interrogated Abdul Wali, an Afghan who had surrendered himself at the front gate of a military base near Asadabad in Kunar Province. Wali was placed in a detention cell on the base. He was suspected of being involved in mortar attacks on the base. During interrogations, it was alleged that Passaro used his hands and feet and a large flashlight to beat Wali. On June 21st Wali died, apparently of a heart attack.⁸⁷

The indictment charged Passaro with four counts of assault within the special territorial jurisdiction of the United States. If convicted on all counts he faces forty years in jail and a \$1 million fine.

The Department of Justice asserted jurisdiction over Passaro’s alleged crimes because the base on which they occurred was within the “special maritime and territorial jurisdiction of the United States” (18 U.S.C. 7 (9)(A)). MEJA was apparently not considered applicable to Passaro because, though he was serving on a US military base, he was under contract to the

⁸⁴ See note 82.

⁸⁵ US Department of Justice. (2004, June 17). CIA contractor indicted for assaulting detainee held at US base in Afghanistan. Press release.

⁸⁶ Dao, J. (2004, June 18). A man of violence or just “110 percent” gung-ho? *New York Times*.

⁸⁷ See note 86.



CIA rather than the DoD. Had the offenses not occurred on the base, Passaro would have escaped prosecution. On the other hand, had a US citizen like Passaro been arrested by local authorities for an off-base crime involving a local national there would be no basis for the United States to request he be handed over to US jurisdiction. He would, thus, be left to vagaries of local laws and potentially be subject to trial (or punishment without trial) possibly without a lawyer or even an interpreter. If convicted, he might be subject to punishments much more severe than those meted out in the American system.

This case illustrates that the deficiencies of MEJA are a two-edged sword. Not only will some contractor employees escape justice entirely because MEJA is inapplicable (or too cumbersome), but others may be subject to accusation and trial in systems foreign to a western sense of justice or fairness with the United States having no basis to assert jurisdiction itself.

For his part, Passaro asserts he was just doing his job and following President Bush's admonition to use "all means" to fight terrorism.⁸⁸ He alleges that his indictment is based on the Administration's embarrassment over the Abu Ghraib and its need to do something to counter the impressions left by that scandal.

As flawed as MEJA may be, it has actually been used once in the five years since enactment. The trial did not involve a contractor employee, but the dependent wife of an Air Force sergeant who was tried for stabbing her husband to death off base near Incirlik, Turkey.⁸⁹ Turkey declined to assert jurisdiction because none of its nationals were involved.

C. THE BALKANS

1. From LOGCAP to Balkans Support Contract

Serious ethnic violence began in the Balkans at about the same time that the original LOGCAP contract was awarded to KBR (actually Brown and Root Services Corporation a KBR subsidiary). US ground forces were committed to Bosnia in 1995 and KBR provided support under the LOGCAP contract. KBR lost the second phase LOGCAP contract in 1997 but continued to provide contract support in the Balkans under a bridge contract. In 1999, KBR was competitively awarded the Balkans Support Contract (BSC).⁹⁰ Through a succession of contract vehicles, KBR has essentially had a continuous support role in the Balkans since the mid-1990's.

KBR's work in Bosnia provided some of the earliest examples of contracted support for a relatively large force (20,000 troops of Operation Enduring Freedom) under an umbrella contingency contract, and had the potential to supply lessons for both contracting officials and policy makers. In a pattern that was to become familiar, KBR provided support primarily at military bases and camps. Support tasks included quality-of-life and subsistence support, engineering, and maintenance work.

⁸⁸ *Associated Press*. (2005, February 20). CIA employee says he's a scapegoat..

⁸⁹ *Associated Press*. (2004, July 14). L.A. trial begins for woman who stabbed husband at Turkish base.

⁹⁰ Herndon, B. Contractors on the battlefield: A KBR perspective. Retrieved briefing charts from, www.logtech.unc.edu/Calendar?2003_observations_Seminar/Presentations/Herndon_KBR.pdf. The author acknowledges a previous case study (Gansler. Brown and Root in Bosnia, p. 44) on this subject (see note 18).

KBR hired a workforce of 6,700 workers, mainly foreign nationals paid at relatively low wages. These workers performed tasks that ordinarily would have required 8,500 troops. This was a 21-percent manpower savings.⁹¹ The Army and KBR also claimed that using contract support in lieu of uniformed personnel resulted in a cost savings of 30 percent.⁹² While freeing uniformed personnel from support functions to perform combat and humanitarian duties was significant, it was all the more important when the US was operating under a self-imposed troop cap of 20,000 personnel in-country.

In what was to become a recurring theme of General Accounting Office reports on contracted combat support, a GAO review of contingency support contracting in the Balkans recommended the Army provide more oversight of contractor operations.⁹³ GAO found that contractors received about 10 percent of the \$13.8 billion spent in the Balkans between 1995 and 2000. In 2000, according to the GAO, the Army was just beginning to attempt to keep contractor costs down. It was exercising minimal control over the costs of recurring services. GAO reported that KBR had brought too many local-hires onto the pay roll and many could be found idle.

Part of the lack of cost control was attributed to the nature of the BSC. Because the contract was a cost-reimbursement, performance-based contract, Army officials gave the contractor considerable latitude in performing task requirements. Government contracting personnel, most of whom were civilians, rotated every six months, preventing them both from acquiring the required expertise on the contract and developing effective relationships with contractor personnel. This prevented them from ensuring effective operations, according to the GAO. Government and contractor personnel seemed to be unsure how much authority the government was supposed to have over contract performance. Neither seemed properly trained to implement the contract.

The inexperience of government contracting personnel in the Balkans (as described by GAO) was not necessarily a view shared by officers of the Defense Contract Management Command (DCMC); these thought DCMC personnel were doing a professional and critical job of contract administration there.⁹⁴ GAO's criticism of Army cost control efforts may have been correct from a narrowly focused point of view, but failed to consider personnel and cost savings flowing from the basic decision to obtain support via contract. Moreover, even relatively inefficient employment of local workers may have positive effects for the United States in a humanitarian operation or insurgency.

Before closing this brief review of contracting in the Balkans it might be worth noting that the US Army Corps of Engineers, Transatlantic Program Center, Winchester, Virginia—rather than AMC—is the PCO on the contract. Like many other combat support contracts, funding (US Army, Europe), PCO responsibility (Corps of Engineers), ACO responsibility (DCMC now DCMA), and the customer (deployed units) all involve different organizations. As a final note,

⁹¹ Stafford, D. & Jondrow, J. (1996, December). A survey of privatization and out-sourcing initiatives. Center for Naval Analyses.

⁹² Brewster, B. (199, May 5). The business of war: US military applies free market trends in Balkans. ABC News. Retrieved from, www.abcnews.go.com/Sections?business/DailyNews/warbiz990505.html.

⁹³ General Accounting Office. (2000, September). Contingency operations: Army should do more to keep costs down in the Balkans. GAO/NSAID-00-225.

⁹⁴ McElroy, T. (1999, September-October). Critical logistics link. DCMC at work in the Balkans. *Dimensions* (Defense Logistics Agency magazine).



the BSC is also an example of where the Army conducted analysis under its “Risk Management” (Field Manual 100-14, 1998, April 23) policy prior to award of contract actions.⁹⁵ This action undoubtedly brought the Army into compliance with DoD Directive 3020.37 requirements for a contractor essential services planning process. See Appendix II for a graphic representation of the risk-mitigation process.

2. Contingency Contracting In Kosovo

In June 1999, Serbian depredations against the non-Serbian population of the former Yugoslavian province of Kosovo resulted in a mass exodus of civilians from Kosovo to Albania. A NATO air campaign had failed to deter the Serbians. Pursuant to international agreement, a coalition of countries sent military forces into Kosovo and Albania to drive the Serb military from Kosovo and restore order. Days earlier, a contingency contracting team deployed to Albania from Germany.

The “team” (initially consisting of Major Daniel Rosso of the US Army Contracting Command, Europe (USACCE), and Major Bill MacQuail, 106th Finance Battalion) arrived at the international airport outside Tirana, Albania, armed with their 9mm pistols and toting rucksacks carrying the essential items, including rations and \$700,000 in cash and \$2.3 million in negotiable instruments.⁹⁶ Not only were they days ahead of the tactical deployment of troops of Task Force Hawk, but upon arrival they could detect no semblance of national or municipal government.

After a night under the stars, the team first acquired a rental car. Then they drove to Tirana to locate contractors, construction equipment and gravel pits, cell phones compatible with the antiquated local telephone system, and conducted a “market survey” of what was available in the city. In their travels they came across a large construction operation engaged in roadwork and noted the company name. This information was provided to USACCE who connected KBR to the firm. They were soon engaged in constructing revetments and other defensive works necessary in the event of Serbian air attacks on Task Force Hawk’s base site.

The team let contracts with gravel pits to haul gravel to the Task Force Hawk location to be used to construct a rough road network to take combat equipment flown in by C-5s. Spotting a truck transporting portable toilets to a refugee camp, they tracked down the source. A short phone call to Italy and telephonic negotiations resulted in the acquisition of the first 22 of an eventual 264 portable toilets for Task Force Hawk. Along with the toilets, trucks and crews from Italy were contracted to service them.

These and subsequent transactions were done in cash, because Albania had no local banking infrastructure. The team would drive into town going from shop to shop to find required items. Rosso would fill out a standard form 44, list every item purchased and have the contractor sign the form. The ability to read English was apparently not a requirement. The back seat of a vehicle, away from prying eyes, was often the location of the exchange of thousands of dollars of cash between MacQuail and a local merchant. Back at Task Force Hawk’s base, Rosso would obtain the signature of a unit representative on his SF 44 and deliver the supplies.

⁹⁵ Greenfield, V. GWU conference (see note 8).

⁹⁶ Logistics in Kosovo: the story of Major Daniel Rosso, US Army Contracting Command, Europe. (1999, September 24). Case study used in “Public Policy and Private Enterprise in National Security.” PUA 698-B, University of Maryland (Dr. Jacques S. Gansler, Professor).



With the tactical deployment of the task force, the workload and the team grew. Arriving with the troops were three “emergency essential” Army civilian contracting officers. KBR arrived on scene as well and provided the team with access to its reliable communication and fax capabilities when needed.

KBR and its sub-contractors used the gravel initially procured by the team to build the needed road network. KBR also took over responsibility for procuring additional portable toilets as originally contracted for by the team. The relationship between KBR and the contingency contracting team was mutually supportive, including the exchange of data on sources of supply and pricing information.

With KBR on the scene, Rosso’s attention was directed more to staff work in support of the integrated logistics effort (engineering, DCMC, ACO, and KBR) headed by the task force’s logistics officer (J-4). Still, there were other contracting successes. When a local contractor lost his gravel truck in an accident, Rosso convinced him to start a new business filling sandbags. These were necessary for force protection. Paid 7 cents per bag that was filled to standard, the contractor and his crew averaged 30,000 bags per day, all filled to standard.

The “wild and wooly” nature of contingency contracting was brought home one day when Rosso and MacQuaid were meeting with a contractor at a café. He told them to display their weapons visibly and leave in their vehicle, as a “bad man” was coming. Because Rosso dealt directly with contractors, a local thug had been losing his normal middleman cut and felt left out of the money. The trust between Rosso and his contractor helped him avoid a potentially nasty or even deadly confrontation.

The Standard Form 44, “Purchase Order-Invoice-Voucher” is authorized for use by FAR 13.306. It is normally used for immediate purchases at or below the micro-purchase limit (generally \$ 2,500 at that time), but a higher limit (\$ 25,000) was authorized for off-shore contingency operations. SF-44 contains no FAR contract clauses and the contractor is not subject to oversight or audit. This all seems remarkably different than the way most FAR-based contracting is done. Indeed it is. It is much more characteristic of commercial reality, whether in the war-torn Balkans or on the main street of an American city.

D. OTHER EXAMPLES

1. East Timor—Helo Support

A crisis in East Timor in 1999 proved to be the first occasion Pacific Command had to make use of the LOGCAP contract.⁹⁷ This was not primarily a US mission. Australia took the lead in an international effort, but the US committed itself to supply support it was uniquely capable of supplying, and eventually transition that support to international agencies such as the United Nations.

When the crisis arose, Australia’s heavy-lift helicopters (CH-47 Chinooks) were inoperative due to systemic transmission problems. The US filled the gap with amphibious assault ships and their CH-53 Sea Stallion helicopters. First on station was the U.S.S. Peleliu with helos of the 31st Marine Expeditionary Unit, later relieved by Belleau Wood and the 11th

⁹⁷ (1) Mattox, P. & Guinn, W. Contingency contracting in East Timor. (2) Folk, J. & Smith, A. A LOGCAP success in East Timor. (3) Keller, S. Aviation Support to East Timor. All in (2000, July-August. *Army Logistician*, 32(4).



MEU. The assault ships served as floating bases. This was effective, but made the ships unavailable for other uses and dedicated a few thousand Marines and sailors to support the use of a small number of helicopters. This situation was undesirable in the long term.

Weighing the options, the US Pacific Fleet decided funding commercial helicopter support through LOGCAP was preferable to rotating a third ship to support the mission. PACOM's director for logistics, engineering and security assistance, BG Philip Mattox, found the LOGCAP contractor, DynCorp, and the Army's LOGCAP manager, to be flexible and helpful. Planning to replace the dedicated military assets proceeded rapidly.

DynCorp was tasked to complete a market survey for available options within 24 hours. The time was late October, and the desire to have American military personnel home for the forthcoming holidays (Thanksgiving to New Year) was among the factors considered in pushing an aggressive schedule. Concurrent with a search for suitable helicopters was an effort to decide upon and prepare a base of operations. Dili, the largest city in East Timor, was selected.

During the process of completing the "rough order of magnitude" proposal, DynCorp tentatively identified two types of Russian helicopters as most suitable for the mission. Medium lift Mi-8s were available from Bulgaria, but huge Mi-26s could only be obtained from Russia. DynCorp representatives went to those countries to check on the status of the aircraft as well as to hand-pick flight crews. The crews were Bulgarian and Russian citizens; and while English is the language of international aviation, that did not extend to these crews. Language proved a problem, and the contract eventually contained a requirement for at least one member of each crew to speak English. By November, DynCorp's recommended approach was approved and DynCorp was tasked to be on station and operational within two weeks.

A Russian Government policy recommending against the use of Russian helicopters and crews to support operations in East Timor interrupted plans for the Mi-26s when Russian authorities refused to approve the transfer flight plan early in November. This resulted in a flurry of letter writing activity by DynCorp, AMC, and other US government agencies to Russian and Indonesian Embassies. The Russians relented. However, the Russian crews were required to have visas in order to legally leave the country. East Timor had no visa entrance requirement. DynCorp coordinated the solution with PACOM and the head of the international force in East Timor. Each Russian crewmember was issued invitational travel orders. The Russians recognized this as meeting their visa requirements.

DynCorp activities at Dili were conducted in conjunction with its partner Flour-Daniels Federal Services and involved the deployment of earth-moving equipment on ocean-going barges and transports. Construction of maintenance shelters and hard stands away from normal operating areas was undertaken to avoid the over-crowded conditions at the airport and to create an all-weather capability for the approaching monsoon season. Local labor was hired to perform site preparation functions.

Delays were encountered in transporting the Mi-8s from Bulgaria. President Clinton was visiting Bulgaria, and Sofia airport and environs were shut down. When the airport finally opened, a giant AN-24 transport loaded two Mi-8s, a fuel truck, generators, spares, and flight crews and took off for East Timor. Airfield restrictions forced a temporary stop at Jakarta, Indonesia, but eventually the Mi-8s unloaded at Bacau, East Timor, and then were assembled and flown to their operating base, Comoro airfield outside of Dili. The heavy-lift Mi-26s were flown directly from Russia in a series of stages covering ten days.



PACOM and international force planners played their part in dealing with airspace clearance issues, life support, and fuel supply problems, as well as working out force protection and “status of forces” type issues. US military presence was minimal, and solving life-support and fuel problems for 100 in-coming personnel (flight crews and construction personnel) proved challenging. Immigration and customs issues had to be worked out—not only in East Timor but also in Australia, as Darwin was the staging area for the Australian contingent of the international force and the major rear area for operations. Planning and executing contingency contracting were new for the Pacific theater. PACOM, with the help of DynCorp’s experience, was able to identify and work key issues. AMC provided a reserve unit to support and oversee contractor performance.⁹⁸

Crew orientation was extremely important since East Timor is desolate and mountainous and has few navigational aids. Crewmembers attended numerous briefings and were oriented to the operational area.

By November 28th, the Mi-8s were ready for operations. They were joined a week later by the Mi-26s. No cargo load was too heavy for the Mi-26s and no village too distant for the Mi-8s to reach. During the three-month mission, crews flew 474 hours without incident. They moved approximately 845 tons of cargo and 6,500 passengers. One commentator on this operation simply titled his article “A LOGCAP Success in East Timor.”⁹⁹

2. System Support: The F-117A

During 1999, initially twelve, and later 24 F-117A Nighthawk stealth fighter-bombers were deployed to Italy. From there they supported NATO operations over the Balkans. Nighthawks flew numerous combat missions, and one was lost during combat operations.

In 1998, the Air Force entered into a contract with Lockheed Martin called Total System Performance Responsibility (TSPR).¹⁰⁰ This required the contractor to provide system support for the operation of the F-117 fleet. The contract required the contractor to respond to maintenance requests within 24 hours. The TSPR contract contained performance standards and projections for cost-savings, as well as fee incentives for improvements in fleet reliability.¹⁰¹

The shift in responsibility led to a reduction in personnel in the government F-117A system program office from 242 to 55 people. This reduction was, in large measure, responsible for a savings of \$30 million within two years.¹⁰² Personnel savings were estimated to grow to \$90 million over the life of the contract. These savings, along with other efficiencies, were estimated to eventually total \$170 million.

The contract also provided for performance improvements to the F-117A fleet. The contractor exceeded all TSPR performance measures. The Air Force-wide goal for non-mission-

⁹⁸ US Army Reserve. New Army reserve unit provides logistic support in east Timor. Retrieved from, www.uasrc.army.mil/news/eastimor.html.

⁹⁹ Folk (see note 95).

¹⁰⁰ Oliva, J. (2001). The black jet turns 20. *Code One* (magazine of Lockheed Martin Aeronautics Company), 16(1). The author acknowledges a prior case study on this subject by Gansler, 45 (see note 18).

¹⁰¹ Peters, K. (2000, September 1). Roadblock. *Government Executive*.

¹⁰² See note 101.



capable aircraft was set at seven percent or less. The F-117A's rate during the first year under the contract was five percent. This decreased to less than three percent in the second year. This is significantly better than most Air Force systems. This record was achieved during a period when there were occasions when up to half the F-117 fleet was deployed overseas.

VI. DISCUSSION—CONTRACTING CHALLENGES

The issues revealed by this research differed widely in their characteristics. A number of topics that transcend the focus of this paper, though suggested by the research, were deemed too broad to be discussed in the current context. The author is, however, left with an abiding impression that contracting under the FAR is much too heavily regulated and sacrifices fundamental principles and efficiency for excessive oversight, and, burdensome and unnecessary procedures. Rather than adopting commercial practices and then making special provisions for government unique requirements, procurement regulations establish many government unique processes and then make limited exceptions for purchasing commercial items (e.g., FAR Parts 12 and 13). The stress of combat-support contracting highlights a number of anomalies and contradictions inherent in government contracting which are, however, not necessarily unique to the topic of this paper and are best deferred to another forum.

The author draws two overarching lessons from the research results documented in this paper. They are: (1) the need for training, and (2) the need to increase and empower the contracting staff of the theater and joint task force commander. Other lessons and issues are important, but attempts to improve combat support contracting and understand the proper role for civilian contractors in proximity to combat operations are likely to make only limited progress unless these issues are addressed.

A. TRAINING

This research found a number of deficiencies in training. It seems fair to conclude that, despite the length of time that contingency and combat support contracting has been going on, its growth has not been equaled by a growing awareness among military personnel of the issues and complexities involved in combat support service contracts.

While the prisoner abuse at Abu Ghraib may have been unique, the evident lack of understanding about proper relationships and roles for contractors may not be equally unique. Many soldiers at Abu Ghraib thought contractors were supposed to be fully integrated into the chain of command and even assume supervisory roles over military personnel. This view was shared by the OIC of investigations at the prison and even articulated by a field grade Army spokesman who made comments about the situation from the Pentagon.

Support service contracts are hard to manage. Maintaining a team concept between contractor employees and government personnel who work side-by-side in an office or on the battlefield is important. Maintaining formal distinctions between the two is also required (primarily because personal services contracts are generally not authorized).

In large military organizations, training probably needs to be multi-faceted. Officers and NCOs might receive general training on appropriate relationships with contractors as part of their initial training or professional military education. In assignments where military personnel are likely to routinely work with or interface with contractors, orientation specific to the circumstances could be undertaken for all personnel.



Customers receiving support under a contract need to have some familiarity with the terms and conditions of the contract. If contractor employees engage in inappropriate conduct or are ineffective, military personnel affected by or aware of their actions need to know who to go to or what can be done to correct the situation. Obviously, a certain degree of sensitivity and sophistication is required. There is no need to make a “federal case” out of a situation where a few words of admonition might correct a deficiency. For some, the difference between suggesting an improvement and giving an order will be difficult to understand. In some instances even such informal interaction may not be appropriate. Training geared to the maturity and sophistication of the trainees is required. Thus, both generalized training and specific orientation may be needed.

Industry views on combat support contracting in Iraq suggest other training is needed. Oversight personnel need to understand contingency contracting is not business as usual. Oversight that causes government decision makers to fear making a decision is bad oversight. Personnel providing oversight for contingency contracting operations need to be trained to do their jobs without injecting added stress into already stressful situations.

In the Balkans, the GAO found a lack of familiarity with the contract, and frequent job rotations limited the effectiveness of government contracting personnel. In cases where the circumstances prevent the incremental acquisition of the required experience level, intensive training and local orientation might be used to partially remedy the deficiency.

Contractors are generally responsible for training their own employees. There are instances when the government has certain responsibilities for training contractor employees, however. Industry representatives reported a number of deficiencies encountered at CONUS Replacement Centers (CRCs) by employees deploying for Iraq. First, the requirement to process through the CRC did not always fit with the deployment schedule required by the contract, due to the timeline imposed or the inadequacy of the CRC to meet the throughput requirement. Many contractor employees reported CRCs “jammed five days of training into two.” Some contractor employees were not processed through CRCs. CRC training did not always stay current with the evolving threat environment or theater commander directives.

Some of the training deficiencies described above are relatively easy to understand and may also be relatively easy to solve. There also seem to be more ethereal questions. The PACOM logistics staff responded well to its first exposure to contingency contracting in East Timor. What if the crisis had been more widespread or US involvement more central? If a major contingency had been PACOM’s first experience with contingency contracting, would they have been able to replicate the success? This question suggests contingency contracting exercises might be a useful part of planning and training in combatant commands and other organizations involved in the contingency contracting process. In a similar vein, how many contracting officers would have been capable of duplicating Major Rosso’s initiative in Albania or coordinating local trucking in Afghanistan? Developing expertise in our highly regulated procurement system does not necessarily contribute to the ability to acquire needed goods and services in remote or under-developed regions of the world. If this observation is correct, ways to develop this expertise and initiative need to be developed.

I have referred to the last items as ethereal. Neither that nor their position at the end of the discussion is meant to indicate a lack of importance. Imposing training requirements on subordinate elements may be relatively easy. Convincing a busy joint commander to train and engage in staff exercises for contracting contingencies he may never have to face may be difficult. Training officers to act like Major Rosso did may also be difficult and may be even more



objectionable when combined with the thought that an officer performing the functions Major Rosso did doesn't really need much training in the intricacies of the FAR. What is needed is initiative, the ability to assess needs and good business sense. Personnel selection may go hand-in-hand with training.

B. JOINT COMMAND CONTRACTING CAPABILITY

Of the three types of contingency support contractors described in Section III, only the theater support contractor operates in an environment where lines of contract authority, resource allocation and the chain of command intersect. Even then, the chain of command and the lines of contract authority are not identical. For the other types of contractors (external support and weapons systems contractors) contract authority, resource allocation, and the customer often constitute three distinct chains of command.

In Iraq, this situation was made more complicated by the presence of other government agencies and their contractors, as well as contractors of the CPA. It has been said, nobody actually knows how many contractors and contractor employees are in the country. We can hope such situations will not recur frequently. The combatant commander is responsible for the success of his mission and yet may have only nominal or no control over large numbers of contractors that have the potential to affect the outcome of his mission.

A number of the case studies presented above have involved instances where the PCO was resident in the United States, but the customer was deployed in a distant and sometimes remote location. Clearly, this arrangement can and has been made to work. Some of the case studies suggest that such arrangements can delay and reduce the effectiveness of contract actions. Intuitively it seems to be a sub-optimum arrangement. PSC companies in Iraq found authority and responsibility for sequencing and prioritizing tasks to be distributed and unclear.

In Iraq, units of the Iraqi Army training under the supervision of officers of the US Army and Marines had progressed to the point of combat training with AK-47s. US officers prepared to receive the assault rifles only to find that the civilian (CPA) authorities in charge of the contract under which they were to be delivered had cancelled the contract after a bid protest had been filed.¹⁰³ The military was not consulted, and no attempt was made to defend the contract action or take alternative action such as a partial cancellation (the contract called for a large variety of mostly military supplies, not all of which were as critical as the AK-47s). One can well imagine that each day the training of Iraqi Army units is delayed will eventually result in an additional day when American soldiers will be at risk. The Joint Commander had no say in the situation.

The Army's "Contractors on the Battlefield" (Field Manual 3-100-21, January 2003, previously FM 100-21 of the same title) emphasizes planning as the key to obtaining effective support from contractors during operations. The Army's earlier guidance recognizes that in "most operations, multiple contracting agents will be present in the theater"—dealing with theater support, external support, and system contractors. The commander is directed to establish the "CINC Logistics Procurement Support Board" to "integrate and monitor contracting activities throughout the theater."

¹⁰³ Hammes, T. GWU conference (see note 8). *Cemex Global Inc.*, (2004, February). GAO file No. B-293676 (no decision filed). *Conference Briefs* (see note 54), 3-21.



The earlier version of the Army's Field Manual expressly pins responsibility on the theater commander for overall "management and maintaining visibility over the total contractor presence in the theater (battlefield). [...] This is in line with the concept that contracting support is centralized at the highest level to ensure a coordinated approach for operation support."

The revised version of the field manual, while containing a more extensive and updated discussion of issues related to contractors on the battlefield, backs off from the explicit language on command responsibility in the earlier version. "The combatant commander sets the tone for the use of contractor support [...]" through the planning process. He is to assure "harmony of effort." Under the revised field manual, the commander's principal assistant responsible for contracting is responsible only for theater support contractors.

There may be instances when such an approach may prove viable, but apparently Iraq is not one of them. In addition to "wild cards" such as the CPA (recalling the action described earlier in this section and actions of its security contractor Blackwater), the Abu Ghraib scandal points out that even some Army-funded contracts were not being effectively monitored and controlled in Iraq.

The kind of command responsibility described in the earlier version of the Army's guidance appears to be desirable. One suspects that the guidance was revised in recognition that the theater commander could not be held responsible when his "control" over many contractors was nominal or non-existent.

The foregoing is not meant as a criticism of the Army guidance. The evolution of the Army's guidance suggests it is the result of a thoughtful assessment. Rather, it points out the deficiency of joint doctrine in this area. "Contractors in the Theater," Chapter 5 of Joint Publication 4-0 "Doctrine for Logistic Support of Joint Operations," has not been revised since 2000 and does not adequately address many of the issues raised by recent operations. The Army's guidance is to a considerable degree a reflection of reality, and may be viewed as an indictment that nobody is really in charge of all the various contractors and contracting agencies that appear on a modern battlefield.

The battlefield commander's command and control of contractors must be strengthened through the alignment of contract authority with command authority. This includes providing adequate staff resources to address contracting issues. It requires passing as many lines of contract authority as feasible through the joint command. In some cases this may involve transferring PCO authority from an outside agency to the joint command. In other instances it may be sufficient to vest the command with COR or ACO responsibility or, as proposed in a pending DFARS revision, vesting the theater commander with contract change authority normally vested in the contracting officer. In a lesser number of instances, especially with non-DoD funded contracts or weapons system contracts, establishing mechanisms for effective visibility and coordination may be enough. Contracting authority should be centralized at the level needed to ensure coordinated operational support—at the level of the joint commander.

In instances where contracting authority cannot be effectively vested in the theater commander, coordination of the various parties involved in combat support contracting must be improved. This probably requires the creation of a high-level office to coordinate policy and to expeditiously resolve disputes or inadequacies in performance among the various stakeholders.



For short-term deployments, with few contractors involved, current policies have generally proved adequate. Major operations with a multiplicity of contractors have demonstrated the need for improvements.

C. CRIMINAL JURISDICTION

The discussion of MEJA in Section IV and the Passaro case in Section V demonstrates the inadequacy of current criminal jurisdiction provisions applicable to contractors overseas. As discussed in those sections, US criminal jurisdiction may be viewed as both a sword and a shield.

MEJA's record of one criminal prosecution in five years is likely an indication to foreign countries that the United States is unwilling or unable to take action under the statute. Contractor employees in Bosnia that recruited local women, including underage girls, for a sex ring were not prosecuted.

Where there is no SOFA, or where the SOFA gives the host government the option to waive or assert jurisdiction, the record under MEJA will no doubt be taken into consideration. If MEJA is to be viable as either a sword or a shield, something needs to be done to make its use more practicable in cases other than those involving murder or egregious war crimes. In some countries, local judiciaries may well inflict death or other extremely serious punishments for crimes usually dealt with much less seriously in the United States. Based on the author's experience as a NATO trial observer in Turkey, had Mrs. Arnt (the wife who stabbed the Air Force Sergeant near Incirlik) been tried in Turkish Courts, she would have been convicted (after serving an unpleasant pre-trial confinement) and executed.

Constitutional jurisprudence imposed on the executive and legislative branches by the Supreme Court (each of whom has a responsibility to protect and defend the Constitution no less solemn than the Court's) has obviated the simplest answer to the problem. If civilians accompanying the military overseas cannot be subjected to the same laws and procedures as the military, Congress needs to come up with something better than MEJA. Proceedings before a special master that are videotaped and reviewed by a district court jury (or other expediciencies that will make trial logistically feasible without sacrificing fundamental rights) might be one approach. This would still preclude many "routine" cases since US district courts typically only try cases involving relatively serious crimes. Completely innovative approaches might be considered. Federal law might assimilate various aspects of state law and procedure and make it applicable to citizens of the state accompanying the force. With state concurrence, accused persons could be transferred to state jurisdiction for trial. This would allow for the prosecution of mid- and low-level crimes as well as murder, the only crime tried under MEJA to date.

D. COMBATANT STATUS

Status as a combatant or non-combatant is legally significant in international law. At a practical level, the distinction may have limited significance. Personnel entering a combat theater as part of a military force are likely to be viewed as combatants by hostile forces regardless of their actual status.

Trucks in a military supply convoy will be considered legitimate targets whether their drivers are military members or contractor employees. One commentator suggested the ground based "pilot" of an unmanned aerial vehicle would legally be considered a combatant regardless of whether military or civilian. This would make him a legitimate target. The command center



from which the aerial vehicle is operated is undoubtedly a legitimate target. Any civilian working there (no matter how benign the function) would share the risk of attack with military operators. Moreover, as PSC companies pointed out, in Iraq the entire country is the battlefield.

Under certain circumstances (international conflicts where all parties respect international law) the distinctions made by international law (e.g., individual targeting, prisoner-of-war status) may confer benefits on contractors who strictly maintain a non-combatant status. If warfare in the 21st Century resembles the discussion in Section II, and may often involve an insurgency or operations in undeveloped nations, the tenets of international law are likely to provide little protection to contractors.

In international conflicts, the US has international standards to maintain. Current practices raise serious questions about combatant status. Contractors who support weapons systems or are employees of private security companies seem to be most at risk of losing protected status or becoming illegal combatants, merely by performing routine functions required by their contracts.

Consideration of non-combatant status under international law should be considered in any developments in policy or doctrine with regard to contractors on the battlefield. At the same time, lessons from recent operations should not be ignored. Protections provided by non-combatant status have become illusory in certain operations.

E. FORCE PROTECTION

Entirely apart from humanitarian considerations, the more important the functions that contractors perform in military operations become, the more important it is to protect them. Incidents like that in Fallujah, Iraq, in April 2004, when four contractor employees were murdered and their bodies mutilated, shows that force protection for contractors—as well as sharing situational awareness between government and contractor personnel—is imperfect.

Force protection requirements for support elements are not limited to contractors. This was illustrated by the well-known case in which Private Jessica Lynch was captured along with other members of her maintenance company. Uniformed truckers in Army transportation companies found the authorized number of ring-mounted weapons for their trucks was inadequate. Adjustments to unit authorizations had to be made.

There has been a trend in Iraq to authorize and direct contractors to provide more capable weapons for their self-defense (sometimes resulting in export control difficulties).

Contractors have made use of private security firms to strengthen protection for their workers. These measures are expensive in dollars, but tend to avoid the traditional concern with contractor-force protection, namely, that it will divert military forces from their primary mission. However, it raises the question of combatant status, which is an important issue in international conflicts where the Geneva Convention is applicable or in other situations where a foreign nation may have criminal jurisdiction over the acts of US contractors.

In the stressful environment of Iraq, approximately 200 contractor employees have been added to the 1,400 military personnel killed there (as of March 2005). Relatively effective measures to protect contractors are being extemporized. As noted above, many of these are self-help measures performed by contractors themselves.



Policy and doctrine concerning contractor force protection is inconsistent and uncertain. Current operations have shown that large numbers of contractors can operate in-theater without necessarily diverting the military from high priority missions. It also appears that significant improvements in mutual visibility between contractors and the military and in sharing situational awareness could be made. Finally, the obvious must be stated. If a theater commander does not know who and where contractors are in his theater, he can hardly provide for their protection.

F. CONTRACTOR RELIABILITY

A lack of contractor reliability in the face of an extremely challenging security environment has not been demonstrated in Iraq. Whether on the level of individual employees or companies, this “primary concern” has not yet proved to be a significant problem based on recent experiences.

The last word on this topic has yet to be spoken, however. Several factors may make doing business in Iraq unattractive. While reputable companies may not abandon their contracts, it remains to be seen how many will compete for renewal of their contracts or for additional work. If a significant portion of the industry doing business in Iraq finds the business climate unattractive and withdraws, it is unclear how many other firms will find contracting opportunities attractive or within their capabilities.

There are several factors that could sour business opportunities for support contractors in Iraq. The politicization of Iraq contracting and the drumbeat of calumny directed at some companies could outweigh potential profits. In other cases, work in Iraq may simply become unattractive for basic business risk reasons. The drive toward fixed price contracting (partially driven by political criticism) could result in withdrawals similar to the Contrack case. If contractors cannot find insurance at reasonable rates, and the government refuses either to provide indemnification for the contractor or reimburse the full cost of insurance, business risk may become untenable. In at least one case the government has refused both indemnification and full reimbursement of insurance costs.¹⁰⁴

Combat support contractors have proved to be reliable partners in recent contingencies. Political opportunism, overly zealous contract oversight, and misguided contract management policies could change that.

G. OTHER ISSUES

There has been considerable comment, much of it critical, by oversight organizations, such as the GAO, and by politicians, of the cost of combat support contracting in Iraq, the Balkans, and elsewhere. The criticism usually highlights particular “overcharges” or lapses in effective contract management. In fairness, it should be noted that GAO’s most recent review of LOGCAP states improvements in managing costs have occurred and that additional improvements are possible.¹⁰⁵

¹⁰⁴ *Abt Associates, Inc.*, Armed Services Board of Contract Appeals (ASBCA No. 54871). (Appeal noted 2004, December 14). Discussed in *Conference Briefs* (see note 54), 3-23.

¹⁰⁵ GAO. (2005, March). High-level DoD coordination is needed to further improve the management of the Army’s LOGCAP contract. GAO-05-328.



The criticisms of contracted combat support seldom discuss the big picture issues associated with acquiring such support by alternative means. The primary alternatives available are active duty or reserve military forces. In some cases, as where force caps have been imposed, these alternatives may be essentially impracticable. Even when potentially available, these alternatives may be very expensive and unattractive.

As pointed out in background sections of this paper, deployments of military forces have been sustained at a very high level since the 1990's. Absent an increase in the permanent military force structure, emphasizing support "tail" over combat "tooth," there appears to be little capacity for alternatives to contracted combat support from that quarter. Any increase in the active force will bring with it "lifecycle" costs of new personnel ranging from their training and infrastructure support, to current compensation and future unfunded liabilities against the military retirement account.

Repeated deployments of Guard and Reserve forces have been criticized as a "backdoor draft." It has been predicted that recruitment and retention will suffer from repeated reserve component call-ups. Lifecycle cost issues, while not identical to those for the active force, will also increase. Added reserve force man-days must be compensated both in current dollars and in future retirement liability. Finally, there are costs seldom discussed in this context. These include family and career disruptions and even increased state welfare costs for those families where the pay differential caused by a reserve call-up of a breadwinner pushes the family into poverty. And the impact to small businesses and local governments due to the temporary loss of trained employees is thought to be significant in some cases.

Many of the studies cited in the notes of this paper address the question of the costs and risks of deploying large numbers of contractors in proximity to combat. The discussion above suggests insufficient attention may have been paid to the risks and costs of going back to a "total force" with a much smaller component of contracted support.

Beyond the simple expedient of reserve forces call-up or augmenting the active force is the British innovation of the "sponsored reserve," requiring contractors to employ reserve members of the armed forces in certain positions that are potentially subject to deployment. Contractor personnel, when deployed, do so in a military (rather than civilian) status. This approach does not actually augment the force, but it addresses both the international law status issue as well as criminal jurisdiction. The US reserve forces already include a large number of "mobilization augmentees" (reservists assigned to support an active unit), so the basic concept of a force of reservists not assigned to a specific reserve unit is not foreign to the US military. This concept holds promise, but it hardly seems to address large-scale and complicated situations such as we have encountered in Iraq. The concept might be expanded to temporarily confer military status on contractor employees being deployed to areas of active conflict.

VII. RECOMMENDATIONS

A. RECOMMENDATIONS REQUIRING LEGISLATION

This research revealed certain inherent contradictions in the current highly regulated procurement system. However, a recommendation for a complete review and reform of the procurement system based on the principal of facilitating rather than regulating contracting actions is beyond the scope of this paper.



1. Streamline Contingency Contracting

Pending comprehensive reform of the entire procurement system, measures to improve the effectiveness of contingency contracting need to be undertaken. Socio-economic policies that are difficult or impossible to implement overseas should not be required in the overseas operations of contingency contractors. Relieve contingency contractors from bid protests before the General Accountability Office, retaining the agency protest and subsequent court appeals. Provide a mechanism for agencies to proceed with mission-essential requirements even in the light of acknowledged administrative errors. Continue to raise the dollar limits and expand the various forms of simplified contracting methods when used to enter into contingency contracts overseas. Study the challenges of contingency contracting, and develop a legislative agenda for reforms based on, but not necessarily limited to, the recent lessons learned from such contracting.

2. Authorize Sponsored Reserves

Study the British experience with “sponsored reserves” and enact personnel and acquisition legislation to authorize a pilot program of an expanded version of contractor/sponsored reserve personnel in support of contingency operations.

B. OTHER RECOMMENDATIONS

1. Train for contingency and other support service contracting:

- A. Develop and train a cadre of personnel (whether with or without a contracting officer or supply corps military specialty) to act as contingency contracting officers. Once they are trained, authorize them to act as contracting officers utilizing standard form 44 and other forms of commercial or simplified methods of contracting.
- B. Include training on proper government-contractor relationships in routine training of government military and civilian personnel.
- C. Provide orientation and training specific to situations where government and contractor personnel will routinely or frequently interface. Emphasize that the development of a team concept does not erase certain distinctions between government and contractor personnel.
- D. Train and sensitize oversight personnel to adapt to the exigencies of contingency contracting and to recognize environments where “business as usual” is not an appropriate standard.
- E. Provide adequate training to deploying contractor personnel. Augment training capabilities at CRCs during surge deployments or accomplish needed training by other means.

2. Strengthen the contracting authority and staff of the joint commander:

- A. Recognize the need to centralize theater-contracting authority in significant deployments. Move toward a “joint contracting” strategy where service components hand off key contracting authority and contract actions to the theater



or joint task force commander. Establish a central office responsible for the coordination of those contracting matters that cannot be vested in the theater commander.

- B. Staff the headquarters of joint commands, on a temporary or permanent basis, with sufficient expertise to monitor and manage contracts in their area of responsibility.
- C. Grant the theater commander the authority to make contract modifications to combat support contracts in his theater.

3. Expedite updating “contractor on the battlefield” policy:

- A. Issue revised policy guidance related to contingency contractors and contracting even if current efforts are recognized as less than perfect.
- B. Continue to update and revise policy, doctrine and guidance incrementally as lessons are learned.

4. Review policies related to indemnification and insurance:

- A. Conduct a review of the need to make indemnification (P.L. 85-804 or other available authority) more readily available to contingency contractors. Study the need for government action to make insurance more available and affordable for contingency contractors. Expeditiously take any action required as result of the studies.

5. Strengthen contract management in contingency contracting:

- A. Deploy sufficient numbers of PCOs, CORs and ACOs vested with adequate authority to expeditiously effect contract actions in contingency operations. If limited tour lengths hinder the acquisition of requisite expertise, conduct intensive training and orientation to remedy this deficiency. Make sure that “doers” are given priority over “checkers” for deployment. Select personnel who see no conflict between “getting it done” and “getting it done right.”

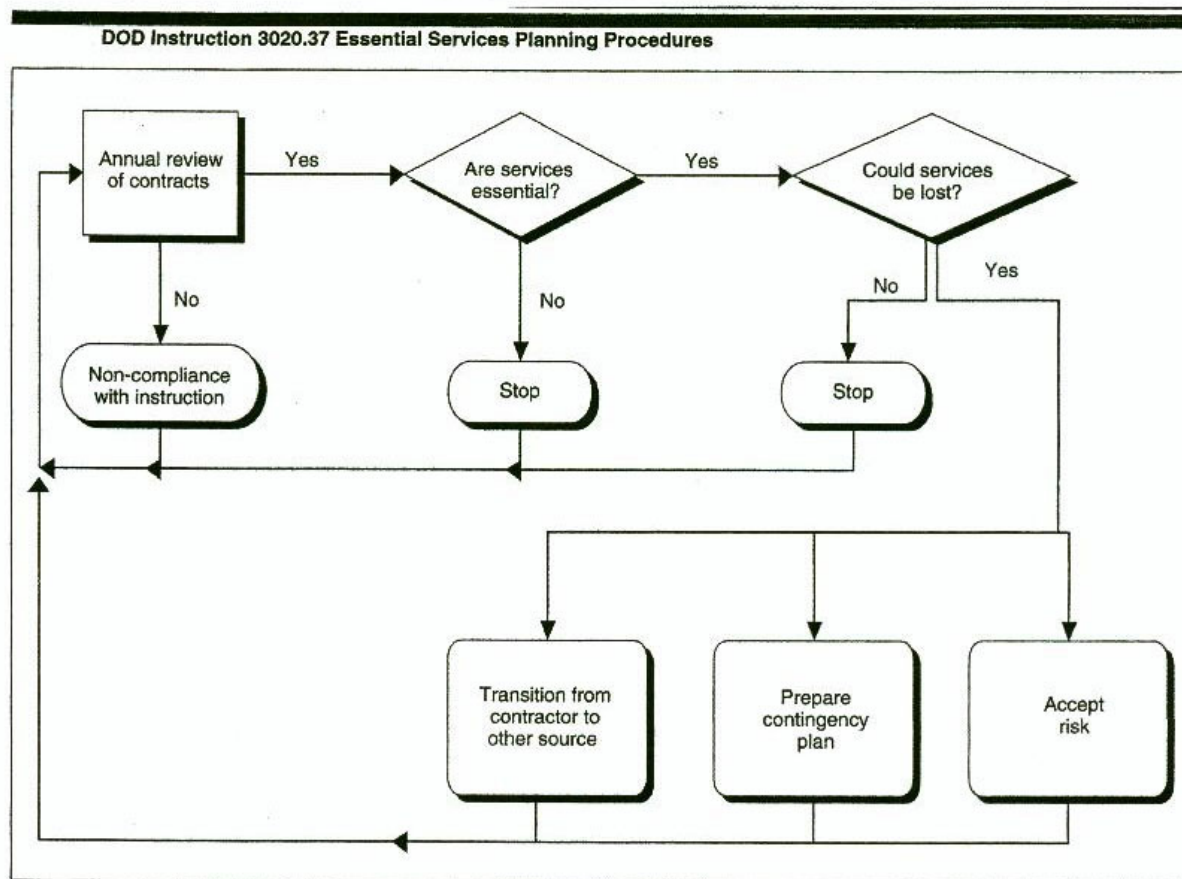


Appendix I. Contract Support Being Provided for Deployed Operations as of 2003

Selected Services Provided by Contractors in Deployed Locations			
Service	Balkans	Southwest Asia	Central Asia
Weapons systems support	X	X	X
Intelligence analysis	X	X	X
Linguists	X	X	X
Base operations support	X	X	X
Logistics support	X	X	
Prepositioned equipment maintenance		X	
Non-tactical communications	X	X	
Generator maintenance	X	X	X
Biological/chemical detection systems		X	X
Management and control of government property	X	X	X
Command, control, communications, computers, and intelligence	X	X	X
Continuing education	X		
Fuel and material transport	X	X	X
Security guards	X	X	
Tactical and non-tactical vehicle maintenance	X	X	
Medical service		X	
Mail service	X		

Source: GAO.

Appendix II. DoD Contingency Planning Process for Contract Services



Source: GAO.

Plenary Panel—Real Options in Acquisitions

Thursday, May 19, 2005	Plenary Panel—Real Options in Acquisitions
3:00 p.m. – 4:30 p.m.	<p>Chair: Thomas Housel, Naval Postgraduate School</p> <p>Papers:</p> <p><i>“Using KVA and Real Options for IT Acquisition: Case Example”</i></p> <p>LCDR Cesar Rios, US Army, Naval Postgraduate School</p> <p>Thomas Housel, Naval Postgraduate School</p> <p>Johnathan C. Mun, Real Options Valuation, Inc.</p> <p>David Mirano, Naval Postgraduate School</p> <p>Sarah Nelson, Intellectual Capital Ventures, LLC</p> <p><i>“Managerial Real Options Practice in Large System Acquisition: Empirical Descriptions and Comparison with Theory”</i></p> <p>David N. Ford, Texas A&M University</p> <p>Yanzhen Wu, Texas A&M University</p>

Chair: Thomas Housel—specializes in valuing intellectual capital, telecommunications, information technology, value-based business process reengineering, and knowledge value measurement. He is currently a tenured Full Professor for the Information Sciences (Systems) Department at NPS. His areas of teaching include: information technology for homeland defense, decision support systems, knowledge management, electronic business, telecommunications, and reengineering. His current research focuses on the use of “Real Options” models in identifying, valuing, maintaining, and exercising options in military decision making. Prior to joining NPS, he also was a Research Fellow for the Center for Telecommunications Management and Associate Professor at the Marshall School of Business at the University of Southern California. Tom has been the Chief Business Process Engineer for Pacific Bell, where he completed numerous reengineering projects and developed a new objective method for measuring the value-added by reengineering. His last assignment in the corporate world was as the Chief of Consumer Market Research for Telecom Italia in Venice, Italy where he developed new methods for predicting the adoption rates for new interactive multimedia broadband applications. He is Managing Partner for Business Process Auditors, a firm that specializes in training Big Six consultants, large manufacturing and service companies in the Knowledge Value-Added methodology for objectively measuring the return generated by corporate knowledge assets/intellectual capital.

He received his PhD from the University of Utah in 1980. He won the prestigious Society for Information Management award for best paper in the field in 1986. His work on measuring the value of intellectual capital has been featured in a *Fortune* cover story (October 3, 1994) and *Investor’s Business Daily*, numerous books, professional periodicals, and academic journals (most recently in the *Journal of Intellectual Capital*, vol 2, 2005). His latest books include: *Measuring and Managing Knowledge* and *Global Telecommunications Revolution: The Business Perspective* with McGraw-Hill (both in 2001).

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Using KVA and Real Options for IT Acquisition: Case Example

Presenter: LCDR Cesar Rios, USN

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Presenter: Dr. Johnathan C. Mun, is the CEO of Real Options Valuation LLC, a consulting, training, and software development firm specializing in real options, employee stock options, financial valuation, and risk analysis located in Northern California. He is the creator of the *Real Option Super Lattice Solver* software, *Monte Carlo Risk Simulator* software, and *Employee Stock Options Valuation* software at the firm. The *Employee Stock Options Valuation* software was used by the Financial Accounting Standards Board (FASB) to develop their example valuation (A87) in the 2004 FAS 123 requirements. He has authored numerous books including *Real Options Analysis: Tools and Techniques* (Wiley 2002, with a second edition forthcoming September 2005), *Real Options Analysis Course* (Wiley 2003), *Applied Risk Analysis* (Wiley 2003), and *Valuing Employee Stock Options* (Wiley 2004). His books and software are being used around the world at top universities.

He is also currently a finance and economics professor and has taught courses in financial management, investments, real options, economics, and statistics at the undergraduate and the graduate MBA levels. He has taught at universities all over the world and has chaired many graduate research thesis committees. He was formerly the Vice President of Analytics at Decisioneering, Inc. where he headed up the development of real options and financial analytics software products, analytical consulting, training, and technical support, and where he was the creator of the Real Options Analysis Toolkit software, the predecessor of the Super Lattice Software discussed above. Prior to joining Decisioneering, he was a Consulting Manager and Financial Economist in the Valuation Services and Global Financial Services practice of KPMG Consulting and a Manager with the Economic Consulting Services practice at KPMG LLP. He has extensive experience in econometric modeling, financial analysis, real options, economic analysis, and statistics. During his tenure at Real Options Valuation, LLC, Decisioneering, and at KPMG Consulting, he had consulted on many real options, risk analysis, financial forecasting, project management, and financial valuation for many multinational firms. His experience prior to joining KPMG included being Department Head of financial planning and analysis at



Viking Inc. of FedEx, performing financial forecasting, economic analysis, and market research. Prior to that, he had also performed some financial planning and freelance financial consulting work.

Dr. Mun received his PhD in Finance and Economics from Lehigh University, where his research and academic interests were in the areas of Investment Finance, Econometric Modeling, Financial Options, Corporate Finance, and Microeconomic Theory. He also has a MBA in business administration, a MS in management science, and a BS in Biology and Physics. He is Certified in Financial Risk Management (FRM), Certified in Financial Consulting (CFC), and is Certified in Risk Analysis (CRA). Finally, he has written many academic articles published in the *Journal of the Advances in Quantitative Accounting and Finance*, the *Global Finance Journal*, the *International Financial Review*, the *Journal of Financial Analysis*, the *Journal of Applied Financial Economics*, the *Journal of International Financial Markets, Institutions and Money*, the *Financial Engineering News*, and the *Journal of the Society of Petroleum Engineers*.

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Presenter: David Mirano, currently lectures on Defense Acquisition at the Graduate School of Business and Public Policy, Naval Postgraduate School (NPS), Monterey, California. He holds a Bachelor's Degree in Economics from Harvard (1985), and a Master's Degree in Systems Management from NPS (2000).

CDR Mirano's previous Navy experience includes a tour as Military Deputy for Contracts at NAVAIR Weapons Division, China Lake, California, as well as four operational tours, i.e., Services Officer onboard USS CARL VINSON (CVN 70), Supply Officer of USS SPRINGFIELD (SSN 761), Material Control Officer for FAIRECONRON TWO (VQ-2) and Stock Control, Sales and Disbursing Officers onboard USS CONSTELLATION (CV 64). CDR Mirano holds three warfare qualifications as Naval Aviation Supply Officer (NASO), Submarine Warfare Supply Officer (SUBSUPPO), and Surface Warfare Supply Corps Officer (SWSCO). CDR Mirano is a member of the Department of Defense Acquisition Professional Community (APC), and holds certification as a National Contract Management Association Certified Professional Contract Manager (CPCM).

Presenter: Sarah Nelson

ABSTRACT: This presentation reviews the use of Knowledge Valuation Analysis (KVA) and Real Options Analysis (ROAn) methodologies in information technology (IT) portfolio acquisition decision-making. The presentation provides an overview of the theory supporting each methodology as well as the operationalization of KVA and ROAn for use as practical tools in IT portfolio acquisition. We use a proof-of-concept case example to demonstrate how KVA provides comparable historical data for ROAn and also permits the monetization of ROAn discounted cash-flow inputs. The two software suites that support KVA (i.e., GaussSoft) and ROAn (SuperLattice) are reviewed in terms of their role in making the methodologies practical and scalable; their ability to maintain performance data on options over time will also be addressed. We conclude with the implications for this approach by addressing some common option valuation and risk challenges in the DoD acquisition environment.

KEYWORDS: real options, knowledge, valuation, risk, valuation, monetization



Managerial Real Options Practice in Large System Acquisition: Empirical Descriptions and Comparison with Theory

Presenter: David N. Ford, PhD, PE is an Assistant Professor in the Construction Engineering and Management Program in the Department of Civil Engineering, Texas A&M University. He researches development project strategy, processes, and resource management. Dr. Ford earned his PhD from MIT and Master's and Bachelor's degrees from Tulane University. He has over 14 years of engineering and project management experience.

Presenter: Yanzhen Wu is a Master candidate in the Construction Engineering and Management Program in the Department of Civil Engineering at Texas A&M University. She researches managerial perceptions of real option. Yanzhen earned her Bachelor's degree from Zhejiang University of Technology in Zhejiang, China.

ABSTRACT

Effective and efficient development of large complex acquisition projects requires proactive management of uncertainties to meet performance, schedule, and cost targets. Flexibility in the form of real options can be an effective tool for managing uncertainty and, thereby, adding value to acquisition projects. But, real options can be both difficult to recognize, design and evaluate and expensive to obtain, maintain, and implement. Real options theory suggests a general approach and has developed precise valuation models that demonstrate the potential of options to add value. But, these models of simplified real options (compared to managerial practice) have failed to significantly improve practice, presumably because of a lack of knowledge and understanding of real options use by practicing managers. In contrast, practicing managers identify, design, value, and implement real options as a regular part of acquisition. Understanding the similarities and differences between current practice and theory is critical for developing operational real-option theories that can improve management practice. In the current work, an experiment using a simple uncertain acquisition project and a simulation model is used to capture managers' perceptions of real options. Subjects both valued flexibility and conceptually understood the impact of uncertainty on option values. Future needs for expanding real options theory into the operational management of acquisition and management implications are discussed.

INTRODUCTION

The uncertainty inherent in large acquisition projects makes increasing their value by improving development and acquisition performance difficult. Unpredictable development environments, immature technologies, and complex interfaces in integrated weapons systems, research laboratories, energy infrastructure, and other large complex systems often generate performance that varies widely from project targets. Uncertainties can be primary causes of cost overruns, delays, and substandard product performance. Effectively managing uncertainty can increase project value by reducing the likelihood of not meeting targets as part of risk management, adding benefits beyond original targets (Ford et al., 2002; Ng & Bjornsson, 2004; Reinschmidt, 2004), or both. Whether uncertainty management is viewed as a form of risk management or performance enhancement can depend primarily on the targets. For example, postponing equipment purchases can add value to the purchaser if future prices are uncertain



and happen to fall. A lump-sum contractor will likely perceive managing this uncertainty as risk management if the bid is close enough to costs that the value addition is required to have costs not exceed the bid. But, the same lump-sum contractor may perceive managing the same uncertainty as a means of boosting profits if the bid far exceeds costs. Researchers and some practitioners recognize the potential of managing uncertainty to improve performance beyond targets as well as for risk management (Amram & Howe, 2002; Yeo & Qiu, 2002). The same basic management theories, tools, and methods can be applied to increase development project value through the management of uncertainty regardless of the levels of performance targets. Therefore, increasing project value can be a useful metric for either uncertainty management purpose.

Both the amount and nature of project uncertainty make it difficult to plan for and to manage. Miller and Lessard's (2000, p. 90) study of sixty large (\$985 million average cost and 10.7 years average duration) engineering projects concluded that project success depended largely on the amount of uncertainty and how these uncertainties were managed. Ceylan and Ford (2002) investigated the complex nature of uncertainty in a single, large (\$2.4 billion) Department of Energy acquisition project; they concluded, in part, that the complexity of managing uncertainty in practice currently exceeds the ability of available tools and methods. Proactively planning for and managing of uncertainty requires forecasting both performance under uncertainty and the impacts of potential decisions. Frequently, a lack of data or understanding of historical experience for prediction, long project durations, and complex interactions between project components (including decisions) make this difficult (Ceylan & Ford, 2002). Managers of large complex system-acquisition projects need decision-making theories, methods, and tools to use uncertainty to increase project value. Miller and Lessard (2000), Ceylan and Ford (2002), and others have found managerial flexibility to be a primary tool for managing uncertainty.

BACKGROUND AND PROBLEM DESCRIPTION

Focusing on project value as a metric for managing uncertainty requires a project valuation method to compare alternative acquisition strategies. Traditional project valuation tools such as Net Present Value ignore or undervalue the potential for flexibility to be used to increase project value (Dixit & Pindyck, 1994; Amram & Howe, 2002; Ng & Bjornsson, 2004; Yeo & Qiu, 2002). Methods that explicitly address flexibility in managing uncertainty include decision tree analysis and real options. Decision tree analysis can be valuable in structuring uncertainty management, but is limited in the number of uncertainty evolution scenarios and strategies that can be valued, largely due to its use of discrete time steps (Lander & Pinches, 1998; Schmidt, 2003). Real-options theory can explicitly capture the value of flexibility and is the focus of the current work. An option is the right, but not the obligation, to change a strategy in the future depending on how uncertain conditions evolve (Amram & How, 2002; Ford et al., 2002; Ng & Bjornsson, 2004). For example, by building an expandable waste-to-energy plant, an owner purchases an opportunity to increase the plant's capacity in the future if waste generation increases, but avoids expansion costs if waste production remains stable or decreases. The extra cost required to make the plant expandable is the cost of flexibility and an indication of a minimal value of the option, as perceived by the owner.

Real options theory formalizes this form of flexibility in the central premise that, if future conditions are uncertain and changing, the strategy later incurs substantial costs; therefore, having flexible strategies and delaying decisions can have value when compared to making all strategic decisions during pre-project planning. Real-options theory values alternative strategies by identifying available future alternative actions and when choices among them should be



made to maximize value based on the evolution of conditions. Options typically include decisions to delay, abandon, expand, contract, or switch project components or methods. Trigeorgis (2000) and others categorize and describe these classifications. Methods for valuing options have been developed and analyzed (Dixit & Pindyck, 1994), applied to engineering (Park & Herath, 2000; Baldwin & Clark, 2000), and promoted as a strategic planning aid by both academics (Amram & Kulatilaka, 1999; Bierman & Smidt, 1992) and practitioners (Leslie & Michaels, 1997). Real options have been used to increase value in natural resources development, research and development, and product development (Brennan & Trigeorgis, 2000; Amram & Kulatilaka, 1999; Trigeorgis, 1993; Dixit & Pindyck, 1994). This work focuses on the understanding of real-options theory by practitioners.

Real options capture the value of managerial flexibility to address uncertainty in decision making (Amram & Kulatilaka, 1999) and can add value to acquisition projects (Yeo & Qiu, 2002). However, in contrast to the expectations of some real-options researchers (e.g. Copeland & Antikarov, 2001), the theory is not widely used by practitioners. In 2002, a survey of 205 *Fortune* 1,000 CFOs (Chief Finance Officer) revealed that only 11.4% use real options, while 96% use Net Present Value (Teach, 2003). Lack of knowledge about real options by practicing managers has been suggested as a reason for the low adoption of real-options theory to practice (Schmidt, 2003; Lander & Pinches, 1998; Teach, 2003). Fundamental knowledge would include recognizing the most important features of options that impact value and the direction of impacts of changes in those features on option values. If this explanation is correct, that practitioners lack a fundamental understanding of real options concepts and relationships, basic education about real options concepts and fundamental relationships is a required next step in improving the management of flexibility with real options. But, if practicing managers have this fundamental knowledge, then improving practice with real options requires a different focus, perhaps on the development of application tools and methods. Describing and evaluating managerial understanding of fundamental real-options value concepts is important for increasing the use of real options to manage uncertainty.

Some evidence suggests that managers do not understand real options well. Miller & Lessard (2000) conclude that managers *intuitively* manage uncertainty to gain the upside value. Based on a case study of options use in practice, Ceylan and Ford (2002) concluded that “Many acquisition project managers recognize the value of flexibility in managing dynamics uncertainties and use options. However, the practice is rarely structured into the frameworks developed by options theoreticians.” The tacit methods used by the majority of managers to identify, design, value, and implement options may hide or be used to obfuscate a lack of understanding of real-options theory fundamentals. Based on the plethora of publications demonstrating the potential benefits of applying simple real options in practice (including one by one of the authors), many real-options researchers evidently agree. But, other evidence suggests that practitioners do understand real-option theory fundamentals. Based on his interactions with managers dealing with uncertainty, Triantis (2001) claims that managers often consider how uncertainty will evolve and their potential strategies, both which are central to real-options theory. Ford (2001) observed managers’ use of options in the development of the National Ignition Facility, including the explicit identification and description of uncertainties, quantitative performance forecasting, option valuation, and strategy selection based on option valuation.

In summary, acquisition project managers use real options widely, but rarely knowingly apply real-option theory that has been demonstrated to have the potential to increase project value. Understanding similarities and differences between managerial perceptions of real options and real-options theory is critical for developing operational real-options theories that



can improve management practice. The current work investigates the consistency between perceptions of real options and real-options theory. Few descriptions of real-options practice (that reveal managerial understanding) exist as a basis for such an assessment. This research developed an uncertain acquisition project exercise and simulation model as the basis for an experiment to reveal how subjects perceive options and to compare those perceptions with real-options theory.

HYPOTHESES

The most fundamental concepts and relationships of real-options theory are captured in the Black-Scholes equation (1973), which values flexibility in a financial asset (e.g. common stock). They value an option based on five factors: 1) variance of returns on stock, 2) stock price, 3) Time to expiration of the option, 4) exercise price, and 5) the risk-free rate of return. Corresponding components of a large acquisition project could be: 1) uncertainty in performance, 2) asset value, 3) duration that flexibility is available (option life), 4) costs to change strategies, and 5) discount rates (Ford & Sobek, 2005). Increasing uncertainty, asset value, option life, or the discount rate increases option values, while higher costs to change strategies decreases option values (Brealey & Myers, 2000). This research investigates perceptions of real options by testing the consistency of human understanding of fundamental drivers of option value with options theory. Due to its importance to option value and the potential for them being influenced by managers (Alessandri, Ford, Lander, Leggio, & Taylor, 2004; Bhargav & Ford, 2005), the current work focuses on the relationship between uncertainty and option value.

H: Perceived option values are positively correlated with perceived uncertainty.

This hypothesis reflects real-options theory. The adjective “perceived” is used to clarify that the concepts being measured are those understood by humans and to distinguish them from actual or optimal values. Support for the hypothesis would suggest an understanding of this fundamental real-options concept.

RESEARCH METHODOLOGY AND DESIGN

To test the hypothesis, the Rig Installation Project, a simulated simple uncertain acquisition project was developed. Research subjects were required to manage this uncertain project without and then with managerial flexibility being available. Subjects repeatedly valued an option to avoid a slow and expensive system-integration failure. To collect multiple types of data, subjects were interviewed (after managing the project) about how they made decisions during the project without and with flexibility, about how they valued flexibility, and other questions related to their perception of flexibility. Performance and interview data were analyzed to describe how subjects perceived and valued flexibility in an uncertain project. A system-dynamics simulation model (Sterman, 2000) of the experimental project was also developed to help test the hypothesis. Decision-making policies described by subjects during interviews and used during the experiment to manage uncertainty and extreme policies were built into the model. This allowed the management of many projects under a wide range of conditions and policies to be simulated. The hypothesis was tested using data collected from the experiment, subjects’ answers to the interview questions, and simulation results.



The Rig Installation Project Experiment

The Rig Installation Project without flexibility (the Rigid Project) is the basis for management with flexibility and will be described first. The Rig Installation Project represents the installation of a semi-submersed, deep water exploration and production rig for oil and gas in the Gulf of Mexico. A rig is composed of multiple systems—such as the sea floor anchors, support cables, flotation can, topsides, drill rig, etc. The project simplifies the complexity of rig installation and system integration into sixteen interacting systems arranged as shown on the right side of Figure 1. Systems are represented by playing cards numbered 1-16. Each system moves from fabrication (left side of Figure 1) to a dock and through one of three paths to the project site.

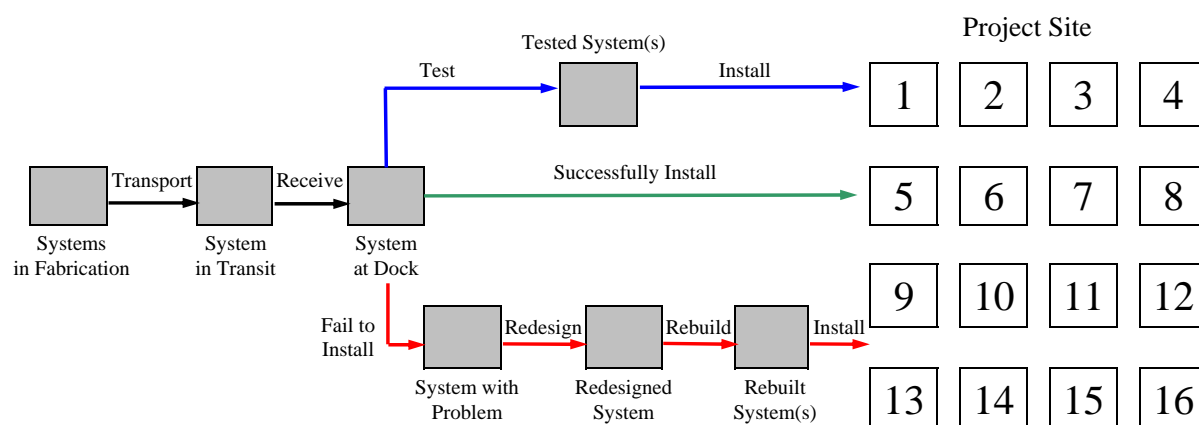


Figure 1. Rig Installation Project

Systems are built in different yards by different contractors and leave fabrication at a rate of one system per week. Systems arrive at the dock two weeks after leaving fabrication. Uncertainty is introduced through the random order of systems leaving fabrication. Before each system leaves fabrication, subjects choose between reserving the yard to test the system or trying to install the system directly without testing. If a subject decides to install the system without testing and the system meets the interface constraints (described next) then the system is successfully installed at the site, the middle path in Figure 1. Successful installation costs \$10,000. Alternately, a failed installation attempt must be redesigned and rebuilt before installation (the bottom path in Figure 1) costs \$40,000, and requires three additional weeks. Testing a system before installation costs \$20,000 (the top line in Figure 1), but assures installation by holding systems until interface constraints are met. Performance was measured by the total cost; lower total cost indicates a better performance strategy.

The first system can always be installed successfully. Each system after the first system can only be installed when installation will create a shared-system interface (card edge) with a previously installed system. For example, if only system 5 is installed, then only systems 1, 6, or 9 can be installed. Each system number, and, therefore, the availability of a shared system interface, is not revealed until the system leaves the dock after the decision to test or attempt installation has been made. The task is difficult because the system number is unknown when the decision is made and because the conditions that determine whether installation will succeed or fail evolve from the time of the decision (at fabrication) to the time when the uncertainty is resolved (at the dock). As described so far, managing the Rig Installation Project

is an exercise in uncertainty management to minimize costs, but does not include flexibility in the form of a real option.

In the flexible version of the Rig Installation Project (the Flexible Project), managerial flexibility is provided by allowing subjects to delay decisions about whether to test a system or send it directly to the site until the system reaches the dock where the system number is revealed. This delay allows subjects to make decisions when they know whether the system meets the interface constraints. Therefore, delaying decisions allows a subject to avoid slow and expensive installation failure by testing systems that would fail installation if installed directly. Subjects decide to purchase or decline flexibility for each system. This form of flexibility is an option to avoid a high cost and delay (i.e., a put option). Delaying the decision about a system incurs an additional cost, the amount which is set by the experimenter. Option costs were adjusted to identify the subject's perceived value of the flexibility, as reflected in the maximum cost each subject was willing to pay for the right to decide later. Option costs started at \$2,000 and were increased by \$1,000 for the next system's delay if the subject accepted delaying the current system decision and were decreased by \$1,000 if the subject declined the option to delay the current system, with a minimum of \$0. See Wu (2005) for additional details on experiment design and operation.

Research Subjects and Experiment Protocol

The target population is practicing acquisition managers. However, differences in education, training and professional experience in real options vary widely across practicing managers and may disguise perceptions of real options. Therefore, to partially control these factors and due to subject availability, time, and resource constraints, graduate students (mainly from the Civil Engineering Department of Texas A&M University) were chosen as the subjects. The simplicity of the Rig Installation Project and clarity of the decision-making task suggest that differences in technical knowledge or experience between practitioners and students will not impact results (i.e., students and project managers were assumed to have the same level of knowledge necessary to manage the Rig Installation Project). Students and managers are expected to perform similarly on an information-processing task such as the task in this experiment (Ashton & Kraner, 1980; Khera & Benson, 1970; Singh, 1998). If the hypothesis (that subjects' perceptions are consistent with options theory) is supported for civil engineering graduate students, then support for practitioners would likely be stronger, considering they have equal or more education, training, or experience in real options.

Subjects sought to minimize total installation costs. Motivation for good performance was provided with \$10 compensation to each subject for participation and monetary prizes for the top six performances. Each subject managed one Rigid Project (without flexibility) to become familiar with the Project and experiment processes and how performance is measured. Subjects then managed two Rigid Projects using their best strategies to achieve the lowest total installation cost. The experimenter verbally guided subjects through each project to ensure compliance with experimental protocol. Project conditions, costs, and subject decisions for each system were collected each simulated week by the experimenter and stored in an electronic data base. A semi-structured interview regarding how subjects made decisions was performed after the Rigid Projects. Subjects were then instructed concerning the use of flexibility in the Rig Installation Project (the Flexible Project). Three to six Flexible Projects were managed by each subject. A second semi-structured interview after the Flexible Projects was used to collect data concerning how subjects made decisions during the Flexible Project, with an emphasis on differences between the Rigid and Flexible Projects.



Simulation Model of the Rig Installation Project

Perceived uncertainty could not be directly articulated by subjects (e.g., with estimates of probabilities) with adequate precision and reliability. Therefore, the simulation model was used to describe the perceived uncertainty based on interview responses and decisions during the experiment. With few exceptions, subjects described the likelihood of success or failure of an attempted installation as their basis for decision-making. In addition, most subjects described those likelihoods as being dependent on conditions that evolved in response to the uncertainty (system sequence) and management strategy (subject decisions).

A simulation model of the Rig Installation Project was developed that can reflect Project processes, system uncertainty, subject strategies, and perceived uncertainty in the form of the likelihood of installation success or failure. The model consists of three sectors: installation, strategy, and cost. The installation sector operates exactly like the experiment by mimicking the flows of systems through a project (Figure 1) and random sequences of systems arriving at the dock. The strategy sector represents the policies that subjects used to make the test/to-site decision for each system based on project conditions. Interview results indicate that subjects perceive uncertainty as high when their ability to predict the outcome of a test/to-site decision is low, and visa versa. For example, 62% of subjects said they would not purchase flexibility in the beginning nor the end of a project when the probability of either success or failure was high; at these times, they felt better able to predict outcomes. Therefore, perceived uncertainty is modeled as low when either the probability of successful installation ($p(s)$) is high or the probability of failed installation ($p(f)$) is high:

Equation 1. Perceived Uncertainty

$$U = \min(p(s), p(f))$$

Where: U = Uncertainty

$p(s)$: Probability of successful installation if system is sent directly to site

$p(f)$: Probability of failed installation if system is sent directly to site

The cost subsystem adds operation costs (testing, installation, redesign, and rebuild costs) and flexibility costs together. See Wu (2005) for details of the simulation model.

RESULTS

Data from 125 simulated projects (42 Rigid Projects and 83 Flexible Projects) managed by twenty-one subjects were collected. Subjects spent an average of two hours on the experiment. One Flexible Project was deleted from the results because of the subject's misunderstanding of flexibility. Performance results suggest that the data accurately reflects real options and subject perceptions. Performance with flexibility was expected to be better than without flexibility. Yet, variances of the Rigid and Flexible Projects are not significantly different based on F-tests. Therefore, one-sided t-tests were used to test whether total costs of Flexible Projects were less than total costs of Rigid Projects (Table 1). As expected, flexible project performance is significantly better than rigid projects based on both an analysis of aggregate project performance ($p=0.0006$) or pair-wise subjects performance ($p=0.0002$).



Project Type	Projects Costs		
	Total	Operations	Flexibility
Rigid Project (n=42)	270.0	270.0	0.0
Flexible Project (n=82)	247.0	235.2	11.8
Difference (improvement with option)	23.0	34.8	-11.8

Figure 1. Cost Performance of Rigid and Flexible Projects

Hypothesis Testing

H: Perceived option values are positively correlated with perceived uncertainty.

The hypothesis was tested with three types of data: subjects' decisions during projects, subject interview data, and simulation results. Graphs of the perceived value of options versus Rig Installation Project time and perceived uncertainty versus Rig Installation Project time were generated from the experiment and simulation results, respectively. Similarity in these behavior modes would show support of the hypothesis.

The option value is conceptualized here as the maximum that subjects are willing to pay for flexibility. Exact perceived option values could not be captured directly using the experimental protocol. However, the envelope of option values can be described with the data, as follows. Each week subjects either did not purchase the option, thereby describing a ceiling value¹, or purchased the option, thereby describing a floor value². Perceived option values for the subject pool of each week must be between these ceiling and floor values. Costs of flexibility oscillate around perceived values due to the movement of option costs in response to subject decisions. To partially compensate for the experimental-protocol-induced oscillation in collected data, ceiling and floor values are the average of the data collected in each week and the data collected in the previous week (Figure 2).

¹ Maximum cost subjects are willing to pay for an option may be less than (but not greater than) the cost offered but declined. For example, a subject declining an option costing \$4,000 might also have declined it if the option had cost \$3,000. Therefore, the ceiling values identified represent an upper limit on real-option values.

² Maximum costs subjects are willing to pay for an option may be more than (but not less than) the cost offered and accepted. For example, a subject purchasing an option for \$2,000 might also have purchased it if the option had cost \$3,000. Therefore, the floor values identified represent a lower limit on real-option values.

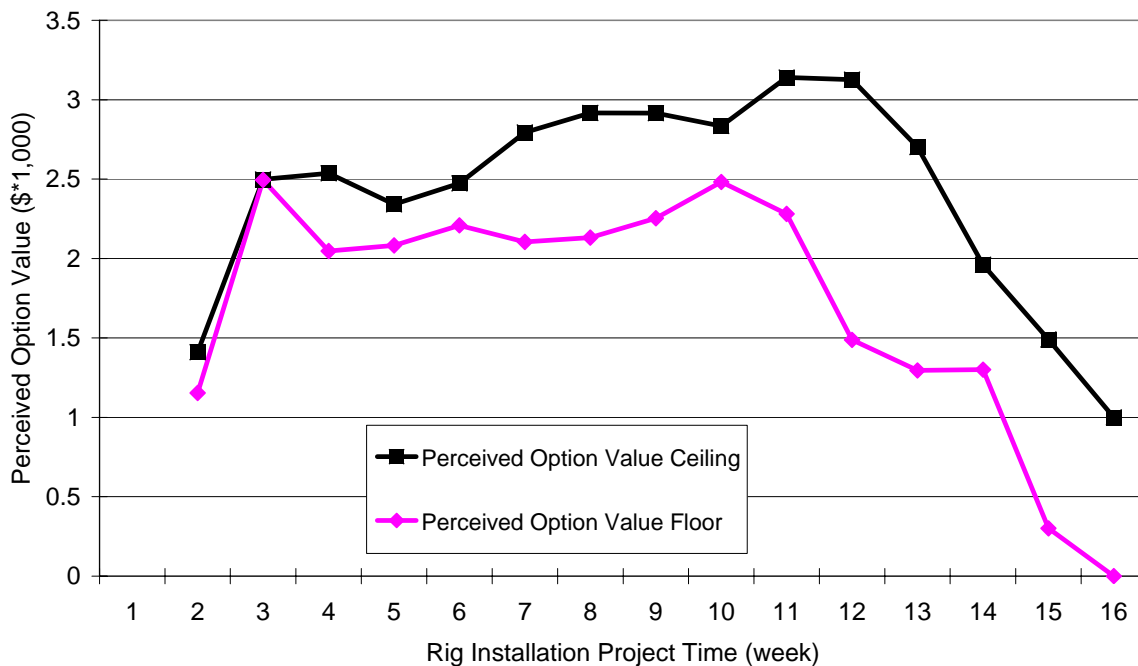


Figure 2. Envelope of Perceived Option Value vs. Rig Installation Project Time

The experimental protocol limits the rate of decrease in the rejected options costs to \$1,000 per week. Therefore, the option value ceiling and perceived option values may drop faster and farther than reflected in weeks 11-16 in Figure 2. A generally concave shape of the perceived option value's envelope over time during the Rig Installation Project is observed in Figure 2. Subjects' answers to interview questions about their policies in Flexible Projects also support the concave shapes in Figure 2. Sixty-two percent of subjects (13 of 21) stated they would not purchase flexibility in the beginning nor end of the project, but would between these extremes. Fourteen percent of subjects (3 of 21) stated they would pay more in the beginning of the project even if the value of flexibility decreased over time. Fourteen percent of subjects (3 of 21) evaluated the flexibility value as constant over time and the remainder (10%) had no idea.

Perceived uncertainty was described with simulation results and supported by interview data. The simulation model was used to quantify perceived uncertainty. Perceived uncertainty was modeled using Equation (1). Perceived uncertainty is dependent on the decisions made during the project. Two extreme strategies were simulated to describe the envelope of possible perceived uncertainties³. An extreme risk-seeking strategy was modeled by sending all systems directly to the site. An extreme risk-averse strategy was modeled by only sending systems directly to the site that would install successfully and by testing all systems that might fail. The perceived uncertainty of 200 Rig Installation Projects with random system sequences were simulated for each extreme strategy (Figure 3). The shape of the simulated perceived uncertainty over time is generally concave.

³ No subjects used either extreme strategy.

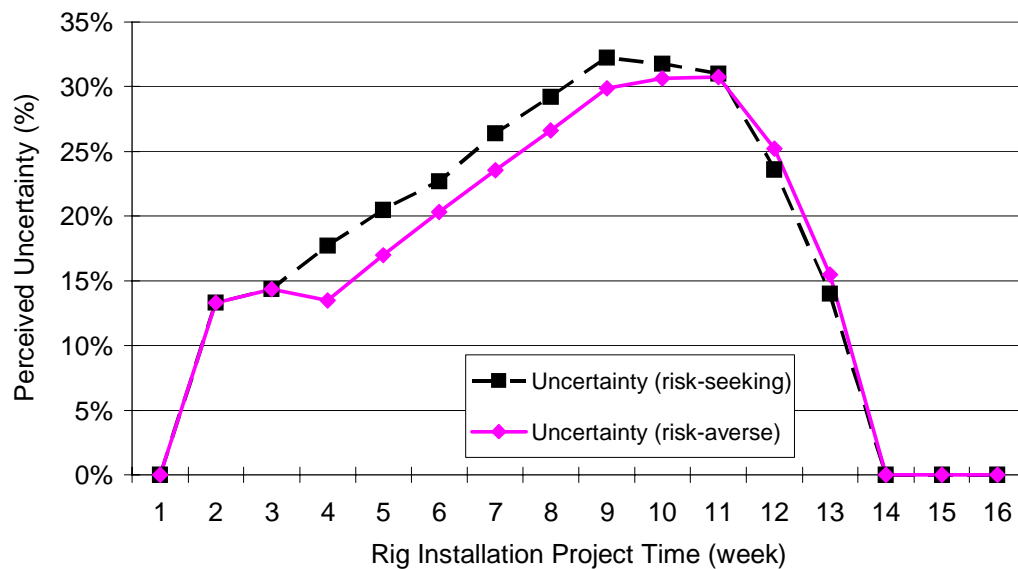


Figure 3. Simulated Perceived Uncertainty vs. Time

The behavior modes in Figures 2 and 3 are both concave. Differences between the consistency and precision of application of strategies in simulation (complete) and by human subjects (partial) can explain differences—such as in the timing of the peaks. Another possible reason is that subjects may overestimate uncertainty early in projects because a few systems have been installed (underestimate and with uncertainty) late in projects when most systems have been installed. The similarity in shapes in Figures 2 and 3 support the hypothesis.

The concave shapes in Figures 2 and 3 are also supported by interview data. The 62% of subjects that said they would not purchase flexibility near project beginnings or completion described their reasoning. Purchasing flexibility in the beginning of projects when the probability of failure was high was seen as unnecessarily adding cost because the system would most likely be tested anyway. Purchasing flexibility near the end of projects when most systems were installed and the probability of success was also high and, therefore, was seen as unnecessary. Subjects preferred paying more in the middle of the project when it was difficult to predict the outcome of attempting to install the system directly (i.e., when uncertainty was relatively high). Additional interview data also support the hypothesis. Subjects were asked, “If you managed the Flexible Project again exactly as we just did *except* that systems that would share a corner with a previously installed system can be successfully installed as well as systems that would share an edge, would you delay your decisions more often?” “Would you expect net savings to be the same, more, or less?” “Why did you answer as you did?” Twenty of twenty-one subjects (95%) believed flexibility would be worth less because the suggested change would reduce uncertainty. This is consistent with real-options theory. Therefore, the interview data also supports the hypothesis.

Interview data was also used to explore subjects' understanding of other portions of real-options theory with questions similar to the one above. For example, subjects were asked “If you played the Flexible Project again exactly as we just did *except* that it takes four weeks instead of two weeks to transport systems from Fabrication to the Dock, would you purchase flexibility more often, the same amount, or less often?” “Would you expect the net savings be

the same, more, or less?" Subjects were also asked the basis for their response. This question tests subjects understanding of the relationship between option life and option value. No significant correlations were found. We suspect this is partially due to the relatively few data points available ($n=21$). However, evaluation of the data in a manner similar to Brehmer's adeptness (1998) using the consistency of changes and direction of differences in data suggest that subjects understand that increasing asset value and option-life increases option-value. See Wu (2005) for details.

CONCLUSION

An experiment and a simulation model of a Rig Installation Project was developed and used to capture managers' perceptions of uncertainty and the value of flexibility. The hypothesis that subject perceptions of the relationship between uncertainty and option value are consistent with real-options theory was tested and supported. Additional data suggests that subjects may also hold perceptions concerning the relationships between asset value and option life and the value of options that are consistent with theory.

The conclusions are limited by the nature and scope of the research. Additional subjects could strengthen conclusions through additional data and analysis. Experimental conditions (e.g. only one uncertainty) are significantly simpler than those experienced in practice, potentially allowing subjects to understand relationships more easily than is possible in practice. The subjects may not accurately reflect practicing acquisition managers.

Despite the preliminary nature of the results, some conclusions can be drawn. We conclude that subjects understand at least one of the fundamental drivers of option value and that they perceive flexibility in the form of options as effective tools in managing uncertain acquisition projects. If results are also applicable to practicing managers, who likely have equal, or more education, training, and experience in managing uncertain projects, the results would also suggest that practicing managers also understand at least some of the fundamental drivers of option value and that they perceive flexibility in the form of options as effective tools in managing uncertain acquisition projects.

This research contributes to the development of real options as effective operational tools for managing uncertainty. Previous research highlights real options' use in isolated anecdotal settings but does not objectively gather and describe perceptions of real options in controlled conditions. The current work is the first known real options research to collect and describe real options perceptions in controlled experiments. We used this data to describe and test subjects' understanding of fundamental option relationships, which can be used to assess and improve practice and build improved options theory for application. The results have implications for both real options research and practicing managers. They suggest that the subjects, and perhaps practitioners, conceptually understand fundamental options relationships. This implies that real-options research—seeking to develop effective tools and methods for applying real-options theory in practice—do not need to focus efforts on demonstrating the value of options or the fundamental drivers of option value. Real options research for application can be more effective if an understanding of fundamental real options concepts is assumed, and work focuses on developing tools to help managers apply options. Such managerial tasks might include recognizing opportunities to exploit options, structuring the complex circumstances faced in practice as options, designing and evaluating strategies, and implementing chosen flexible strategies. Despite the preliminary nature of the results, they also have potential implications for practicing managers. Although they valued flexibility, subjects in general found it difficult to articulate their strategies and the basis for the design, assessment, and selection of



those strategies. Therefore, managers can potentially improve the management of uncertainty in acquisition projects by making their strategies and the flexibility in those strategies more explicit and available for evaluation and improvement.

Future research on the nature of human perceptions of options can test the consistency of perceptions with other fundamental real options relationships and the depth of that human understanding. Research and development of tools and methods for the application of basic real options in practice can build and test tools that bridge the gap between current real-options theory and uncertainty management practice. These tools may include means for making strategies more explicit and structured, measuring uncertainty, and evaluating options with complexities similar to those experienced in practice. Continued real-options research that links theory to practice can increase the breadth and effectiveness of real-options use to improve acquisition projects.

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