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Knowledge, Experience, and Training in Incentive Contracting for the Department of Defense

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Panel 20. Analyzing and Incentivizing Performance Outcomes

Thursday, May 5, 2016	
3:30 p.m. – 5:00 p.m.	**Chair: Mark Deskins,** Director, Acquisition Career Management, ASN(RD&A) ***Big Data Analysis of Contractor Performance Information for Services Acquisition in DoD: A Proof of Concept*** Uday Apte, Professor, NPS Rene Rendon, Associate Professor, NPS Mike Dixon, Assistant Professor of Operations Management, Ivey Business School ***Knowledge, Experience, and Training in Incentive Contracting for the Department of Defense*** Kevin Carman, Dean, DAU Randall Gibson, Professor, DAU ***Learning in the Shadows: A Retrospective View*** Donna Kinnear-Seligman, Mission Assistance Program Analysis Manager, DAU

Knowledge, Experience, and Training in Incentive Contracting for the Department of Defense

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Abstract

This paper assesses the incentive and award fee contracting training and experiences gained by the Department of Defense (DoD) Acquisition Workforce (DAW) through the implementation of various incentive arrangements to influence more favorable performance outcomes. The researchers developed a model to measure current and expected gaps between training, experience and knowledge. Additionally, the model correlates training and experience with knowledge and correlates training and experience with performance outcomes. The researchers used a survey instrument that included 30 questions to capture observations and assessments of the DAW who attended advanced classes between the period of 2013 and 2015. The survey provided key data to determine the presence of any noticeable gaps between required and actual levels of training, experience and knowledge.

Introduction

Part 16 of the Federal Acquisition Regulation (FAR) describes a wide variety of contract types that may be used for the acquisition of goods and services using appropriated funds in the Federal Government. The contract types primarily vary according to (1) responsibilities assumed by the contractor for costs of performance and (2) profit incentives for achieving or exceeding specified standards or goals. The contract types are grouped into two broad categories: "fixed-price" and "cost-reimbursement." The contract types range from "firm-fixed-price," where the contractor has full responsibility for performance costs and profits, to "cost-plus-fixed-fee," where the contractor is allocated minimal responsibility for performance costs with the fee (or profit) fixed by the terms of the contract. In between these two extremes are various "incentive" contract types, where the contractor's responsibility for the performance costs and profit are adjusted depending on the actual results of specific uncertainties identified at the time of contract award. Tables 1 and 2 present a summary of the FAR descriptions for three primary fixed-price type contracts and three cost-reimbursement type contracts.

Table 1. Summary of Fixed Price Contract Types

	Firm-Fixed-Price (FFP)	Fixed-Price Incentive Firm Target (FPIF)	Fixed-Price Award-Fee (FPAF)
Use When . . .	The requirement is well-defined. •Contractors are experienced in meeting it. •Market conditions are stable. •Financial risks are otherwise insignificant.	A ceiling price can be established that covers the most probable risks inherent in the nature of the work. The proposed profit sharing formula would motivate the contractor to control costs and to meet other objectives.	Judgmental standards can be fairly applied by the fee determining official. The potential fee is large enough to both: •Provide a meaningful incentive. •Justify related administrative burdens.
Contractor is Obliged to:	Provide an acceptable deliverable at the time, place and price specified in the contract.	Provide an acceptable deliverable at the time and place specified in the contract at or below the ceiling price.	Perform at the time, place, and the price fixed in the contract.
Contractor Incentive *(other than maximizing goodwill)*	Generally realizes an additional dollar of profit for every dollar that costs are reduced.	Realizes profit on cost by completing work below the ceiling price. May earn higher profit by incurring costs below the target cost or by meeting objective performance targets.	Generally realizes an additional dollar of profit for every dollar that costs are reduced; earns an additional fee for satisfying the performance standards.

Background

In September 2010, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]) in his Better Buying Power (BBP) initiative memos clearly expressed, as a matter of policy, the importance of properly choosing contract types as a way of "aligning the incentives of the government and contractor" (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics [OUSD(AT&L)], 2010). While the September 2010 memo *BBP 1.0* emphasized the increased use of Fixed-Price Incentive Firm Target type contracts, BBP 2.0 refined the guidance by emphasizing the use of the "appropriate contract vehicle for the product or services being acquired" (e.g., "one size does not fit all") and also "focus[ed] on improving the training of management and contracting personnel in the appropriate use of all contract types" (OUSD[AT&L], 2012). More recently, in BBP 3.0, there was even more refined guidance: "Employ appropriate contract types, but increase the use of incentive type contracts" (OUSD[AT&L], 2015a).

Table 2. FAR Summary of Cost Plus Contract Types

	Cost-Plus-Incentive-Fee (CPIF)	Cost-Plus-Award-Fee (CPAF)	Cost-Plus-Fixed-Fee (CPFF)
Use When ...	An objective relationship can be established between the fee and such measures of performance as actual costs, delivery dates, performance benchmarks, and the like.	Objective incentive targets are not feasible for critical aspects of performance. Judgmental standards can be fairly applied. Potential fee would provide a meaningful incentive.	Relating fee to performance (e.g., to actual costs) would be unworkable or of marginal utility.
Contractor is Obliged to:	Make a good faith effort to meet the Government's needs within the estimated cost in the Contract, Part I the Schedule, Section B Supplies or services and prices/costs.		
Contractor Incentive ***(other than maximizing goodwill)***	Realizes a higher fee by completing the work at a lower cost and/or by meeting other objective performance targets.	Realizes a higher fee by meeting judgmental performance standards.	Realizes a higher rate of return (i.e., fee divided by total cost) as total cost decreases.

In a report entitled *Performance of the Defense Acquisition System, 2015 Annual Report,* dated September 16, 2015, the OUSD(AT&L) concluded "that incentive contracts (cost-plus-incentive-fee and fixed-price-incentive) control cost, price, and schedule as well as, or better than, other types—and with generally lower yet fair margins" (OUSD[AT&L], 2015b).

Prior to the September 2010 BBP memo cited above, the Government Accountability Office (GAO; 2005) reported that the Department of Defense (DoD) had paid billions in award fees regardless of acquisition outcomes. The GAO (2005) audits stated the award fee criteria were subjective and faulty, resulting in fees awarded for marginal performance.

Even though a number of corrective actions were implemented, they still failed to address a key area of training and experience in the application of incentive arrangements. The report by the GAO stated the guidance on Award Fees has led to better practices but is not consistently applied for the DoD. The audit report also addressed the following topics: programs that paid fees without holding contractors accountable for achieving desired acquisition outcomes, such as meeting cost and schedule goals and delivering desired capabilities, and programs that paid contractors a significant portion of the available fee for what award fee plans describe as "acceptable, average, expected, good, or satisfactory" performance when the purpose of these fees is to motivate excellent performance.

The shortfalls of incentive contract arrangements are well documented in two GAO studies (GAO, 2005, 2009) and other literature. They address the areas of cost control, schedule, management, and technical performance. Generally, contractors who fail to meet incentive-related goals also frequently fail to meet other terms and conditions of the contract, which if structured properly, would carry performance penalties. Some of the shortcomings seen in the application of incentive contracts led to several clarifications from senior leadership in the DoD, including additional amplification of what's important in the BBP. All too often, the contractors continue to earn high fee levels on late or cost over runs

because the criteria tends to be overly subjective and the outcomes are not always well written with clear and equivocal objective outcomes. This could be a result of a knowledge shortfall, ineffective training, and/or inexperience. However, no research has been conducted to look more closely at the root cause of the problem in incentive contracting. This study hypothesized that knowledge, experience, and training could be contributing to the root cause, impeding the appropriate use of contract types to include incentive type arrangements.

This research began with the development of a Research Model that accounts for the variables that contribute to incentive arrangement failures. The research pursuit is intended to help the DoD better understand the level of experience, knowledge and training required for the effective application of incentive contract arrangements. The researchers leveraged the Kirkpatrick Learning Model (Figure 1), specifically Levels II–Learning, III–Behavior, and IV–Results.

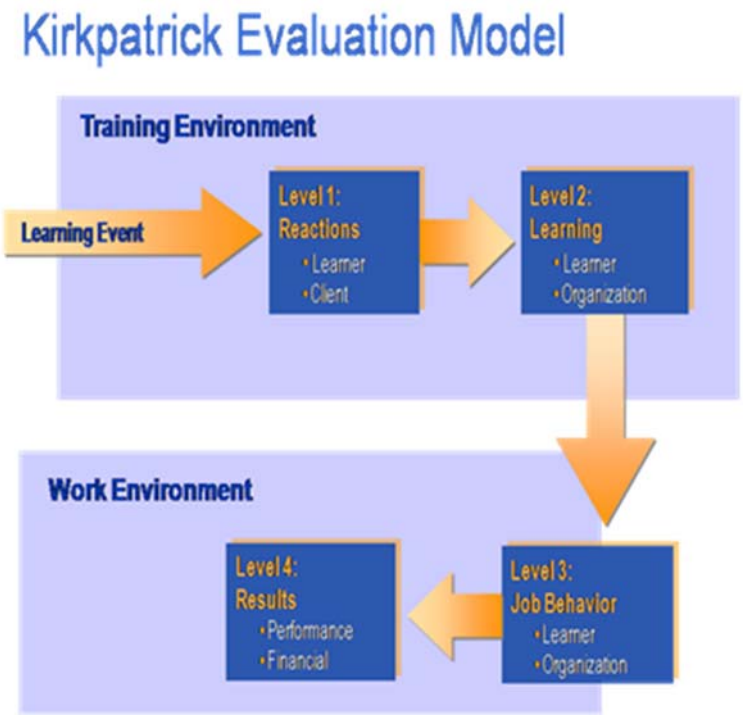

Figure 1. Kirkpatrick Evaluation Model

Kirkpatrick's four levels of evaluation consist of

- Step 1: **Reaction**—How well did the learners like the learning process?
- Step 2: **Learning**—What did they learn? (the extent to which the learners gain knowledge and skills)
- Step 3: **Behavior**—What changes in job performance resulted from the learning process? (capability to perform the newly learned skills while on the job)
- Step 4: **Results**—What are the tangible results of the learning process in terms of reduced cost, improved quality, increased production, efficiency, etc.?

Research suggests that as much as 90% of training resources are spent on the design, development, and delivery of training events, yet only yield 15% on-the-job application (Brinkerhoff, 2006). The learning reinforcement that occurs after the training event actually produces the highest level of learning effectiveness, followed by activities that occur before the learning event.

Research Model

Training Effectiveness Model

The Training Effectiveness Model (Figure 2), would assess if Knowledge, Training, and Experience gaps exist among Contracting Officers, Contract Specialists, Acquisition Professionals, Program Managers, and Deputy Program Managers. The primary focus of this research is to better understand the experiences (H1A and H2A) gained through the management of various incentive arrangements and determine if gaps exist in experience levels, and whether these gaps have a potential causal relationship with programmatic performance. Training received through the DAU and other training (H1B and H2B) were used to determine the presence of any substantiated gaps and their influence on performance outcomes. A gap analysis would confirm the disparity between current and required levels of knowledge, training, and experience to achieve desired performance outcomes performance. For Hypothesis 2, a correlation was used to determine the strength of the relationship between experience and training and its potential causal relationship to knowledge. A gap analysis and correlation was also conducted to determine the strength of knowledge supported by training and experience.

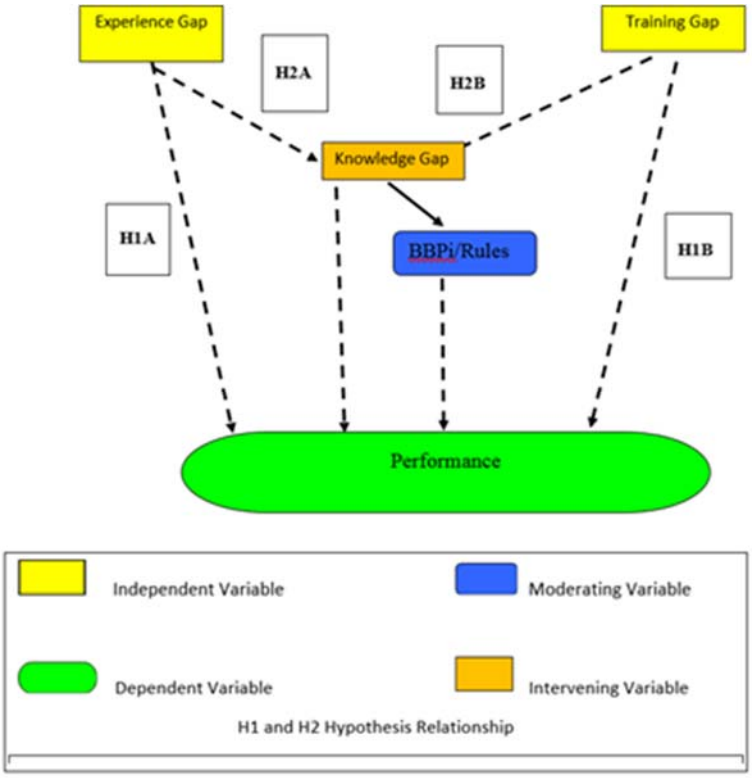

Figure 2. Knowledge, Experience, and Training Effectiveness Model

A *Knowledge Gap* is defined as the difference between what Acquisition professionals from the Program Management (PM) and Contracts Management (CM)

communities observed as the current knowledge levels and the ideal or desired knowledge level. A Knowledge gap was measured by the absolute difference of the arithmetic mean of the observed or current knowledge level and the required knowledge level in the context of incentive and award fee contracts.

A *Training Gap* is defined as the difference between what the Acquisition professionals from the PM and CM communities observed as current training level and the ideal or desired training level. A Training gap is measured by the absolute difference of the arithmetic mean of the observed or current training level and the desired or required training level in the context of incentive and award fee contracts.

An *Experience Gap* is defined as the difference between what the Acquisition professionals from the PM and CM communities observed as their current experience levels and the ideal or desired experience level. An Experience gap is measured by the absolute difference of the arithmetic mean of the observed or current experience level and the desired or required experience level in the context of incentive and award fee contracts.

Performance is the overall effectiveness of the acquisition professional as perceived by the Program Managers and Contracting Officer groups. Performance is defined by the eight generic attributes (DoD, 2014) that program managers and contracting officers encounter with incentive and award fee contracts. The eight attributes are cost growth, program schedule, technical requirements, user requirements, technical issues, program risk, cost control, and contractor performance. The validation of the hypotheses of this research depended in part on the correlation analysis (at a minimally acceptable level of significance of at least .05 or $p < 0.05$) between the gaps or intervening variables and the incentive contracting performance. It is important to stress that a correlation coefficient of any magnitude or sign, regardless of statistical significance, does not imply causation (Emory & Cooper, 1991). However, the study explored the independent variables that might in some way influence performance outcomes. Consistent with the Kirkpatrick Evaluation Model, the DoD Acquisition Workforce survey volunteers provided useful information about themselves and their peers. The data centered on

1. the Effectiveness of classroom training received by the respondent and its impact on job performance of incentive contracting (Level 2)
2. job performance levels achieved, expected and targeted with respect to incentive and award fee contracting (Level 3)
3. performance effects of perceived gaps in knowledge, training, and experience with respect to incentive and award fee contracting (Level 4)

Research Methodology

The intended population for this research included Defense Acquisition Workforce Improvement Act (DAWIA) students who completed the Program Management (PM) Office Course (PMT 352) and Contracting (CON) for Decision Making (CON 360) from each of the military services, DoD agencies and included support contractors between the period of October 2013 and December 2015. Two control groups were surveyed: a Program Management group consisting of Program Managers, Deputy Program Managers, and function acquisition leads; and the Contract Management group consisting of Procuring Contracting Officers, Administrative Contracting Officers, Contract Specialists, and contract support administrators/staff. A statistical analysis was performed to answer the following research questions:

Research Question 1

What are the relationships among training gap, experience gap, and performance attributes that contribute to incentive contract arrangements among Defense Acquisition Workforce members in the contracting and program field?

- ***Hypothesis 1:*** There are gaps in training and experience that affect performance attributes that contribute to incentive contract arrangements among Defense Acquisition Workforce members in the contracting and program field.
  - *Hypothesis 1A:* There is a reliable relationship among experience gaps and performance attributes among contracts and program managers.
  - *Hypothesis 1B:* There is a reliable relationship among training gaps and performance attributes among contracts and program managers.

Research Question 2

What are the relationships between training gaps, experience gaps, and knowledge gaps that contribute to incentive contract arrangements among Defense Acquisition Workforce members in the contracting and program field?

- ***Hypothesis 2:*** There are differences in the relationships between training gaps, experience gaps, and knowledge gaps that contribute to incentive contract arrangements among Defense Acquisition Workforce members in the contracting and program field.
  - *Hypothesis 2A*: There is a reliable relationship among experience gaps and knowledge gaps among contracts and program managers.
  - *Hypothesis 2B:* There is a reliable relationship among training gaps and knowledge gaps among contracts and program managers.

The researchers used a web-based survey consisting of 30 questions; 1,194 individuals from the program management track responded, and 946 individuals from the contracting track responded. A Beta Testing of the survey instrument was conducted with the DAU West Contracting and PM Department faculty prior to the release of the survey. The researcher performed a Cronbach's alpha coefficients assessment that resulted in a very high reliability value of 0.936, $p < .05$.

Data Analysis

This research measured the gaps and correlation relationship among knowledge, training, experience, and performance gap that exist in incentive and award fee contracts. This was accomplished by assessing the students' current level of training, knowledge and the experience required to support incentive contract arrangements, compared to the level of knowledge, training, and experience required to achieve expected outcomes. Data from two population samples (i.e., PMs and CMs) identified the gaps.

This research pursuit was based on empirical data in order to assess knowledge, training, and experience gaps that could be influencing the success or failure of incentive and award fee contract arrangements. This accompanying analysis required a systematic method that accurately described the relationships among the independent, dependent and intervening variables measured.

Descriptive correlation research was the most suitable choice to determine accuracy (Isaac & Michael, 1977). The variables of this study consisted of two independent variables, one intervening variable, and one dependent variable, as follows:

Independent Variables

- Observed vs. Required/Expected Incentive Contracts Experience Gaps
- Observed vs. Required/Expected Incentive Contracts Training Gaps

Intervening Variables

- Observed vs. Required/Expected Incentive Contract Knowledge Gaps

Dependent Variables

- Performance Attributes

***Hypothesis 1*:** There are gaps in training and experience that affect performance attributes that contribute to incentive contract arrangements among Defense Acquisition Workforce members in the contracting and program field.

Table 3 provides the descriptive statistics of the knowledge, training, and experience gaps. It also shows the mean, median, mode, and standard deviation of each variable. The gaps for both the PM and CM were moderately strong at 3.8 to 4.3 on a 6-point Likert scale. The PMs and CMs indicated noticeable gaps in training, experience, and knowledge.

Table 3. Descriptive Statistics for CM/PM Knowledge, Training, and Experience Gaps

	CM Know Gap	CM Train Gap	CM Exp Gap	PM Know Gap	PM Train Gap	PM Exp Gap
N	424	424	424	424	424	424
Mean	3.7783	3.8113	4.1061	3.9458	3.9033	4.3302
Median	4.0000	4.0000	5.0000	4.0000	4.0000	5.0000
Mode	6.00	6.00	6.00	6.00	6.00	6.00
Std. Deviation	1.77396	1.82503	1.88952	1.67710	1.72249	1.63861
Variance	3.147	3.331	3.570	2.813	2.967	2.685
Minimum	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	6.00	6.00	6.00	6.00	6.00	6.00

Table 4 shows the Pearson's r analysis of the independent variable, training gap, and the dependent variable of performance by PMs. All nine performance attributes had a moderately low correlation that ranged from .359 to .441, $p < .000$. All of these correlations had a significant confidence level at the 0.01 level.

Table 4. Results of the Pearson's r Correlation Between Program Managers Training Gap and Performance Attributes

Variables	N	Pearson's r	Sig.
Cost Growth – Training Gap	506	.441	.000
Program Schedule – Training Gap	506	.407	.000
Tech Requirements – Training Gap	506	.399	.000
User Requirements– Training Gap	506	.383	.000
Technical Issues – Training Gap	506	.373	.000
Program Risk – Training Gap	506	.359	.000
Cost Control – Training Gap	506	.401	.000
Contractor Performance – Training Gap	506	.381	.000

Note. *Correlation is significant at the 0.01 level (two-tailed)

Table 5 shows the Pearson's r analysis of the independent variable, training gap, and the dependent variable of performance by CMs. Cost growth indicated a very strong correlation of r = .934, p < .000. The remaining seven performance attributes had a moderately high correlation ranging from .592 to .717, p < .000. All of these correlations had a significant confidence level at the 0.01 level.

Table 5. Results of the Pearson's r Correlation Between Contracts Managers Training Gap and Performance Attributes

Variables	N	Pearson's r	Sig.
Cost Growth – Training Gap	372	.934	.000
Program Schedule – Training Gap	372	.690	.000
Tech Requirements – Training Gap	372	.694	.000
User Requirements– Training Gap	372	.622	.000
Technical Issues – Training Gap	372	.669	.000
Program Risk – Training Gap	372	.592	.000
Cost Control – Training Gap	372	.717	.000
Contractor Performance – Training Gap	372	.659	.000

Note. *Correlation is significant at the 0.01 level (two-tailed)

Table 6 shows the Pearson's r analysis of the independent variable, experience gap, and the dependent variable of performance by PMs. Cost growth indicated a moderately strong correlation r = .728, p < .000. The remaining seven performance attributes had a moderate correlation ranging from .466 to .584, p < .000. All of these correlations had a significance at the 0.01 level.

Table 6. Results of the Pearson's r Correlation Between Program Managers Experience Gap and Performance Attributes

Variables	N	Pearson's r	Sig.
Cost Growth – Experience Gap	506	.728	.000
Program Schedule – Experience Gap	506	.532	.000
Tech Requirements – Experience Gap	506	.511	.000
User Requirements– Experience Gap	506	.466	.000
Technical Issues –Experience Gap	506	.483	.000
Program Risk – Experience Gap	506	.549	.000
Cost Control – Experience Gap	506	.584	.000
Contractor Performance –Experience Gap	506	.546	.000

Note. *Correlation is significant at the 0.01 level (two-tailed)

Table 7 shows the Pearson's r analysis of the independent variable, experience gap, and the dependent variable of performance by CMs. Program Risk indicated a strong correlation of r = .911, p < .000. The remaining seven performance attributes had a moderately strong correlation ranging from .782 to .894, p < .000. All of these correlations had a significance at the 0.01 level.

Table 7. Results of the Pearson's r Correlation Between Contracts Managers Experience Gap and Performance Attributes

Variables	N	Pearson's r	Sig.
Cost Growth – Experience Gap	372	.874	.000
Program Schedule – Experience Gap	372	.873	.000
Tech Requirements – Experience Gap	372	.851	.000
User Requirements– Experience Gap	372	.823	.000
Technical Issues –Experience Gap	372	.854	.000
Program Risk – Experience Gap	372	.911	.000
Cost Control – Experience Gap	372	.894	.000
Contractor Performance – Experience Gap	372	.782	.000

Note. *Correlation is significant at the 0.01 level (two-tailed)

Table 8 shows a mean gap analysis of current and should be performance levels of incentive and award fee contracts by the CM respondents. The scale measures the various levels of understanding of outcomes that can be achieved through incentive arrangement. On a Likert scale of 1–6, 1 represents knowing the characteristics of an incentive arrangement, 2 represents understanding the benefits, 3 represents applying the mechanics, 4 represents analyzing the risks, 5 represents evaluating outcomes, and 6 represents creating and developing suitable contracts.

Table 8. Results of a Mean Gap Analysis Between Contract Managers Current and Should Be Performance Level

Variables	N	Current Mean	Current SD	Should be Mean	Should be SD	Mean Gap
Program Manager	304	3.0968	1.7832	4.1184	1.7723	1.0216
Deputy Program Manager	301	3.0370	1.7899	4.0864	1.7318	1.0494
Contracting Officer	327	4.0185	2.0340	5.1804	1.5412	1.1619
Contract Specialist	369	3.3425	1.9019	4.7015	1.7621	1.3590

The CM respondents identified a gap greater than 1.0 for all four groups. The greatest gaps were contract specialists, with a 1.3590, and contracting officers, with a 1.1619. The contracting officers could believe that among the contracting officers and contracting specialists, performance levels should result in more meaningful performance outcomes.

Table 9 shows a mean gap analysis of current and should be performance levels of incentive and award fee contracts by the PM respondents. The PM respondents identified a gap greater than 1.0 for each of the groups. The greatest gaps were deputy program managers, with a 2.0384, and contract specialists, with a 1.4396. Program managers could believe that among deputy program managers and contract specialists, performance levels should result in more meaningful performance outcomes.

Table 9. Results of a Mean Gap Analysis Between Program Managers Current and Should-Be Performance Level

Variables	N	Current Mean	Current SD	Should be Mean	Should be SD	Mean Gap
Program Manager	386	3.0200	1.7777	4.1036	1.7756	1.0836
Deputy Program Manager	383	2.0112	1.5380	4.0496	1.7351	2.0384
Contracting Officer	343	3.9510	2.0372	5.1590	1.5382	1.2080
Contract Specialist	327	3.2416	1.9019	4.6812	1.7604	1.4396

The results of the multiple regression analysis are shown in Table 10. The analysis was conducted with the independent variable of CM training means and dependent variables of performance attributes. The constant determines the overall effect of the

variables on the performance attributes. The multiplier R-value was 0.935, p < 0.000; and the multiple R-squared was 0.872, suggesting that the independent variable, CM training, explains the 93.52% of the variances in performance attributes. Multiple regression analysis was used to evaluate the strength of the relationship among the independent and dependent variables. The regression model summary and coefficients implies that CM training had a strong positive correlation with performance attributes.

Table 10. Multiple Regression of CM Training as a Function of the Performance Attributes

Dependent Variables	*B*	*SEB*	Beta	*t*	*p*<
(Constant)	-2.821	0.155		-18.166	0.000
Cost Growth	1.490	0.058	0.937	25.775	0.000
Program Schedule	-0.015	0.054	-0.010	-0.276	0.783
Tech Requirements	-0.015	0.067	-0.010	-0.230	0.818
User Requirements	0.051	0.051	0.036	1.011	0.312
Technical Issues	-0.015	0.054	-0.010	-0.281	0.780
Program Risk	-0.083	0.052	-0.058	-1.591	0.113
Cost Control	0.110	0.053	0.076	2.050	0.041
Contractor Performance	-0.049	0.046	-0.033	-0.043	0.298

Independent Variable: CM Training Mean — Multiple $R = 0.935$ R-squared = 0.872 $p < 0.000$

The results of the multiple regression analysis are shown in Table 11. The analysis was conducted using the independent variable of CM experience means and dependent variables of performance attributes. The constant determines the overall effect of the variables on the performance attributes. The multiplier R-value was 0.920, p < 0.000; and the multiple R-squared was 0.844, suggesting that the independent variable, PM experience, explains the 92.0% of the variances in performance attributes. Multiple regression analysis was used to evaluate the strength of the relationship among the independent and dependent variables. The regression model summary and coefficients can be interpreted that PM experience had a strong positive correlation with performance attributes.

Table 11. Multiple Regression of CM Experience as a Function of the Performance Attributes

Dependent Variables	*B*	*SEB*	Beta	*t*	*p*<
(Constant)	0.236	0.096		2.459	0.014
Cost Growth	0.238	0.081	0.233	2.960	0.003
Program Schedule	0.074	0.056	0.075	1.312	0.190
Tech Requirements	0.013	0.071	0.013	0.189	0.850
User Requirements	-0.015	0.050	-0.015	-0.293	0.770
Technical Issues	0.070	0.049	0.071	1.441	0.150
Program Risk	0.369	0.056	0.361	6.536	0.000
Cost Control	0.290	0.050	0.285	5.815	0.000
Contractor Performance	-0.062	0.053	-0.064	-1.186	0.236

Independent Variable:	Multiple $R = 0.920$	R-squared = 0.844	$p < 0.000$
CM Experience Mean			

The results of the multiple regression analysis are shown in Table 12. The analysis was conducted using the independent variable of PM training means and dependent variables of performance attributes. The constant determines the overall effect of the variables on the performance attributes. The multiplier R-value was 0.450, $p < 0.000$; and the multiple R-squared was 0.203, suggesting that the independent variable, PM training, explains the 45.0% of the variances in performance attributes. Multiple regression analysis was used to evaluate the strength of the relationship among the independent and dependent variables. The regression model summary and coefficients imply that PM training has a weak positive correlation with performance attributes.

Table 12. Multiple Regression of PM Training as a Function of the Performance Attributes

Dependent Variables	*B*	*SEB*	Beta	*t*	*p*<
(Constant)	0.818	0.231		3.533	0.000
Cost Growth	0.586	0.168	0.446	3.488	0.001
Program Schedule	0.159	0.162	0.125	0.983	0.326
Tech Requirements	0.066	0.196	0.052	0.336	0.737
User Requirements	0.067	0.159	0.052	0.422	0.673
Technical Issues	-0.226	0.159	-0.173	-1.418	0.157
Program Risk	-0.184	0.147	-0.145	-1.252	0.211
Cost Control	0.072	0.144	0.056	0.499	0.618
Contractor Performance	0.029	0.132	0.023	0.223	0.824

Independent Variable: Multiple $R = 0.450$ R-squared = 0.203 $p < 0.000$

PM Training Mean

The results of the multiple regression analysis are shown in Table 13. The analysis was conducted considering the independent variable of PM experience means and dependent variables of performance attributes. The constant determines the overall effect of the variables on the performance attributes. The multiplier R-value was 0.730, $p < 0.000$; and the multiple R-squared was 0.534, suggesting that the independent variable, PM experience, explains the 73.0% of the variances in performance attributes. Multiple regression analysis was used to evaluate the strength of the relationship among the independent and dependent variables. The regression model summary and coefficients imply that PM experience has a moderately positive correlation with performance attributes.

Table 13. Multiple Regression of PM Experience as a Function of the Performance Attributes

Dependent Variables	*B*	*SEB*	Beta	*t*	*p*<
(Constant)	-0.543	0.296		-1.833	0.068
Cost Growth	0.975	0.095	0.701	10.274	0.000
Program Schedule	-0.097	0.103	-0.071	-0.942	0.347
Tech Requirements	0.014	0.119	0.011	0.116	0.908
User Requirements	0.059	0.087	0.048	0.675	0.500
Technical Issues	-0.006	0.086	-0.004	-0.066	0.948
Program Risk	0.073	0.107	0.053	0.689	0.491
Cost Control	0.060	0.094	0.044	0.636	0.525
Contractor Performance	-0.049	0.090	-0.036	-0.549	0.583

Independent Variable:	Multiple $R = 0.730$	R-squared = 0.534	$p < 0.000$
PM Experience Mean			

***Hypothesis 2*:** There are differences in the relationships between training gaps, experience gaps, and knowledge gaps that contribute to incentive contract arrangements among Defense Acquisition Workforce members in the contracting and program field.

- *Hypothesis 2A*: There is a reliable relationship among experience gaps and knowledge gaps among contracts and program managers.
- *Hypothesis 2B*: There is a reliable relationship among training gaps and knowledge gaps among contracts and program managers.

A Pearson's Correlation (i.e., linear correlation) analysis was conducted between the training gaps, experience gaps, and the knowledge gaps and is recorded in Table 14. For CM knowledge gap and training gap, a strong correlation of $r = 0.898, p < 0.000$ is supported. CM knowledge gap and CM experience gap have a strong correlation of $r = 0.893, p < 0.000$. For program managers (PM) knowledge gap and training gap, a strong correlation of $r = 0.843, p < 0.000$ is supported. PM knowledge gap and CM experience gap have a strong moderate correlation of $r = 0.767, p < 0.000$. Pearson's r correlation results for CM and PM training, experience, and knowledge gaps are presented in Table 14.

Table 14. Results of the Pearson's r Correlation Between Training Gap, Experience Gap, and Knowledge Gap

Variables	N	Pearson's r	Sig.
CM Knowledge Gap - CM Training Gap	445	.898	.000
CM Knowledge Gap - CM Experience Gap	445	.893	.000
PM Knowledge Gap - PM Training Gap	369	.843	.000
PM Knowledge Gap - PM Experience Gap	369	.767	.000

Note. *Correlation is significant at the 0.05 level (two-tailed)

The multiple R-squared was 0.898 and .893, suggesting that the two independent variables, experience gap and training gaps, explain 89.8% and 89.3% of the variances in knowledge gap, respectfully.

Multiple regression analysis was used to evaluate the strength of the relationship among the independent and dependent variables. The regression model summary and coefficients can be interpreted such that knowledge gap and experience gap have a strong positive correlation with knowledge gap.

Table 15 shows the multiple regression of knowledge gap as a function of CM training gap and CM experience gap. There is a strong correlation between the variable of $r = .925, p < 0.000$. This implies that when the CM training gap aligns with experience gaps, knowledge gap will be optimized. Hypothesis H2is supported for CM Training gaps, CM Experience gaps and Knowledge gaps.

Table 15. Multiple Regression of Knowledge Gap as a Function of Training Gap and Experience Gap for the Contracting Group

Variable	*B*	*SEB*	Beta	*t*	*p*<
(Constant)	.160	.089		1.789	.074
CM Training Gap	.430	.035	.458	12.251	.000
CM Experience Gap	.490	.037	.497	13.316	.000
Dependent Variable: Knowledge Gap	Multiple R = 0.925		R-squared = 0.855		p < 0.000

Note. *Correlation is significant at the 0.05 level (two-tailed)

Table 16 shows the multiple regression of knowledge gap as a function of PM training gap and PM experience gap. There is a moderately strong correlation between the variable of $r = .785, p < 0.000$. This implies that when the PM training gap aligns with experience gap, knowledge gap will be moderately optimized. Hypothesis H2 is supported for PM Training Gaps, PM Experience gaps and Knowledge gaps.

Table 16. Multiple Regression of Knowledge Gap as a Function of Training Gap and Experience Gap for the Program Management Group

Variable	*B*	*SEB*	Beta	*t*	*p*<
(Constant)	.913	.161		5.663	.000
PM Training Gap	.554	.066	.458	8.389	.000
PM Experience Gap	.334	.064	.497	5.189	.000
Dependent Variable: Knowledge Gap	Multiple $R = 0.785$		R-squared = 0.616		$p < 0.000$

Note. *Correlation is significant at the 0.05 level (two-tailed)

Research Findings

Summary

With respect to incentive contracting arrangements,

- Moderate (self-assessed) gaps exist in knowledge, training and experience.
- The experience gap, vice the training gap, is perceived to be more closely related to performance outcomes, and Contract Managers see training to be more closely related than do Program Managers.
- Training and experience are highly correlated to knowledge.
- The current state of skill-sets is more about the mechanics, while the desired state is more about creating and developing suitable contracts.
- There are only a few significant differences between Contract Managers and Program Managers regarding assessments of knowledge, training, and experience.

Discussion

Both Program Manager and Contract Manager Respondents reported moderate knowledge, training, and experience gaps amongst their organization personnel who implement incentive contract arrangements.

Knowledge associated with contractor incentives, and associated incentive contracting approaches and techniques, are necessary elements in addressing performance obstacles. Our research indicates that both Program Managers and Contract Managers perceive a strong relationship between both the observed *training gap* and *experience gap* to the observed *knowledge* gap.

Our research suggests that *experience*, rather than *training*, is more closely identified with performance issues using incentive arrangements. More specifically, with a noted exception, respondents did not strongly relate the observed *training* gap as impacting skill-sets needed to address acquisition obstacles (e.g., “Unexpected Cost Growth,” “Changes in Program Schedules,” “Changes in Technical Requirements,” “Changes in User Requirements,” Technical Issues,” and “Program Risk”). The exception was Contract Manager Respondents who more strongly identified the relationship between *training* gaps

and meeting performance challenges but reached the strongest only for the cost-related acquisition obstacles (e.g., “Unexpected Cost Growth” and “Cost Control”).

Our survey asked Contract Managers (Contracting Officers and Contract Specialists) and Program Managers (Program Managers and Deputy Program Managers) to self-assess their “current” and “should be” levels of performance in working with incentive contract arrangements, thereby allowing visibility of any perceived gaps. Our research also asked Contract Managers and Program Managers to assess each other.

Using a 6-point Likert scale, Contract Managers self-assessed themselves near the middle of the range and indicated they needed to increase performance levels, significantly from the current state. Program Manager assessments of Contract Manager performance level were very closely aligned with those of the Contract Manager self-assessments previously mentioned and corroborated what the research confirmed.

The Program Manager self-assessments were very similar to both the Contract Managers’ self-assessments and the Contract Managers’ assessments of Program Managers except when it came to the assessment of Deputy Program Managers, where there was more than a 2-point gap (Current = 2.0 or “understands benefits,” while Should-be = 4.05 or “analysis of risks”).

As expected, a strong relationship was noted between the observed training and experience gaps and knowledge gaps, suggesting that reducing training/experience gaps could also reduce any knowledge gaps.

Qualitative Data

The respondents provided over 6,000 comments, and the following is a representative sample of the strengths and/or shortcomings of the application of incentive contracts.

Knowledge

- “Contractor outcomes—profit/fee—were higher than they should have been because personnel routinely failed to hold contractors to the criteria found in the Award or Incentive plans.”
- “I think people don’t want to use contract types they don’t fully understand.”
- “I strongly believe that incentive contracts are necessary at my command and have recommended them after being brought on. It was acknowledged that this is the best contract type in the interest of our program, but overly complicated and burdensome given the lack of training of our staff.”
- “KO was unable to write the outcomes to meet my program outcomes. I was pushed to use FFP or CPFF or IDIQ arrangements because KO did not fully understand the formation of award fee contracts.”
- “Not sure all of my people are good at thinking through how different incentive structures will cause the contractor to behave. Incentives other than cost are particularly tricky and I generally shy away from them because I sense that the contractor will ‘outfox‘ us and we will end up regretting the structure down the road.”

Training

- “People had the training, but did not understand how to use it in their duties.”
- “Most time is spent trying to apply mechanics of type rather than truly implementing meaningful measures.”

- "The biggest problem is developing meaningful criteria. Services acquisition are very hard to 'incentivize.' The wording of the meaningful criteria is the bigger problem than coming up with 10, 20, 30 percent incentive. That is simple math."
- "Because we don't have good command level training for how to administer these overly complex contracts, everyone struggles to efficiently do their work."
- "Lack of training is the biggest problem."
- "We do not receive enough training to understand these concepts enough to execute effectively."

Experience

- "Experience is the main driver of shortfalls. Not everybody is in situations where they are using CPAF, FPIF, or CPIF contracts regularly."
- "This lack of experience, understanding and training makes it very difficult to effectively utilize these contract types."
- "Nobody seems to know what to do, if and when we use it and/or the required information is not passed to the field.
- "Experience seems to drive individuals to contracts that they are familiar with."
- "Lack of experience with multiple contract types can cause under-performance."
- "The lack of experience outs (place) the government at a disadvantage in execution of these types of contracts."
- "There's just no substitute for experience, not IQ, not education. With experience comes intuition, and it's intuition that recognizes what flies and what doesn't. Oftentimes, people are thrust into programs and projects for which they lack a basis for making informed decisions about the future."

Recommendations

1. Ensure incentive contract development training be reinvigorated for PMs and CMs to fully understand the fundamental principles and benefits of incentive contracts as well as provide a rigorous setting where they can practice designing incentive contracts and applying them.
2. Identify the lessons learned from successful and unsuccessful incentive arrangements within the past 10 years and make them available across the defense acquisition workforce; incorporate these to the greatest extent possible into existing courseware.
3. Produce an incentive and award fee guidebook that addresses the performance attributes identified in this study and address the question "How do I write an incentive arrangement?" to include incorporating performance attributes that lead to achievement of the PM's goals and outcomes.
4. Ensure the appropriate acquisition workforce qualification competencies (or any variation thereof) incorporate the key standards that address incentive and award fee contract proficiencies that are assignment specific.

5. Recommend that the Functional Integrated Product Team (FIPT) explore a wide range of competencies that are specifically tuned to the implementation of incentive arrangements for PMs and CMs in assignment specific positions.
6. Conduct a follow on study to address the relationship between knowledge, performance, and the applicable regulations.

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