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Introducing Prospect Theory into Defense Acquisition Strategy: Framing Early Decisions for Joint Warfighting Advantage

June 2026

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

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ABSTRACT

In an age of renewed great-power competition, accelerating acquisition processes is a necessity. Achieving speed, however, depends on refining the early framing and conceptual phases of programs to deliver value to the warfighter and enable Joint Warfighting Concepts. This study introduces prospect theory, developed by Kahneman and Tversky, as a decision tool for understanding how pressures related to time, cost, schedule, and risk can distort choice sets in major defense acquisition programs (MDAPs). These pressures can introduce biases that override objective analysis and logical acquisition pathways. Through an analysis of acquisition behavior and program documentation related to the Littoral Combat Ship (LCS) and the Integrated Combat System (ICS), this study shows how misaligned framing can lead to prolonged corrective actions, while alignment with acquisition best practices and Joint Force requirements can improve program outcomes. The study further proposes artificial intelligence (AI) as an auditing tool to identify early bias and improve alignment among acquisition pathways, force-structure development, and Joint Force capability needs.



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ACKNOWLEDGMENTS

For Live, Mom and Pa.



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LIST OF ACRONYMS AND ABBREVIATIONS

ADM	Acquisition Decision Memorandum
AGS	Advanced Gun System
AI	Artificial Intelligence
AOR	Area of Operations
ASUW	Anti-Surface Warfare
AWS	AEGIS Weapons System
CBO	Congressional Budget Office
CI/CD	Continuous Integration / Continuous Development
CLF	Combat Logistics Force
COEA	Cost and Operational Evaluation and Analysis
CONOPS	Concept of Operations
COP	Common Operating Picture
CRS	Congressional Research Service
CSBA	Center for Strategic and Budgetary Assessments
DAS	Defense Acquisition System
DMO	Distributed Maritime Operations
DOW	Department of War
DOWI	Department of War Instruction
EO	Executive Order
EUT	Expected Utility Theory
FAC	Fast Attack Craft
FYDP	Future-Year Development Plan
GAO	Government Accountability Office
HASC	House Armed Services Committee
HD	Human-Decision
HW/SW	Hardware/Software
IB	Industrial Base
ICS	Integrated Combat System
IOC	Initial Operation Capability
J1/J2	Juncture 1 and Juncture 2



JADC2	Joint All Domain Command and Control
JCIDS	Joint Capabilities Integration and Development System
JCS	Joint Chiefs of Staff
JROC	Joint Requirements Oversight Council
JWC	Joint Warfighting Concept
LCS	Littoral Combat Ship
LOE	Line of Effort
MDAP	Major Defense Acquisition Program
MILSPEC	Military Specification
MIW	Mine Warfare
MTW	Major Theater War
NAVAIR	Naval Air Systems Command
NAVORD	Naval Ordnance Systems Command
NAVSEA	Naval Sea Systems Command
NAVSHIPS	Naval Ships Systems Command
NSS	National Security Strategy
O&M	Operation and Maintenance
OA-COTS	Open Architecture Commercial Off-the-Shelf
ONV	Objective Net Value
OSD	Office of the Secretary of Defense
PPBE	Planning, Programming, Budgeting, and Execution
PRC	People's Republic of China
PT	Prospect Theory
QDR	Quadrennial Defense Review
RP	Reference Point
RRAB	Requirements and Resourcing Alignment Board
RSR&E	Research, Development, Testing and Experimentation
SSDS	Ship Self-Defense System
SUW	Surface Warfare
TFBN	Total Force Battle Network
TLAM	Tomahawk Land Attack Missile
TSBF	Total Ships Battle Force



TTP	Tactics, Training and Programs
USV	Unmanned Surface Vessel
VCJCS	Vice Chairman of the Joint Chiefs of Staff
WAS	Warfare Acquisition System



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DISCLOSURES

With advisor approval, I used OpenAI's ChatGPT in two limited and distinct ways during this thesis. First, ChatGPT was used as part of the research design and experimentation to generate simulated defense-planner outputs under prospect theory gain- and loss-frame conditions. This use is described in the methodology and analysis sections of the report and was treated as part of the study's experimental process, not as an independent factual source. Second, ChatGPT was used in a limited writing-support capacity to identify spelling errors, minor grammar issues, punctuation concerns, and sentence-level clarity problems. It was not used to create the thesis argument, develop the research questions, invent the core concepts, select the methodology, or determine the analytical conclusions.

All core ideas, concepts, research design choices, analytical processes, interpretations, and final conclusions were developed and derived by the author. When AI-assisted editing suggestions were reviewed, the author retained the original context and meaning, rejected suggestions that changed substance, and made all final decisions regarding wording. To mitigate risks associated with generative AI, including hallucinated information, inaccurate citations, altered meaning, or unintended changes to the author's voice, all AI outputs were reviewed manually. Factual claims, citations, and source references were checked against the original source material, and no AI-generated factual claim was incorporated without verification.



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I. INTRODUCTION

Leaders are judged by the quality of their decisions.

—Garvin and Roberto

Given the stakes for warfighting systems, it could be assumed that leaders would put all effort into decision making, treating it as a process rather than just an event (Garvin & Roberto, 2001, p. 108). However, the latter is true. Leaders do not often get decisions right and treat decisions more like a “distinct choice” (Garvin & Roberto, 2001, p. 109). Add in the haste to act and the uncertainties of the “self-reinforcing” external dynamics, such as a new grand strategy and a new geopolitical challenge presented to the world at any given time, the decision sets, no matter what, end up passing through the individual first, rather than a process (Schreyögg & Sydow, 2010, p. 3). This puts the acquisition professional in a tough spot with all eyes on.

Operating with uncertainty simply is part of the human experience (Kahneman & Tversky, 1979). With success and failure arguably driven by two forces—behaviors and power, i.e., the allocation of resources—it is crucial that the acquisition professional recognize methods to improve “critical thinking,” “decisions and recommendation processes,” to better align the strategy planning phases with the overall strategic intent (Flyvbjerg, 2023, p. 17; Mortlock, 2020, p. 200). In understanding behavioral patterns, through the study of behavioral frameworks such as prospect theory, defense planners can learn to adapt decision behaviors and accelerate acquisition processes. Specifically in the early phase where debates, institutional norms and bureaucratic drag can backlog a program already at the beginning. The key is to gain confidence early through behavioral actions in implementing key enablers, such as authorities (or leadership), institutional process improvements (i.e., behavioral decision models) and decision assistance tools such as human-Artificial Intelligence (AI) interfaces.

The idea of applying prospect theory to warfighting acquisitions has not been explored. With the issuance of Executive Order 14265 in November 2025, which first and foremost redesignated the Defense Acquisition System (DAS) as the Warfighting



Acquisition System (WAS) and treat the whole acquisition ecosystem as a “warfare function” (Trump, 2025, para. 1–2). This is where the initial framing stages sets the tone for success and failure. Whether to focus on a large combatant program or a hybrid mix of unmanned and small combatant forces, PT can provide early framing analysis at the conceptual level, like behavioral finance, to provide decision assistance to the acquisition professional.

With the warfighter as the end user, PT’s relevance in consumer choice behavior could provide insights into acquisition behaviors (Gourville, 2024, p. 1). Given the undulating nature of geopolitical events and the strategic-level strategies that aim to follow the rolling waves of the security environment, prospect theory may be a way to filter subjective perceptions into objective decisions—effectively, how the objective realities are perceived by defense planners given the pressures of the moment.

A. WHAT COMPLICATES THINGS

Take President John F. Kennedy’s 1961 special address to Congress, in which a commitment to land on the moon was made, along with the declaration of the “freedom doctrine” (Kennedy, 1961, para. 3). In it, Kennedy declared that “we face an extraordinary challenge” in, yet again, “extraordinary times” (Kennedy, 1961, para. 3). The speech called for measures to be taken, especially against a rival whose “aggression [that] is more often concealed than open,” and argued for an increase in defense spending to meet the challenges (Kennedy, 1961, para. 7). At the same time, President Kennedy recognized that it is more complicated than it seems, as “there is no single simple policy which meets this challenge” (1961, para. 12).

No matter the epoch, the external pressures facing warfighting acquisitions—of whichever nation, alliance, and in the case of this study, the U.S. Navy—are, from the start, marked by pressures to act fast and get it right from the outset. This places not only policymakers under pressure to do what it takes to avoid allowing anything to derail what was marked as a call to act by a national leader. It is here, that this study seeks to emphasize that the “call to act” and “delivery at speed” is often based on singular, close-range of events that have occurred generating intense perceptions within the minds of policymakers



and military leaders that will influence decision making on weapons programs (Hegseth & Feinberg, 2025, p. 1-2). As it trickles down to the requirements owners, the key issue becomes how the global security environment is perceived relative to perceptions of the status, readiness, and effectiveness of the Joint Force, or, in a narrower setting, the U.S. maritime force structure. Delivering at speed now for a great power challenge may in a decade devolve into a new requirement for another time that may, again, be “extraordinary” (Kennedy, 1961).

It is here that the decision space can become infused with tremendous distortions and given the election cycles of western countries, such external pressures to “think fast” and “act fast,” will always loom (Flyvbjerg, 2023, p. 19). Again, shaping the perceptions of decision makers. As new strategies are implemented, so are the scenarios, that bring about the “prospects” that defense planners need to achieve given the pressure to act (Kahneman & Tversky, 1979, p. 274). In the case of the Navy, the challenges is to transform post-Cold War but still meet current mission obligations, worldwide. Then again, seek transformational systems that would inevitably reintroduce a warfighting readiness requirement akin to the Cold War epoch.

B. PROBLEM STATEMENT

People are limited in their capacity to evaluate “extreme probabilities or unlikely events,” highlighting the problem that no matter the information give, some information will be overlooked and or simply, not available (Kahneman & Tversky, 1979, p. 282). Humans are inevitably our “own,” biggest risk (Flyvbjerg, 2023, p. 190). Given the always-evolving security environment, it is not easy to align strategy with capability. Recent reforms recommended moving away from consensus decision-making toward a more capability-based assessment, in effort to accelerate acquisition process and enhance warfighting capability (Commission on Planning, Programming, Budgeting, and Execution Reform [Commission on PPBE Reform], 2024, p. 1). The key is to know what systems need to be build to, not the other way around in building a strategy to the systems. As the Commission on PPBE Reform identified om 2024, the defense planner has an “insufficient capacity” to assess decisions for “so many high-stakes issues,” which risks creating a



backlog for programs, slowing things down, and, furthermore, limiting “decision trade space,” which can risk hasty decision-making to clear the backlog (Commission on PPBE Reform, 2024, p. 2).

The core problem is the human’s cognitive limitations in decision making stemming from biases, essentially the tendency to “seek information but fail to adjust adequately to subsequent information” (Robbins & Judge, 2026, p. 89). The program decisions for the Littoral Combat Ship (LCS) were not judged objectively, as evident from the heavy effort to signal and convince Navy leaders to accept a small combatant design into maritime transformation efforts. The Integrated Combat System (ICS), on the other hand, represents an evolution of the AEGIS Weapon System (AWS), shifting from local, centralized weapons control toward a fleet-wide, converged, integrated combat systems force model built around common hardware and software (HW/SW) architecture (Naval Sea Systems Command [NAVSEA], 2022, p. 3).

The main problem for LCS is that it was oversold, where ICS was undersold. The latter was valued added while LCS struggled to achieve any meaningful value. Initially conceived as a “focused-mission ship,” the technologies, such as supporting network centric warfare capable, fast moving, high payload, sustainable and survivable ships were simply immature (O’Rourke, 2005, p. 19). It did not enable network-centric warfighting concepts as initially thought. On the other hand, through Project Overmatch and ICS, existing platform and future platform will be updated to a “scalable, netted combat system,” that will effectively support Distributed Maritime Operations (Franchetti, 2024, para. 32). Something that LCS could not achieve with ship procurement rates or capability. ICS is, on the other hand, achieving “decision superiority” and “lethality” at machine speed (Franchetti, 2024, para. 33).

The problem centers around shifting reference points and the perception of these at the time of the decision making. For example, few expected a remerging Russia or China that would require a rethink of the military strategy. It illuminates the points that shifting reference points inevitably overlook the improbable even though it may have been presented to defense planners as probable.



Using precepts of prospect theory and a study of two programs—one flawed, the LCS program, and one effective program, ICS program—the plan is to learn *how* defense planners behaved and develop a model that can improve decision making in the early conceptual phases of a program. The first challenge to mitigate is our own. As Flyvbjerg (2023) noted, “we are our own biggest risk” p. 190).

C. PURPOSE STATEMENT

This study aims to support recent acquisition reforms and to address how to set that tone early—using prospect theory framing and decision audit tools via human-AI interfaces—to provide explanatory solutions to potential choice sets in the initial program phases. The research seeks to contribute dynamics that can service the early acquisition decision process with greater confidence, speed and certainty. By learning from previous acquisition decisions in the LCS and ICS cases, decision behaviors can be examined through PT framing and an analytical AI lens to build a model for framing decision sets with greater accuracy. This could support better initial program decisions and subsequently reduce debates, biases, distortions, and misperceptions that can slow the formalization process. More importantly, it could reduce decision uncertainty for milestone decision authorities (MDAs).

It is imperative that acquisition strategies today break the pattern early to avoid path dependency—i.e., flawed assumptions carried forward—and recognize how behaviors influence decision-makers, which is where prospect theory, normally implemented in the analysis of economic behavior, can provide a study on *how* defense planners behave. This can help provide early indicators that can be avoided, through understanding “framing effects,” and expand upon other behavioral acquisition research into the challenges of formulating an acquisitions approach (Kahneman & Tversky, 1979, p. 277; Mortlock, 2020, p. 274).

Ultimately, the acquisition process must focus on building a capable Naval force structure that can be sustained and remain operationally ready in any era, whether in renewed great-power competition, or unipolar world seen at the end of the Cold War. Given the complexity of today’s threat landscape but also the “uncertainty” of what is to come,



conceptual designs to meet these threats would need to be evaluated more quickly and with better understanding on how the impact the current system and future system of systems. The current force structure is lagging in meeting the demands of Navy's Distributed Maritime Operations (DMO) concept and maintain persistent readiness for crisis responses (Martin, 2025, p. 13). What prospect theory provides is a way to explore the correlation between strategy and the systems in understanding where risks can be taken or avoided.

D. HYPOTHESIS

A planner needs help. This study intends to explore the use of AI as an analysis and auditing tool to test for distortion levels (i.e., bias) of an objective program analysis using PT framing techniques (tenets). The maxim by Flyvbjerg to “think slow, act fast,” is how “big projected should be approached” (2023, p. 19). However, in an environment where peer actors are driven to overtake the U.S., up front, accelerated planning matters. Instead, the paradigm shift should embrace a “think Fast, act fast” approach but to mitigate mistakes — i.e., flawed assumptions carried forward, a planner needs support. The intent is to create a model that can help decision making.

This research lives in the gap-analysis space within the decision trade space. If decision making is not an incident but an activity—a prolonged process—then it risks being shaped by personal and institutional biases, politics, and even “power plays,” all of which can influence outcomes (Garvin, 2001, p. 110). The question then: Could elements of the decision process be compressed into something closer to a decision event?

Decision quality matters but when the metric is speed, pressure can lead to decisions that can lead to poor prospects due to behavioral pulls towards reference points (Kahneman & Tversky, 1979). Decisions on systems can have “far-reaching impacts on the future of the Navy” which is why “decisions under risk” need to be mitigated (Kahneman & Tversky, 1979; O'Rourke, 2001, p. 1).

Based on the problem statement and purpose statement, this study hypothesizes whether prospect theory principles, applied through gain-and-loss framing and supported by AI analysis, can expose hidden framing, cognitive distortion, and decision bias to shorten the decision window and improve early acquisition decision-making.



E. RESEARCH QUESTIONS

The questions guiding this research are as follows:

1. Can prospect theory assist in identifying the best available decision within complex choice sets that may have long-lasting impacts on maritime force-structure makeup?
2. Can the AI-assisted application of prospect theory help identify cognitive biases and loss/gain framing values in support of improving the transparency, speed, and ethical quality of early acquisition decision-making?

F. RESEARCH METHODOLOGY

The overall research effort was conducted using a hybrid qualitative approach, using two lines of effort (LOEs). The first LOE consisted of a qualitative analysis of program documentation to determine the documentation on the programs analysis, the objective analysis. The second a focus on the documenting the junctures in the maritime transformation life cycle and allocating it to the reference points in support the PT analysis for the AI, subjective simulation.

The objective analysis, using a decision matrix framework, was conducted using program documentation using a scoring range of 1–3, evaluated against the PM constraints of schedule, cost, performance, and technical risk (S-C-P-TR) (DoDI 5000.85, Ch. 1, 2021). The objective scoring range was as follows:

1 – favorable, 2 – mix, 3 – unfavorable (low is better)

Each juncture would incorporate a range of options, that defense planners would have considered at the time. For the *objective net values*, a *decision/criteria weight multiplier* is represented in Table 1 for each juncture. A higher score depicts the level of higher criticality for a criteria. The lower total objective score would win.



Table 1. Criteria multipliers/weighting

Decision Context	Cost	Schedule	Performance	Technical Risk
J1: Post-Cold War Transformation	2	2	2	3
J2: Warfighting Readiness & Integration	3	3	3	2

The *objective net values* (ONV) were calculated using a weighted (w) criteria S-C-P-TR, and as depicted above, adjusted per juncture. The following formula was utilized in calculating the objective net value and the overall objective score:

$$ONV = wC \times CS \text{ (criteria score)}$$

$$ONV = (wC \times C) + (wS \times S) + (wP \times P) + (wR \times R)$$

The second effort applied Prospect Theory (PT) framing to determine the perceived levels of distortion in decision-making using AI to act as simulated respondent from a “surface working group” tasked with formulating requirements and budget priorities. Two primary prompts were developed that were formulated into an AI prompt that included an overall setting, i.e., the juncture, roles, task and the perceived constraints of the juncture. The second part of the AI prompts was modeled after Kahneman and Tversky’s PT framing thought experiment method (1979; 2003, p. 1455). The prompt text included the condition frame, whether loss or gain, the scenario and the two program options, A or B and output section, a short analysis and PT frame score. The PT frame score was the most critical as it would serve as multiplier, or distortion metric against the objective score.

A total of 40 runs (n = 40) are included, with 10 per PT frame, making it a total of 20 runs per juncture with the following AI run plan:

$$n = (10Loss, J1 + 10Gain, J1) + (10Loss, J2 + 10Gain, J2)$$

$$n = 20J1 + 20J2 = 40$$

Run: n(9, 29): add [risk averse]

Run: n(19, 39): add [risk seeking]



A total of 40 AI runs are in the experiment ($n = 40$). Each decision juncture included 20 runs, divided evenly between loss-framed and gain-framed prospect theory conditions. Therefore, J1 included 10 loss-framed runs and 10 gain-framed runs, while J2 included the same distribution. Four runs included minor prompt modifications in the “tasking” section for simulated the defense to add in a simulated sensitivity variable (risk orientation sensitivity). Runs $n=9$ and $n=29$ introduced a project-manager risk-averse condition, while runs $n=19$ and $n=39$ introduced a risk-seeking condition. The following is a table of AI Prompt Run Plan:

Table 2. AI “run” plan

Juncture	PT Frame	Runs	Sensitivity Variable
J1: Post-Cold War Transformation	Loss	10	Run 9: PM risk-averse prompt
J1: Post-Cold War Transformation	Gain	10	Run 19: PM risk-seeking prompt
J2: Warfighting Readiness & Integration	Loss	10	Run 29: PM risk-averse prompt
J2: Warfighting Readiness & Integration	Gain	10	Run 39: PM risk-seeking prompt
Total	Loss + Gain	40	Four modified prompt runs

Importantly, the PT frame was not treated as another decision factor for evaluation, but rather as a simulated disrupter. The intent was to insert a distortion multiplier to measure how a defense planner, simulated by an AI analysis, would alter the decision based on inputs for a change in behavior and the reference point (i.e., prompt scenario).

Each PT frame was assigned a weighted multiplier derived from Kahneman and Tversky’s PT value function, where “loss aversion becomes steeper,” at around the “distortion” values 3 and 4 by a factor of 2–2.25 (1979, 2003, p. 1456). The output will be in the form of a PT frame score:

1 = aligned perception, 2 = low distortion, 3 = moderate distortion, 4 = high distortion

As an example, if Option A reveals a PT score of 2, the objective score of “A” would be multiplied by the following distortion scores:

1 = 1.0, 2 = 1.5, 3 = 2.0, 4 = 2.25



$$PT\ Frame = PT\ Score \times PT\ Multiplier$$

$$PT\ Frame + Objective\ Score = Adjusted\ Score$$

$$Example: PT\ score\ (2) \times 1.5\ (PT\ multiplier) = 3\ (PT\ Frame)$$

$$3\ (PT\ Frame) + 16\ (objective\ score) = 19\ (adjusted\ score)$$

The PT multipliers generated the “appearance” of distortion and aimed to introduce subjective perception to showcase the variance relative to the outcome of the objective for each option (Gourville, 2004, p. 2).

G. SCOPE, ASSUMPTIONS, AND LIMITATIONS

The research analyzes one flawed program—the Littoral Combat Ship—and a more successful program—the Integrated Combat System (ICS)—through the use open-source documentation provided from the Government Accountability Office (GAO), public congressional records, Navy press and program office releases, reports from the Congressional Budget Office (CBO) and Congressional Research Service (CRS), and academic journals and studies. A major limitation is access to internal documentation from the programs that is restricted, particularly acquisition decision memorandums (ADMs), internal presentations, and engineering change proposals that could give insights into specifics such as trade-offs made. The open-source documentation proved to be sufficient in determining the sequence of events, decisions made and inputs into a generic AI model.

The scope for this study included extensive background information (Chapter II) on the two programs under study, warfighting concepts, transformation efforts, historical lessons, acquisition best practices and reforms. Also of note are the three reference points (RPs) used in the PT decision analysis. Chapter III is a focused literature review revolving around the core behavioral theories, path dependency and prospect theory. To include literature on the two programs from various open sources such as GAO, CRS, CBO and studies by CSBA. The outputs and the analysis are covered in Chapter IV, with conclusions in Chapter V.



II. BACKGROUND

The end of the Cold War resulted in a great deal of uncertainty but also gave way to new opportunities (Clinton, 1994, p. 1). With new eras in geopolitics coming and going, so do the debates and decisions in optimizing a force that aligns with the military strategy but also with the grand, national master plan to achieve the “political ends” (Liotta & Lloyd, 2005, p. 29). At the core of the decision problem, no matter the strategic environment, is the resource allocation problem (Liotta & Lloyd, 2005, p. 29). So far, this has been a challenge for Navy leaders. Given the nature of the Navy’s core mission in operating on a global scale, force design requires continuous measures to compose a balanced fleet that can meet the “worldwide demands for crisis response” (Martin, 2025, p. 13). So far this has been a challenge.

There are two distinct causes, or junctures, that make up this struggle. The first is force composition. Essentially the type of ships, such as large, small or even unmanned combatants that, given the era, make up the core of which force planning is centered on. Ships are like buildings with a service life between 30 and 50 years (Martin, 2025, p. 1). It is critical to keep building ships as they not only affect the viability and strength of the industrial base, but remain an integral component of U.S. sea power, force projection and deterrence (Clark et al., 2017, p. 8; Martin, 2025, p. 1). The second juncture revolves around transformation and the implementation strategy, which inevitably pits nested platform-centric planning axioms against new attempts for a system of systems approach, with platforms purpose built to the overall Joint force architecture (O’Rourke, 2001). J2 makes sense from a decision superiority perspective but it does need to be carefully balanced against the axioms of J1. Novel ideas are good and the fleet is in need of an update, so that the fleet remains “lethal, survivable, focused, and tailored for the operations it is likely to face” in an emerging great power environment (Clark et al., 2017, p. 8). Yet, J2, despite its advantages, also needs to consider the imperative of balanced force structure “that can better match its forces to changing demands or wartime priorities” and maintain essential components that can project credible deterrence and power below the “threshold of war” (Congressional Budget Office [CBO], 2015, p. 8; Martin, 2025, p. 77).



The main purposes of the background chapter is a primer on terminology, causes and information on the difference between the two primary junctures that were utilized in the human decision (HD) – AI auditing experimentation. Additionally, an overview of the lack of a gap analysis on LCS. The very idea that sparked the idea for introducing prospect theory as a research topic.

A. JUNCTURE 1: TRANSFORMING THE GARRISON NAVY

Following the collapse of the Soviet Union, new threats and opportunities confronted the United States that required a rethinking of force structure and strategy (Pendley, 2008, p. 61). Sparked by fear in the 1970s that the Soviet Union had surpassed the U.S. in naval superiority, a heavy push to “expand and modernize” the Navy into a 600-ship fleet, or “Garrison Navy,” ensued in the 1980s (Work, 2007, p. 1). The Navy almost achieved the cold war metric, reaching a total of 592 ships in 1989 (CBO, 2015, p. 8; Work, 2014, pp. 1–2). Throughout the 1990s and up until the formalization of LCS as a program in 2004, the Cold War metric remained the primary motivation for navy leaders (GAO, 2022, p. 1).

However, two things happened. The first was the implementation of the Goldwater-Nichols Act in 1986, which effectively reorganized the Department of Defense (DoD) aimed at revitalizing civil-military affairs and shifting the total force to a more Joint operational focus (Perinovic, 2019, p. 127). The second occurrence was the fall of the Soviet Union. The effect on the Navy was arguably heavy. It decoupled the Chief of Naval Operations (CNO) from “long-range force planning,” as the role shifted over to the Joint Chiefs of Staff (JCS), with force planning, such as requirements, now resting within the Joint Capabilities Integration and Development System (JCIDS) process (Perinovic, 2019, p. 131). The Navy lost influence not only over its own maritime force composition but arguably over the *type* of vessels that would be built and fielded.

With the fall of the Soviet Union, there was no specific enemy to plan against. At least for a while until the events of 9/11 and the 2017 NSS declaring a reemergence of great power conflict (Trump, 2017). For defense planning this was significant as Congress invariably showcased notable hesitancy to commit to a force structure plan without



knowing what the threat would be (U.S. Congress, 1990b, p. 14169). Debates ensued over the best path forward and how to balance resources and military commitments. One proposed path was to transform the Navy through a “mix of programs,” that included proposals such as the Arsenal Ship and Streetfighter concept with early iterations of capabilities suited for network-centric warfare (O’Rourke, 2001, p. 5). At the time, the aim was to determine the appetite for accepting unique proposals that could be integrated into early concepts for a new warfighting approach but also address long-term investment concerns (O’Rourke, 2001, p. 9).

1. Finding Balance

The U.S. prevailed in the Cold War due to its technological superiority but equally, due to good force planning and adaptation of “operational concepts” that could compensate for the numerical conventional advantage held by Soviet forces (Work & Grant, 2019, para. 1). Highlighted by both the 1991 and 1994 national security strategies, the collapse certainly brought relief and “extraordinary possibilities,” but also introduced uncertainty, and questions, which inevitably convoluted defense planning (Bush, 1991, pp. 1–2; Clinton, 1994, p. 1).

The Navy, as a result, fell back to the “maintenance” of its force structure, making force planning more or a less a “political adventure” rather than a push to transform systems and the fleet architecture (Perinovic, 2019, p. 128; O’Rourke, 2001, pp. 11–12). Given the potential for non-state volatility in the world, but also the domestic political chasms in and around defense budgeting, the Navy struggled to find its footing (O’Rourke, 2005, p. 19). Concurrently it remained steadfast in pursuing the Cold War metric, quietly pushing programs like DD-21 (Work, 2014, p. 2; CBO, 2015, p. 8). However, the DD-21 programs, along with the Arsenal program would eventually be terminated, with the Navy pursuing a family of ships consisting of DD(X), CG(X) and the LCS platform to be procured (O’Rourke, 2005, p. 7).

2. The Missing AoA: What Led the Prospect Theory Idea

LCS was announced as the Navy’s new surface combatant in November 2001 without conducting an analysis of alternatives (AoA) (O’Rourke, 2016, p. 13). Yet, the



large combatant programs that included DD(X) and SC-21 did so and were terminated. First, the fact that the Navy never conducted an AoA validated that the Navy was never keen on small combatants. Second, it demonstrated the consequences of Goldwater-Nichols, where the CNO lost influence over maritime force planning (Perinovic, 2019, p. 24). Third, it demonstrates the institutional bias in which budget considerations became the only anchor, rather than bona fide maritime requirements. Yet it became the Navy's number one budget priority in 2001 and effectively established a new juncture in Navy force design (O'Rourke, 2005, p. 19).

The missing AoA is what sparked the idea of incorporating PT into acquisitions. LCS lacked proper analysis that would have fortified an analytical foundation for better decision-making. There are three intricate analyses that can help bolster the argument for the need for the program before formalization:

- an analysis to identify capability gaps or mission needs;
- an analysis to compare potential general approaches for filling those capability gaps or mission needs, so as to identify the best or most promising approach; and
- an analysis to refine the approach selected as the best or most promising. (O'Rourke, 2016, p. 13)

Each provides objective analysis and, in some cases, quantitative analysis that can strengthen or weaken the argument for decision-makers. If PT were inserted, the switching costs could have been analyzed, which are the “existing benefits” or “new costs incurred” (Gourville, 2004, p. 2).

To introduce PT, the best way to start is with the following quote: “consumers often reject new products that offer significant improvements over existing products” (Gourville, 2004, p. 1). If something works well, like a good running, why buy a new just because the new car offers a few additional novel things. PT argues that decision-making is ultimately biased, even if the value of an alternative may yield a better outcome. PT rejects the notion that humans act rationally and do not typically aim for the highest expected utility or total benefit but for the net value it brings emotionally (Kahneman & Tversky, 1979, p. 269; Gourville, 2004, p. 2). They do this by reverting back to reference points that is nearest in the mind at the time of the decision making. For this research, this is represented by the



two junctures. Juncture 1 one driven by fleet size, cost and capabilities. Juncture 2 driven by cost, operational effects and warfighting readiness,

For example, assume a scenario involving a small village with 200 people, where *100 people will be saved if Program X is implemented, but with Program Y, there is a 50% chance of saving all people and a 50% chance that all will die*. The quantitative values are exactly the same, but a human, at least typically, would choose Program X because it provides psychological certainty through the words, or perception, that people “will be saved” (scenario adapted from the “Asian Disease Model”) (Kahneman & Tversky, 2003, p. 1458). Reframing it as a loss scenario, *100 people will certainly die with Program X, but if Program Y is implemented, there is a 50% chance that no one will die and a 50% chance that all 200 will die*. Again, the expected number of deaths for all programs is 100, but people will still prefer to choose Program Y because it does not lead to a guaranteed 100 deaths with Program X (Kahneman & Tversky, 2003, p. 1458). In short, in the mind of the human, there is still a chance that some could be saved, maybe even all.

What PT further states is the value of loss and gains, or in other words, what is felt from a decision. In the case of the Navy, OSD overlooked the benefits to be gained from DD-21, such as shipyard viability through procurement rates (schedule), lethality (performance), and possibly even costs in the long run (GAO, 1997, p. 28; Work, 2007, p. 14). For PT, it comes down to the behaviors, or “psychological reactions to gains and losses,” rather than the “objective gains and losses themselves” (Gourville, 2004, p. 2). There may be an antidote to this. The first is to understand this dynamic and guard against it through building an intricate analytical foundation before signing off on a program

3. Winning Traits

To win, a Navy needs “to cause the adversary to shift his own defenses,” and force the enemy into depleting its resources and combat capability that can be subsequently exploited (Rowden et al., 2015, para. 1). To do so, the Navy must operate disbursed where lethality is distributed through cutting-edge means, new tactics, techniques and procedures, that can disrupt enemy operations (Rowden et al., 2015, para. 1).



a. Sustainment

Sustained operations at sea are not easy to execute, and at present, the U.S. maritime force structure is not sufficiently postured to meet global duties (Martin, 2025). The role of surface combatant changed in and around the 1980s as they would be typically used as an escort capability (O'Rourke, 2005, p. 5). With the advent of game-changing technologies such as AEGIS, VLS, and the Tomahawk Land Attack Missile (TLAM), the pendulum swung back to the U.S. The escort mission could transition the surface combatant into a stand-alone, offensive surface combatant of significance, akin to an aircraft carrier's striking power (O'Rourke, 2005, p. 5). What could not be made up in numbers, technology arguably made up for, which led the U.S in edging out the Soviets. The same scenario may be playing out in a very similar fashion with the People's Republic of China (PRC). To sustain warfighting capabilities in operations, a Total Ships Battle Force (TSBF), or the number of "countable" ships, will not work in a future fight, especially against the PRC and the area of operations (AOR). A concept consisting of a Total Force Battle Network (TFBN), with emphasis on "joint, information-based, effects-based operations," namely Distributed Maritime Operations (DMO), may be the only way to aggregate capabilities to overcome PRC force numbers (Work, 2004, p. 20).

If executing DMO warfighting doctrine—dispersing the fleet while concentrating effects—is a key factor in addressing the numerical disadvantage against a peer adversary like the PRC, then sustainment becomes the core requirement for executing that strategy (Chief of Naval Operations, 2024). It is one thing to build a TFBN but it requires a combat logistics force (CLF) to go along with it, as well as a way to replenish not only fuel and logistics at sea but also combat firepower (Martin, 2025). Rearmament at sea continues to be difficult and for now remains not fully solved (Hoang, 2024, para. 4). A good maritime strategy is only as good as its "afloat logistics train," the fuel and supply that service the fleet with a combat logistics force (CLF) spread very thin already (Martin, 2025, pg. 13).

b. Modularity

The aircraft carrier is effectively one of the most glaring examples of modularity (Lewis, 2026). An aircraft carrier with its flat deck can change out its mission package, or



“Air Wing” in a very short period (Lewis, 2026). The F/A-18 program, now almost 45 years old, was built around modularity and multi-role capability, including all-weather, air-to-air, air-to-ground, and airborne electronic attack functions (Naval Air Systems Command [NAVAIR], 2026). Even more, it is capable of tanking missions (Eckstein, 2015, para. 1). LCS envisioned similar features with its concept of modularity and “plug-and fight” mission packages (O’Rourke, 2016b, p. 16). Precedence for small combatants in a defense role for large combatants executing missions on the landward side from afar in coastal areas, makes sense and so does modularity. However, LCS modularity was untested, not fully analyzed and had no precedent of mission configurations applied to surface combatants.

4. Summary

What this study aims to do, in ushering transformation, is to align the acquisition practices—or behaviors—that can help generate a force structure capable of pursuing the right requirements—the kind that don’t just aim for the *moon*. In spite the changes, adapt budget challenges and preserve utility and suitability in future changing security environments. Maintaining a competitive technological advantage is not only critical to enacting sea control, but also to retaining influence in exercising global leadership (Rowden et al., 2015, para. 2). The LCS concept may have been introduced as a reaction to the terminations of a series of large combatants in the 1990s, which resulted in the Navy taking a risk seeking leap with LCS arguably out of fear of losing more (Kahneman & Tversky, 1979, p. 264; O’Rourke, 2005, p. 19). The Navy was institutionally biased towards larger combatants and LCS came as a surprise given the lack of analysis before program formalization in 2004 (GAO, 2022, p. 1). It wasn’t wrong to want another capable large combatant given the success of the multi-mission, DDG-51 Arleigh Burke destroyer that with its powerful sensors such as the *SPY* radar, lethality (VLS capacity) and sonar equipment gave the Navy unmatched capabilities (Work, 2002, p. 64). It was no surprise that Navy leaders remained staunch in their defense against any new combatants, especially unfamiliar types that wouldn’t feature similar capabilities such as the DDG.



B. JUNCTURE 2: WARFIGHTING READINESS

Juncture 2 is driven by yet another shift in the geopolitics, with the PRC moving its industrial base to a “wartime footing” (Chief of Naval Operations [CNO], 2024, p. 6). Yet again, the focus shifted away from sustaining a peace to establishing immediate warfighting readiness given the challenge that PRC has presented to U.S. policy makers.

Consequently, a similar approach must be applied today, in which the United States must readdress how to regain a technological edge capable of compensating for the numerical mismatch with PRC. One critical factor in reestablishing warfighting readiness will involve a significant modification to the TFBN that would be more powerful than old Cold War metric, garrison TSBF Navy. To achieve decision superiority and enable dispersion, a common integrated fleet architecture is the imperative over procuring new platforms (Franchetti, 2024, para. 32–33). By creating common “COTS/Open architectures,” new and legacy platforms must all operate on one system. A challenging but necessary task, legacy ships must be upgraded with modular hardware/software components that enable existing or new weapons to be fired from existing platforms (Work, 2007, p. 95).

The reform of the Defense Acquisition System (DAS) into the Warfighting Acquisition System (WAS) in late 2025 and 2025 *National Security Strategy* (NSS) are examples of concerted, decisive corrective steps towards treating the defense acquisition system as a “warfighting function” that is focused on “speed to capability” and “operational lethality” (Hegseth & Feinberg, 2025, p. 1). In short, the fleet must be strengthened quickly which is an essential element to achieving deterrence and resolving conflict (Trump, 2025, “Peace through Strength,” para. 2). Critical to achieving this superiority will be the technological means, systems, and imperatives, along with the acquisition practices, required to execute a sound strategy with realistic clear-cut goals, that is, overall policy objectives, as well as what the Navy needs to win the fight for the Joint force (Trump, 2025, “The Strategy,” para. 1; Liotta & Lloyd, 2005, p. 122).

Although not fully disseminated to the fleet as an official doctrine, Distributed Maritime Operations (DMO) is a warfighting doctrine that aims for dispersed, distributed



lethality and netcentric warfare (Clarity, 2023, para. 1). In essence, not putting all the eggs in one basket has typically been the Navy’s operating framework with a focus on Carrier Strike Groups. Given the current NSS, DMO is the mechanism to execute the plan, which is the connection between the “ends and the means” to achieve the desired outcomes of the strategy (Trump, 2025, p. 1).

With an expectation for a common operating picture by all players, command and control must have the ability to data share across “disparate platforms,” with platforms purpose built (Clarity, 2023, para. 1). DMO presents several operational challenges but the most prominent is ship quantity requirements and resources to sustain operations (Martin, 2025, pp. 11–12). With an already strained Navy, the force structure remains imbalanced and cannot meet every crisis across the globe (Martin, 2025, p. 13). To make DMO effective, the concepts need sensors and purpose-built platforms so that a reliable Common Operating Picture (COP) all players, have the ability to data share across “disparate platforms” (Clarity, 2023, para. 1).

Another challenge is command and control (C2) and mitigating cognitive vulnerabilities, with risk for decreased initiative (i.e., mission command) and decision paralysis (Clarity, 2023, “Vulnerabilities,” para. 1). Additionally, platforms need to be purpose built that can plug into the network, with reliability, and sustain force connectivity (Clarity, 2023). Another component to enabling DMO is to revitalize legacy shipyards that can build a mix of surface combatants even unmanned Surface Vessels (USVs). (Martin, 2025).

C. WARFIGHTING ACQUISITION SYSTEM (BIG “A”)

Known as Big “A,” the acquisition process within the DOW is executed through three distinct processes: requirements generation, the Planning, Programming, Budgeting, and Execution (PPBE) process, and the Warfighting Acquisition System (WAS). PPBE is schedule-driven as a system of processes, with WAS being event-driven and requirements being threat/capability gap-driven (Commission on PPBE Reform, 2024).



1. Planning, Programming, Budgeting and Execution

PPBE is essentially a resource-allocation process for DOW (Candreva, 2024, p. 217). As a “system of processes,” each phase in the PPBE cycle supports operational planning, force structure, and resource-allocation decision-making; budget formulation and justification; and “program execution” (Candreva, 2024, p. 218). It is not event-driven or threat-driven, but schedule-driven by the budget cycle and the legislative branch, as the primary arbiter for authorizing and appropriating DOW funds. In total, PPBE within the Big “A” framework functions as the programming and budgeting mechanism, and it is up to program managers to determine how to allocate and execute resources for the program’s life cycle relative to funding availability. PPBE also supports the system’s post-development operations in the form of operations and maintenance (O&M) funding. This allows defense systems to be sustained globally in support of the National Security Strategy and makes up an integral part of the program’s total life-cycle costs (Candreva, 2024, p. 218). In the context of PT, the way funding is allocated drives the majority of decision-making, especially the changes that are driven by externalities, which include the geopolitical shifts and even ideological “political party” lines that can influence, or even distort decision sets and program identities (Fordham, 2019).

For maritime acquisition systems, the Chief of Naval Operations (CNO), as the Service chief, can influence maritime capability requirements through the strategy maintained and direction envisioned for the Naval Forces. Through a division of labor organized around a staff, the Office of the Chief of Naval Operations (OPNAV) oversees the incremental PPBE process with a section dedicated to resourcing, program execution and resource advocacy (Candreva, 2024, p. 207). Vastly more complex regarding cycles, dollar amounts and legal constraints, the aim of recent reforms is to get back to the older mechanism. As example, the days of “General Navy Board,” where the board, comprised of experienced naval officers from all ranks—senior, mid-grade and junior, advised the secretary of the Navy and even the president directly on maritime requirements, design, and force requirements (Perinovic, 2025, p. 2).



2. Warfighting Acquisition Systems

The previous requirements process used a “capabilities-based process” and is now based on a portfolio management process (Hegseth, 2025). The previous iteration, formerly the Defense Acquisition System (DAS), collated requirements via the Joint Capabilities Integration and Development System (JCIDS) using a top-down approach to assess, identify, approve, and prioritize joint military capabilities, which was guided by the national defense strategy (Chairman of the Joint Chiefs of Staff [CJCS], 2021). This has shifted to where the components would assess and prioritize the requirements, similar to the practices before the Goldwater-Nichols Act of 1986, where the Chief of Naval Operations served as the principal advisor to OSD on the needs of the Navy (Perinovic, 2019, p. 124). With JCIDS abandoned, the Joint Requirements Oversight Council (JROC) remains in place. The JROC is composed of the component-level chiefs, including the CNO, and with the recent reforms, is now supported by the “Requirements and Resourcing Alignment Board (RRAB), the Vice Chairman of the Joint Chiefs of Staff (VCJCS), and the Deputy Secretary of War” to formulate DOW requirements as follows:

- Streamlining and accelerating the identification of the top priority Joint Force needs and the solutions required to fulfill them;
- Earlier and more rigorous engagement with industry as DoW works to solve operational problems and convert capability gaps into fielded capabilities.
- Greater integration of requirements determination and resource prioritization to ensure budgeting decisions are focused on the most critical needs and can deliver an integrated and effective Joint Force. (Hegseth & Feinberg, 2025, p. 1)

JCIDS was disestablished, with “Military Service requirements determinations now the Military Services’ responsibility” (Hegseth, 2025). The transformation prioritizes accelerated acquisition practices so that “no new review layers or other bureaucratic processes that may impede timely fielding of new technologies or capabilities will be created” (Hegseth, 2025). The evolution of the recent reforms speaks to what this study aims to achieve: that decisions and requirements development should move to the stakeholders closest to the problem, the service components.



3. Event Driven: Formalization of Pathways

Department of War Instruction (DOWI) 5000.02, updated in January 2026 after the November release of EO 14265, formalizes the major capability acquisition (MCA) pathway, the decision reviews, responsibilities and procedures. Guided by the MCA (Figure 1), a program's life cycle is developed around a series of events, namely where milestone [program] decision authority (MDA) serves as the gatekeeper in the program development life cycle (Department of War [DOW], 2020a, 2026a). Decisions to proceed are made based on a number of factors such as risk, complexity and urgency (DOW, 2020/2026, p. 9). With MCA providing one pathway, the operation of the adaptive acquisition framework (AAF) builds in flexibility for program managers. It provides additional pathways that can be exploited and tailored to risk, program strategy and urgency of a warfighting program (DOW, 2020b/2026b).

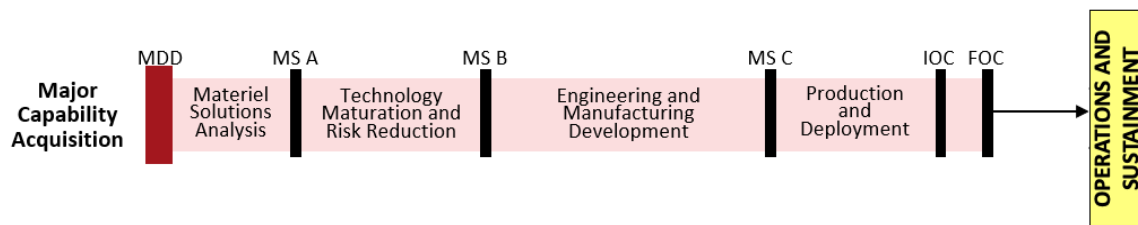


Figure 1. MDAP pathway. Adapted from Department of War (2020a, 2026a)

Within each of the acquisition pathways the milestone decisions serve as critical junctures, not only formalizing a strategy but also creating a type of “path dependency” that as time moves forward becomes harder to reverse course (Schreyögg & Sydow, 2009). With the new reforms, the requirements process will move away from the JCIDS-like process where requirements were defined years in advance through highly technical analysis. The shift will focus on “agile, problem-centric requirements” in supporting “desired operational effects,” with industry and the defense industrial base vital to this new effort (Trump, 2025, para. 1; Hegseth & Feinberg, 2025, p. 5). The aim: to “focus on speed, a “flexible requirements and resource” process by empowering the right people, at the right

level with decision making to get to the first critical juncture faster (Hegseth & Feinberg, 2025, p. 1).

Accelerating the requirement and resources process, however, will come with some risk and as a result require sound decision early and with incomplete information. This will require an understanding of what can influence decisions. An initial factor to success will be leadership involvement in recognizing the distortions that can lead to negative path dependencies. More so, to understand the critical junctures in formulating program strategies with sound decision making under risk (Kahneman & Tversky, 1979)

D. CASE BACKGROUND: LITTORAL COMBAT SHIP

Three major factors influenced the design of the Littoral Combat Ship (LCS): the post–Cold War geopolitical shift, updated warfighting concepts, and a movement towards affordability within defense systems (Johnson & Long, 2007). The end of the Cold War left the U.S. with no peer competitor but a variety of “opponents,” all with their won coastline (CSBA, 2010, p. 5). To conduct power projection conceivably by larger combatants, from sanctuary positions or in areas closer to shore, known as the littorals, a different flavor of anti-access/area-denial (A2/AD) was in play that included sea mines, air and land-based defensive systems, coastal vessel and Fast Attack Craft (FAC) armed with missiles (CSBA, 2009, p. 6). The new threat, not normally encountered in Cold War scenarios, created an impetus for a new combatant, new concept of operations and fresh tactics, training and programs (TTPs). As these threats were closer to shore, a transformational concept with novel technologies for fast, small and minimally manned combatants that were suitable, survivable and capable in defeating littoral threats was needed (Work, 2007, p. 98). With costs the major metric in defense planning, the concept needed to incorporate an overall reduction in operation and maintenance costs (O&M).

1. From Concept to Program

The Navy wanted it all with LCS. It needed to land helicopters, reach sprint speeds of up to 50 kts, cost a fraction of an Arleigh Burke, and change out its mission set in a matter of days (Johnson & Long, 2007, p. 7). Moreover, operate deep in contested littoral areas, near shore and in waterways with a high asymmetric threat such as mines, small boat



surface attack swarms and coastal missile batteries. Then, do the mission swaps in and around contested operating areas and get the area cleaned up before other high value ships arrive. From a Sailor standpoint, that is a lot of work, especially with minimally manned crew.

Arguably born from the “Streetfighter” concept through research from Defense Advanced Research Program Agency (DARPA) and a series of wargames that tested “anti-access” operations in the littorals, resulted in a vision for a “family of small ships,” that could go “fast,” be “small, networked and modular,” so that they could get in and out fast but pack in all the capability and missions sets that a regular surface combatant could (Johnson & Long, 2007, p. 7). What ensued from a concept, emerged with support from the then-Secretary of Defense Donald Rumsfeld expected the Navy to accept such a concept given that such a vessel would effectively “kill several birds with one stone” in not only filling in gapped ship force levels but also affordability challenges (Work, 2004, p. 7). The Navy, however, remained staunch in its defense of larger combatants, swayed by in large part by the institutional norms for a fleet architecture metric that included larger combatants as a baseline (Work, 2014, p. 2). Not to mention that the procurement of larger combatants inevitably served the industrial shipyard yard capacity, an important imperative in U.S. seapower (O’Rourke, 1994, p. 59; CSBA, 2020). After “year-long deliberations” with the then CNO, Admiral Clark, and with pressure from OSD, affordability would be the new metric, which would require any proposal for a surface combatant to include a small combatant into the “operational architecture” of a future battle force (Work, 2004, p. 71; Work, 2014, pp. 2–3). A second spur came with the 2001 Quadrennial Defense Review (QDR), which did not favor re-creating a large, heavily armed surface combatant, such as the DD-21 that was “reminiscent” of the battleship. Instead, a “family of ships” that included, the DD(X) (now DDG-1000), CG(X) and a smaller surface combatant with LCS was presented to policy makers for approval as a compromise to several singular, large combatant, focused-mission surface combatant program (Johnson & Long, 2007, p. 8).

What emerged were two ship classes: the Freedom class (LCS-1) and the Independence class (LCS-2) with two different builders. The lead ship, USS Freedom (LCS 1), was christened and launched on September 23, 2006, by the Lockheed Martin-led team



at Marinette Marine, while USS Independence (LCS 2) was laid down on January 19, 2006, and launched on April 28, 2008, by Austal (Lockheed Martin, 2006, para. 2–4; Naval History and Heritage Command, 2024, para. 1–3). Depicted in Figure 2, LCS 1 featured a steel-built monohull with LCS 2 featuring an aluminum trimaran hull design (All Hands, n.d, para. 1).



Figure 2. Two LCS ship classes – Freedom and Independence. Source: Government Accountability Office (2010, p. 3)

A total of 35 LCSs have been built since the start of the program in 2001 (Naval Sea Systems Command [NAVSEA], 2019, para. 1). Initial acquisition cost for a missionized LCS 1 in the early 2000s was estimated at approximately \$470 million (Johnson & Long, 2007, p. 11). Not too far off, was a full missionized Independence-class with a price tag of about \$500 million, while Arleigh Burke-class destroyers (DDG-51) in comparison costing \$1.49 billion, giving you about 3 LCS for the price of one DDG (Work, 2014, p. 39). Both vessels measure approximately 400 ft in length and displace around 3,200 tons, with the LCS 1 variant slightly shorter but heavier between 3,400 and 3,500 tons (NAVSEA, 2019.). This is roughly one-third the displacement of a DDG-51, which measures about 500 ft and displaces close to 10,000 tons (Newdick & Rogoway, 2021, para. 3).

2. Requirements

The requirements for LCS can be broken into two parts: a concept of operations (CONOPS) and performance. The CONOPS, or total system, centered around reconfigurable “battle modularity,” a type of “system of systems” approach to solve the “payload fraction” problem by increasing payload without degrading performance in operational service (Work, 2004, p. 49, p. 140).

Achieving the CONOPS and performance requirements would exceed a long-standing small surface combatant problem of “weight gain,” versus sustaining “performance” whereas a rule of thumb, payloads were limited to about 10–15 % of a ship’s displacement (Work, 2004, p. iii). Getting it to 40%, or just about half of the ship’s displacement and not impacting performance was the challenge. The idea to aggregate the payload using payload packages and off-boarding, unmanned type systems that could maximize mission utility, suitability and flexibility while maintaining its performance requirements (Work, 2004, p. 49). Through improved hull designs, such as the LCS 2 trimaran concept and in LCS 1, the semi-planning monohull allowed the payload fraction to be increased (All Hands, n.d, para. 1). This allowed the payload-to-displacement ratio to be improved upon so that payload integration would not compromise performance.

Performance thresholds for the total system ranged from 40 kts top speed for a fully missionized LCS with an endurance range of 3,800 NM at cruising speeds of 18kts to 50 kts for top speed and endurance of 4,300 NM at a cruising speed of 20 kts (DOW, 2004, p. 7). Core crew requirements were ambitious from 15 to between 40 and 50 total Sailors (DOW, 2004, p. 7). Lastly, the mission payload requirements varied slightly between objective and threshold from 210 metric tons to 180 metric tons for the latter (DOW, 2004, p. 7).

3. The Mission

The overarching mission for LCS was to prosecute the littorals with several mission sets. Particularly, anti-submarine (ASUW), surface warfare (SUW) (e.g., small boat surface attacks) and mine warfare (MIW) (DOW, 2004, p. 3). As LCS was supposed to embody a “systems of systems” consisting of a “platform” and separately its unique



breakthrough performance metrics of “speed, endurance and engineering,” coupled with the third system, “battle modularity” (Work, 2004, p. 49). Here, consisting of a minimally manned core crew, assorted mission modules, mission packages and the reconfiguration support structure (i.e., logistics and maintenance structures) (Work, 2004, p. 49). It would be unprecedented for the Navy to achieve the concept of *battle modularity*, as well as unprecedented success in overcoming long standing institutional norms, that large combatants and carrier strike group would remain the mainstay of Navy force planning (Work, 2004, p. 47).

E. CASE BACKGROUND: INTEGRATED COMBAT SYSTEM AND AEGIS EVOLUTION

The success of the AEGIS Weapons System (AWS) can be attributed to a solid acquisition strategy. At the time of its development in the 1970s, building a transformative weapons control system came from a significant paradigm shift in the 1960s that recognized the importance of merging all the of the ships individual weapons systems into one total combat system as part of the composition and development of the ship itself (Threston, 2009, p. 109). Not the way other way around, where the weapons system was designed around legacy shipbuilding practices (Sutherland et al., 2018, p. 29).

AWS was not just an advanced weapons system but a new mentality of doing business in developing ships for the fleet. AWS incorporated a new “business model,” designed around a union of contractor, government and engineers where shipboard sensors and weapons systems were considered twins, rather than separate entities (Threston, 2009, p. 109). Up until the late 1930s, ships were simply designed around “space and weight” with ships and ordnance acting as separate, distinct lines of effort to be merged later in the development (Sutherland et al., 2018, p. 29). At the time, separate organizations existed with ship acquisition (NAVSHIP) and ordnance (NAVORD), governed each by their own charters (Threston, 2009, p. 109).

This is where the AEGIS development process was revolutionary in putting all lines of effort and the organizations such the AEGIS Weapons Systems Project (at the time called PMO 403), RCA (the contractor) and Combat System Engineering Agent (CSEA)



under one roof. More unique was the creation of a project office (PMS 400) and the creation of a navy project officer with CAPT Wayne E Meyer charged with overall responsibility of the program (Threston, 2009, p. 114). “Instead of pursuing each of the organizations’ charters,,” e.g., the engineers, the contractors and the government, AWS was put under one single organization to pursue “the best technical approach” in unison (Threston, 2009, p. 114).

1. Lessons from AEGIS

What was unique about AWS was not only its operational effects but how it revolutionized shipboard combat systems in creating a total ship concept. Earlier ships would treat the “detect” and “control” function separately, while the engagement part was left to the “ordnance” group as a separate activity (Threston, 2009, p. 111). A key factor in achieving breakthrough performance was how AWS solved the “detect-to-engage” problem through incorporating the combat systems into a single continuum (Threston, 2009, p. 111). Through “speed of effect” as a cornerstone or “performance imperatives,” the reaction times of the combat systems (e.g., the operators onboard the ship) could get a missile away in a few seconds, marking a truly “revolutionary leap” in shipboard air defense (Threston, 2009, p. 113).

Given today’s threat environment, the “speed of effect” is again an important consideration in the design of combat systems and ships. Updating AEGIS baselines based on ship schedules can no longer be sustained in an era where threats and technology are outpacing proprietary hardware and shipyard building rates. Open architecture, commercial-of-the-shelf (OA-COTS) hardware, and modern agile software-development approaches are the only ways to keep pace with emerging threats. Using the lessons and similar approach, the Integrated Warfare System (IWS) project office was established, which through its portfolio management scheme, worked to install and integrate hardware and software systems to bring to life a fleet Integrated Combat System (ICS). Fundamental to the new approach would be yet another revolutionary leap, an “all-digital” environment, like a mobile phones cloud server that can deliver updates and upgrades at the speed of relevance (Franchetti, 2024; Sutherland et al., 2018, p. 27).



2. Requirements

The core requirement for ICS is enabling “fleet wide connectivity,” basically the ability for all elements in the force to have one common, converged combat system (Franchetti, 2024, para. 32–33). Whether a small, unmanned surface vessel (USV), multi-role combatant with AEGIS or even an aircraft carrier featuring a ship self-defense system (SSDS), all will evolve into ICS to become the only and common combat system on all ships in the fleet (Franchetti, 20024, para. 32–33). Through IWS as the organization and “driving force” in achieving a singular ICS, old and new combat systems across the fleet will be managed under one charter, “align [ing] the ICS organization, processes, resources, and acquisition strategy to develop a common tailorable ICS with focused effort” (NAVSEA, 2022).

AEGIS did this in its development process, with stakeholders brought in under one charter. The strategy embraced is a new technical governance approach with common requirements, common interfaces, common HW/SW elements, common standards and processes, and continuous integration/continuous delivery (CI/CD) pipelines (NAVSEA, 2022).

3. A New Business Model

AWS integrates nearly all maritime mission sets of anti-air warfare, ballistic missile defense, sub-surface, surface and strike, making it a highly complex system to upgrade to guarantee premium capabilities (Deluca et al. 2013, p. 1). The legacy AWS business model utilized proprietary software and military specification (MILSPEC) hardware (HW) in upgrading legacy ship baselines (BL), which was irregular and was dictated by the initial construction or midlife building plans of a ship and weapons fielding schedules (Deluca et al., 2013, p. 7).

The new business model aimed to speed up upgrades. By implementing updates periodically, using a continuous development approach (CA/CD) for the software capabilities and for the hardware, through OA-COTS applications, baseline upgrades are not dictated by shipyard schedules but by how fast the developers can improve upon the SW/HW base (Deluca et al., 2013, p. 14). The new methodology should reduce costs and



is a way of keeping pace with “evolving computing technology” (Deluca et al., 2013, p. iii). The techniques to implement ICS and what it will enable critical in a time when “total system integration,” will make difference in overcoming ship-total force deficit to the PRC. The old AWS business model could not accomplish complete fleet integration as each ship left the shipyard with a different baseline depending on when it was built or upgraded. One DDG may have had a better baseline with a better capability than another DDG sailing in the same operating area. With AWS evolving into ICS, the system became “hardware-agnostic” and a “self-software suite,” enabling surface ships to become a true system of the “total system” (Franchetti, 2024b, paras. 32–33).

ICS builds on the AEGIS original business model of “total systems” first thought about by the leadership of CAPT Meyer by treating each ship, platform and even USV as an individual element of one combat system (Threston, 2009). Like the original AWS development method, each of the ships weapons systems, sensors and even sonar, normally built and installed separately before the advent of AEGIS, were treated as an integral to the whole package of AEGIS. Every system on the ship was tied to AEGIS. Furthermore, the engineers, government and contracting entity were treated as an element of AWS integration (Threston, 2009). The same is relevant for ICS, where IWS unites all stakeholders to fuse the combat elements of platforms, sensors, and weapons system into one overarching fleet weapons systems.

The initial iteration of ICS will not be the final product. With CA/CD, iterative and modular practices, continuous updates will be fed to the fleet’s combat system that will be able to keep pace with the threat picture and enable warfighting readiness to “achieve decision superiority and lethality at machine speed” (Franchetti, 2024, para. 34). As AEGIS adapted to the “changing character of war” at the time, so is ICS in meeting the challenges of the time. There is simply no time for a platform centric, bottom-up planning approach, neither may it be relevant any longer given the leap in technologies. A top-down method in bringing together all “emerging” and “disruptive” HW/SW technologies to build a one-of-kind fleet architecture first where platforms are subsequently built and procured to the ICS standard (Franchetti, 2024, para. 23, para. 29; O’Rourke, 2001, p. 12).



To enable the new ecosystem of a “cloud-based development environment,” a combination of software engineering methodologies needs to be leveraged. Namely the modern practices of development (Dev), security (Sec), and operations (Ops) (DevSecOps) procedures that can ensure security, timely updates and performance of the total system and keep pace with the threat picture and technological leaps (Department of War Chief Information Officer [DOW CIO], 2024, p. iv). The life cycle of the system is then developed around “a series of iterations” enacted through a cycle of phases starting with: 1) planning, 2) development, 3) building, 4) testing, 5) releasing, 6) delivery, 7) deployment, 8) operations, 9) monitoring, and lastly, 10) feedback (DOW CIO, 2024, p. 15). The life cycle phases will not only transform the machines but the way operators and developers think where feedback can elicit immediate improvements at faster speed (NAVSEA, 2022).

A notable example of DevSecOps at work is coding through the adoption of continuous integration/continuous development (CI/CD) (Department of Defense [DoD], 2024, p. 12). Small incremental changes are made instead of gigantic, stove-piped sections. DevSecOps stresses an iterative development process to ensure optimal software “performance, security, and operational integrity throughout the entire software life cycle “is maintained from development to deployment and beyond (DoD, 2024, p. 12). ICS is a practical example of current iterative development initiatives, given the complexity and integration, or backward integration, into the AEGIS combat system. Furthermore, DevSecOps in software development—and with the advent of more specific AI models for defense systems—will need to be maximized to increase capabilities quickly, while also serving as evidence of good practices to break path dependencies in software systems. Software improvements are among the first important upgrades in innovating military capabilities. The following Table 3 depicts a comparison of the modernization efforts in creating a singular ICS using current data from NAVSEA PEO IWS, comments/documentation by the CNO in 2024 and the information provided from RAND the duty on AEGIS modernization practices (Deluca et al., 2013).



Table 3. Legacy-IWS comparison table. Adapted from Deluca et al. (2013, p. 12, Table 2.1), Franchetti (2024), NAVSEA (2022)

Dimension	Legacy / Platform Model	ICS / Force-Level Model
Development approach	Platform-specific development.	Common, tailorable ICS; common HW/SW across the Surface Fleet.
Architecture	Tightly coupled HW/SW; custom combat-system solutions.	Hardware-agnostic software; decoupled HW/SW; common compute infrastructure.
Delivery Model	Large, monolithic deliveries; upgrades mainly at new construction or mid-life.	Smaller, more frequent capability delivery through agile, CI/CD, and DevSecOps.
Fleet Effect	Multiple combat systems; different standards, processes, and training pipelines.	Scalable, netted combat system that supports DMO, decision superiority, and system-of-systems operations.

F. SUMMARY

Creating a path dependency is not necessarily a negative thing given the success of AWS and how it served as a blueprint for ICS and future ship development. Transformation success is often marked by a novel concept or well executed development of a weapons, which was the case of former groundbreaking innovations that included Naval gunnery innovations for the battleship and the AEGIS program. It took a bottom-up approach of up-and-coming new graduates from the Naval Academy to develop the idea of aligning guns along the centerline that revolutionize the battleship at the time (Fahey, 2024, p. 12-16). Similar with AEGIS, behavioral changes made the difference which included leadership engagement that understood that an all-stakeholder cooperative approach needed to be implemented under one charter to achieve the “tighter integration” of all the technical elements that made AEGIS into what it can do today. (Threston, 2009, p. 118). To this date, the technology remains unmatched. In the case of ICS, efforts to continue evolving and making ICS “backwards compatible” with AEGIS are evidence of human-intervention strategies that come from the good leadership and acquisition strategies (GAO, 2010, p. 2). By using enablers and best practices, such as innovative evolutionary approaches such as



DevSecOps in software can help mitigate the resource allocation problem to update, exchange and replace obsolescence factors in weapons systems (Wilson, 2023, para. 2; Dunlap, n.d., p. 5).

The debate about bringing back the “Cold War metric” in generating a fleet for a “two-major theater war (MTW) posture,” is what would naturally “drive a good portion of U.S. [JF] readiness and force structure” design (Kosiak et.al., 2001, p. ii). However, it may not be possible any longer given the resource problem, requiring new approaches and measured acquisition strategies that may focus on HW/SW problems first. Instead of a one for one replacement of old versus new platform, the reality is that fleet numbers will not exceed 300 plus ships anytime soon for a host of reasons. What may serve as a better, more relevant measure is to get overall fleet capability and readiness up which starts with a review of technologies, tactics, techniques, and procedures (TTPs) to develop warfighting “strategies or tactics for achieving objectives different from those that they might pursue with a larger fleet” (CBO, 2015, p. 8). The end state may be a “fleet composition” that may be different from what the Navy is used to, as well as policy makers. Achieving greater lethality in today’s age is not contingent on ship count but in the way systems can be upgraded to keep pace with the threat picture and aggregated to achieve operational effects (Franchetti, 2024, para. 32–34). The next chapter discusses the primary literature studied in support of the research methodology and analysis.



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III. LITERATURE REVIEW

The primary focus of the literature review is the merging of prospect theory with acquisition strategies. One focus is the study of transformation and force-design efforts following the collapse of the Soviet Union and the ensuing debates around optimizing force composition. In particular, the review examines the Navy’s debates around admitting small surface combatants into its force design. Early studies on the Littoral Combat Ship (LCS) reflected enthusiasm, while later studies began to address the serious challenges that the program was experiencing as a result of poor acquisition strategies. With decisions made, the counterexample of the Integrated Combat System (ICS) program, as an evolution of the AEGIS Weapon System (AWS), responded with a different strategy and best practices to generate a sound business model for achieving value in the modern era, where warfighting readiness became an imperative. To achieve the lethality and endurance required for distributed maritime operations, a fully integrated, fleet-wide combat system would need to be established (Franchetti, 2024, paras. 32–33). Lastly, a great deal of research was spent on prospect theory and its uses in behavioral acquisition.

A. TRANSFORMATION AND FORCE-DESIGN LITERATURE

A core driver for starting this research came from the issuance of Executive Order (EO) 14265, which marked a new era for “modernizing defense acquisitions” and revitalizing the defense industrial base (IB) (Trump, 2025, paras. 1–2). The announcement was followed by additional guidance to transform the Defense Acquisition System (DAS) into the Warfighting Acquisition System (WAS) and to additionally reform the Joint requirements process (Hegseth, 2025a; Hegseth & Feinberg, 2025b).

These changes marked a refreshed juncture in a lineage of past reforms and transformation efforts that include the Goldwater-Nichols Department of Defense Reorganization Act of 1986 (Perinovic, 2019, p. 124). Conversely, the post–Cold War period sparked a great deal of debate on force design, captured by Kosiak et al.’s *A Strategy for a Long Peace* (2001), on the necessity for transformation efforts and the parallel, requisite ability to maintain global commitments given the new “peace dividend” achieved



after the Cold War (p. ii). Among the focused debates on the strategy surrounding transformation efforts, in particular naval transformation was prominently taken up by defense analysts, O'Rourke, and Work. The study by O'Rourke, *Transformation and the Navy's Tough Choices Ahead* (2001), elaborates on a more overarching strategy and the practical steps concerning transformation efforts. Notable key drivers included signaling transformation efforts, increasing research and development funding (RDT&E) mechanisms to support greater experimentation, and providing reassurance in support of unity of effort (O'Rourke, 2001, pp. 9–10). The studies by Work, which include *The Challenge of Maritime Transformation: Is Bigger Better?* (2002) and *Naval Transformation and the Littoral Combat Ship* (2004), pick up on what O'Rourke and Kosiak et al. left off with. Work narrows the scope of transformation to specific systems, particularly the Navy's, albeit reluctant, choice to introduce small combatants, such as LCS, into its force structure.

Taken together, the literature on transformation strategy and framework serves as a starting point for investigating behavioral factors, similar to economic behavioral factors that PT has been applied to (Gourville, 2004, p. 1). Further analysis is needed on the institutional and cognitive biases, and ultimately the decisions, that misfired on LCS. In particular, the reference point that drove decision-making needs to be understood. In the GAO report *Strong Leadership Is Key to Planning and Executing Stable Weapon Programs* (2010), several enablers were identified for improving program outcomes, in particular, leadership engagement that facilitates positive schedule and cost outcomes. Important to this study are an array of enablers and best practices, among them indispensable front-end planning and establishing a sound business case before starting a program (GAO, 2010, p. 28). Despite, what is missing from further analysis is the application of behavioral factors that drive the business cases. Especially understanding how distortions can affect decisions in the early framing phases that involve the creation of the business case.

B. LCS PROGRAM LITERATURE

With the new “peace dividend” achieved through the reduction of the Soviet threat, generating a sound business case became very difficult for Navy planners given the debates



to moderate funding (U.S. Congress, 1990a, pp. 13584–13585). As the world changed, so did policy and the acquisition ecosystem. Cold War planning tended to revolve around threat-based requirements and with the advent of a new security environment marked by great power struggles, it became urgent to make improvements to the acquisition system. Instead of a threat-based approach, the acquisition system is now geared toward a problem-centric approach, making behavioral acquisition an even more relevant part of acquisition strategies.

Given the reference point that the post–Cold War era shaped, decision-makers oversold LCS as a transformative, affordable system instead of focusing on the core philosophies that were espoused in the readings by Work and O’Rourke on transformation strategies: experimentation, testing and technological maturity (Work, 2004, p. 2; O’Rourke, 2001, p. 29). A series of studies provided by various defense analysts, in particular, the GAO report *Littoral Combat Ship: Actions Needed to Address Significant Operational Challenges and Implement Planned Sustainment Approach* (2022), point to the tragic decision and implementation failures. Specifically, the significant technological and operational suitability issues of the LCS concept (GAO, 2022).

Taken together, the extensive documentation involving LCS was hardly positive following the formalization of the program in 2004, where literature supporting a small combatant were could not be found in an GAO or CRS record before 2001 (GAO, 2022, p. 1). It would be too much to detail all LCS defects from the array of GAO, CRS, RAND and CSBA reports. Rather, the core focus of this study was to identify the decision conditions, institutional behaviors, and acquisition strategies that shaped divergent program outcomes. The defense analyst, Work continued to follow the program’s development in detail with a candid assessment of the status of LCS in *The Littoral Combat Ship: How We Got Here and Why* (2014). The insights served as part as principal context for this capstone research project: when presented with an equivalent prospect, such as two different vessel types with similar capabilities, the one that may gain the most may be overlooked due to behavioral factors and institutional biases that sway decisions (Kahneman & Tversky, 1979, p. 269). With decisions arguably emotionally based, best practices can serve to mitigate the risks in decision-making, but program decisions remain



ultimately aligned to the closest reference points driven by institutional norms and behavioral norms.

C. ICS/AEGIS LITERATURE

Most source material on ICS came from Threston's (2009) *The AEGIS Combat System*, which laid out an excellent understanding of the program strategy employed in the development process. Besides the enablers that made AWS and ICS was the mitigation of behavioral factors that typically derail program development cohesions by bringing together all lines of efforts, requisite contractor, engineering and government groups under a program charter (Threston, 2009). AWS, at the time, was delivered on schedule and within cost (Threston, 2009). In *Warship Design/Combat System Integration: Still a Very Complex Problem*, Sutherland, Johnson, and Valesky (2018) examined the origins of systems engineering, integration practices and the evolution of combat-system design in ships. Institutional norms did not affect ICS as much as they did LCS. Rather, the norms surrounding combat system development were carried forward from AEGIS into ICS to not only improve upon fleet combat system architecture but to derive value and warfighting readiness in enabling top tier operational effects.

Transformation efforts must preference the warfighting advantage, which the Navy had achieved with the initial development of the preeminent combat system for surface combatants with the AEGIS Weapons Systems (AWS) (DeLuca et al., p. xiii, 2013). In *Assessing AEGIS transition to an Open-Architecture Model*, a 2013 RAND study by DeLuca et al., a strategy is a business case was made to modernize AWS to ensure future life-cycle affordability and sustained warfighting capabilities. With remerging geostrategic chasms, decision makers did not have the luxury of time in rebuilding an entirely new combat systems architecture. Inevitably striving to optimize the existing system with the development of the Integrated Combat System (ICS) approach.

With the case established, transformation, however, would bring its own set of challenges in fielding such a complex overhaul (DeLuca et al., 2013, p. xiv). If AWS was a system of systems, ICS would need to mirror the AWS approach by treating each ship as an element of the total system and incorporating a strategy that placed all stakeholders



under one charter (NAVSEA, 2022). Through the use of open-architecture software, an iterative and continuous development approach, and common source-code libraries equivalent across all combatants, ICS featured a pathway toward a fully integrated combat system to enable the number of missions sets of anti-air warfare, ballistic missile defense, surface, sub-surface and strike that great power navy demands (DeLuca et al., 2013, p. 2).

D. BEHAVIORAL THEORY LITERATURE

Typically applied in economic behavior analysis, utility theory considered people as rational actors, where decision choices were assumed to be arranged, weighted, and calculated to achieve the highest expected value (Kahneman & Tversky, 1979, p. 263). It did not account for behavioral factors, where people deviate from rational decision making and are influenced by perception instead of the objective value (Kahneman & Tversky, 1979, p. 263). It is here that Kahneman and Tversky (1979) argue in their paper, *Prospect Theory: Decision under Risk* a “critique” to utility theory or “expected” utility theory (EUT) (p. 263). This is the core philosophy this research aims to explore and related to warfighting acquisitions. To maximize value, subjective perception hampers the right decision. With the core of prospect theory typically applied to economic behavior, there is a current gap in applying behavioral concept over into acquisition practices.

1. Bounded Rationality: Precursor to Prospect Theory

Bounded rationality was originally introduced by Simon in 1955 with his work *A Behavioral Model of Rational Choice* and extended by Kahneman and Tversky’s 1974 work *Judgment under Uncertainty: Heuristics and Biases*. Simon’s work highlighted that although it is intended to act rationally, humans are limited in their capacity to judge all alternatives and naturally revert to the closest reference point. There is only so much time in the day, and given the time limitations and information uncertainty, decision makers operate with the margins of cognitive ability (Somone, 1955, p. 99). In other words, when under pressure, humans do their best but often revert back to their motivations and biases to achieve better expected outcomes (Halevy & Chou, 2014, p. 399).

The study by Halevy and Chou (2014), *How Decisions Happen: Focal Points and Blind Spots in Interdependent Decision Making*, point to what this research points to that



a) despite best efforts, relevant information is overlooked, b) that not “all alternatives are known,” neither all of the consequences and lastly, c) “negative information, once acquired, tends to be more impactful than equivalent positive information” (Halevy & Chou, 2014, p. 398–399). In short, decision making is behavioral.

Broadened by Kahneman (2003) in *Maps of Bounded Rationality: Psychology for Behavioral Economics*, capacity is inhibited given the size of the problem a decision-maker is faced with (Kahneman, 2003, p. 1450). Given this, then what can be done to shape positive outcomes despite uncertainties? The answer lies in understanding and appreciating how we make decisions and to understand how better decisions are made that can then create best practices to help mitigate fallacies, misconceptions and mistakes.

2. Core Theory: Prospect Theory

At the core, PT is about decision making under risk, centered on two points: the “prospects and gambles” (Kahneman & Tversky, p. 263, 1979). Decisions under risk can come in various forms, for example which stock to invest in or which “color to pick at the roulette table” (Holmes et al., 2011, p. 1070). Historically, research has related the analysis of such decisions with normative behavioral models associated with expected utility theory (EUT) (Holmes et al., p. 1070, 2011). Kahneman and Tversky offered a counter argument to EUT asserting that decision making is in fact more subjective (i.e., perception based), effectively a choice between a gamble (or loss) or a prospect (or gain) (Kahneman & Tversky, 1979, p. 263). The perception component of that choice is effectively linked to the last reference point and is subject to sensitivities like a psychological effect that is felt in a gain or loss (Holmes et al., 2011, p. 1076). According to the research, the psychological effect of a loss outweighs the psychological effect that is felt when the gamble resulted in a gain (Kahneman & Tversky, 1979, p. 264).

The concept of PT, as stated in the initial work by Kahneman and Tversky, was established for “prospects” involving “monetary outcomes,” effectively a theory in support of economical behavioral models (1979, p. 274). However, there is room for it to be extended into other decision models, given that PT can be separated into two phases in the “choice process,” an opportunity to be extended into behavioral acquisition models



(Kahneman & Tversky, 1979, p. 274). Specifically, in the early framing stages of a program's acquisition pathway (the “early phase of editing”) and into the first juncture at program approval, or what PT refers to as the “subsequent phase of evaluation” (Kahneman & Tversky, 1979, p. 274).

Given that most cost and schedule overruns in both civilian and defense projects reveal poor planning and flawed decision-making, it is evident that we, as humans—despite technological decision aids—can be our own worst enemy, with the greatest threat often residing within “[our] own head, in [our] behavioral biases” (Flyvbjerg, 2023, p. 190). What prospect theory proposes is that decision makers tend to underweight probable outcomes and instead move toward decisions that, under risk, avoid the option that could produce the largest potential gain. Instead, they are often inclined toward loss-averse decisions (Kahneman & Tversky, 1979, p. 264).

a. PT Stages

EUT asserts that the concern in decision making rests in the final states, which for the acquisition manager is an important consideration. However, the final state is only as good as the decisions and process established in the early framing stages, as PT asserts, the “editing phase,” or the “preliminary phase of the offered prospects” (Kahneman & Tversky, 1979, p. 274). Central to this research is that in one case or program, a good outcome may have been achieved, through aligning and sequencing good decisions along the descriptive pathway and analysis with the overall goal, strategy and requirements. However, in an unsuccessful outcome, the decision points may have been influenced by the relative cognitive and institutional biases perceived in and around the milestone timeframes.

In a follow-on work by Kahneman and Tversky, *Advances in Prospect Theory* the stages are redefined, as 1) framing — i.e., the presentation of acts, the contingencies and outcomes relevant to the decision and 2) valuation, effectively the assessment of the value of each prospect (1992, p. 299). The sensitivities per framing begin to diminish relative to the reference point. Basically, as one moves further away from the last reference point, the



sensitivity, or perceptions relative to that reference point begin to diminish (Kahneman & Tversky, 1992, p. 303).

b. *Gains and Losses*

Adapting PT into consumer behavior, Gourville in his work, *Why Consumers Don't Buy: The Psychology of Product Adaption* (2004), defines prospects as opportunities and differentiates the two into objective and subjective—i.e., the perceptions and sensitivities to the “losses” or “gains” in outcomes (p. 2). Assume the introduction of a new product such as TiVo, which back in the early 2000s was a recorder for live TV programming for playback later (2004, p. 1). It was innovative and at first glance, a win or “gain” for the consumer, as it would allow viewers flexibility when they would want to watch their favorite show. The argument, however, is that the innovation requires “switching costs,” where the consumer would need to perceive the gains as benefits without incurring extra costs (Gourville, 2004, p. 2). Research has shown that this is not always the case and gains typically end up in losses, with costs are incurred, and result in “psychological” switching costs (Gourville, 2004, p. 2). These perceptions are effectively prevalent in all decisions makers or in the case presented by Gourville, where consumers tend to protect their current holdings. In PT terms, decision makers overweight, i.e., favor, what “they currently” have versus what they may have to give up. In the case of TiVo, the switching costs are the costs of another receiver and membership.

A case in point is the example of LCS at the time of its inception. Some argued for a requirement in the littorals using an innovative, new smaller combatant, to usher a new era of warfare with network-centric, distributed operations. Simultaneously, smaller combatants would conceivably lower operational and maintenance costs and if done right, whether through a concept of operations or technology, could offer a vessel with a multi-mission capability of 3 for the price 1 DDG (Work, 2014, p. 39).

c. *Reference Points*

According to PT, the “preferences (appeared to be) [are] determined by attitudes to gains and losses, defined relative to a reference point” (Kahneman & Tversky, 2003, p. 1456). For this study, the junctures are formed around two distinct maritime force-structure



shaping efforts. The first is platform-centric transformation efforts in the post-Cold War period. Specifically, a “grand transformation,” “foremost on the number of ships in its *Total Ship Battle Force* (TSBF) to one that focuses on the aggregate capabilities found in its *Total Force Battle Network* (TFBN) (Work, 2007, p.3). The second is integration/ interoperability-centric efforts, largely driven by HW/SW improvements to improve warfighting readiness and meet reemergent great power demands. For the PT analysis, the adjusted “distortion” scores are measured relative to the junctures, representing the “zero values” from which the deviations of gains and losses are counted from (Kahneman & Tversky, 1979, p. 275).

As Gourville denotes, “reference points matter” (2004, p. 3). In Navy terms, one can associate a reference point to a juncture, such as a shift away from reimagining the “next large fleet,” akin to Cold War large fleet garrisons and into a “networked littoral battle fleet” (Work, 2007, p. 149). Smaller fleets were seen as risky, but evidence suggests that a new approach, the network centric kind, would still overmatch any threat (Work, 2007, p. 149). PT would argue that simply the appearance of smaller combatants would overweight a decision by policy makers for remaining on a path to fund and build larger combatants given the reference point of the “status quo,” that the Navy had never been anything else but a fleet made with large combatants (Gourville, 2004, p. 3).

d. Value Function

A pertinent aspect to this study is the value function derived from Kahneman and Tversky’s thought experiments (1979, p. 277). It hinges on reference points and the relationship to that reference point, i.e., the difference in the perceived value given the reference point (Kahneman & Tversky, 1979, p. 277). There are two aspects to this, which can be graphed. The first is the reference point, which is whatever the “zero value” sum is, such as an asset position, i.e., savings, or even something quantitative, like catching a break in reaching the bus just before it drives off or missing the bus and having to buy another ticket. This leads to the second aspect, the subsequent “magnitude of change (positive or negative) that can be measured from the “zero point on the scale,” i.e., the reference point (Kahneman & Tversky, 1979, p. 275).



e. Best Practices

Recognizing the biases alone is one thing but it is equally important to put into practice actions that can the decision process. Ultimately provide the impetus that can provide value to the warfighter. In *Strong leadership is Key to Planning and Executing Stable Weapons Programs*, leadership engagement, evolutionary and incremental acquisition strategies provided measurable *values* (GAO, 2010). From the study, 21%, or 13 programs, out of 63 MDAPs, that had been in development since 2007, were assessed as stable (GAO, 2010, p. 5). From a value function, little deviation for cost and schedule. Key to the success was not only leadership engagement but also that the programs were characterized by the following stability factors: “clear, defined requirements,” “realistic cost and schedule estimation” and resistance to new requirements” (GAO, 2010, p. pp. 28–29). Each of these stability factors in the context of PT framing become the reference points in not only assessing the value but the decision to make based on how that value may distort or enhance the decision makers viewpoint.

E. GAPS IN KNOWLEDGE

Despite substantial analysis for mostly LCS, AEGIS and IWS/ICS through press-releases and academic studies, there has yet to be an application of prospect theory into behavioral decision-making within acquisition programs. Additionally, limited research exists studying the applications of AI modeling to analyze and audit acquisition decisions and lessons. There is potential for human-decision (HD) and AI decision analysis especially in the space of early framing phases. Even in the preformation phases given the recent improvement and reforms enacted to streamline DOW acquisition practices. A great deal of process improvements has been accomplished over the course of the years with an aim to maintain the warfighting edge in a reemerging peer adversary, great power environment. With process improvements, comes initial confusion and likely even appearances that could drive initiatives which if not analyzed properly may again drive path dependencies. This is where HD-AI decision tools can be applied, especially early to test early pathway and options. The problem is that PT is about emotions and utilizing AI would require a program of emotions. The takeaway is to acknowledge that emotions play



a heavy factor in major decisions, even for weapons systems development and acquisition. To support enablers in good acquisition practices, the reference point has to be understood. Key to is building on the GAO studies, *Strong Leadership is Key to Planning and Executing Stable Weapons Programs* (2010) identified enablers in applying sound decision making. Incrementing capabilities are among others, a key factor identified generating program stability. Understanding the capabilities to better align strategy requirements and performance are a better understanding of reference points which through framing could be measured against cost constraints, debated warfighting concepts, institutional norms, shifting world politics and the national defense strategies.

F. SUMMARY AND THEORETICAL POSITIONING

The goal is to identify as best able to the behavioral and organizational mechanisms that can avoid decisions that are “historically conditioned” (Schreyögg et.al, 2020, p. 690). Given the complexities of weapons systems, the acquisition strategies can become inherently plagued by “timeworn routines, cognitive rigidities and structural inertia” that can, in the case of LCS, mislead transformation (Schreyögg et al., 2020, p. 690). In the case of ICS, the hardships of LCS providing valuable lessons for ICS. The two programs are not alike but showcase two different approaches to the transformation problem sets which is demonstrated in the next chapter of analysis.



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IV. ANALYSIS

In each juncture, the innovations that enable new warfighting concepts, required a shift in perception. “Innovations demand change,” requiring that some things need to be giving up to gain something else. In the case of the initial juncture that shaped the debate around small combatants, the Navy abandoned focused-mission large combatant ships to gain approval for a program to usher in transformation first. In the case of ICS, the loss to revisit large combatants’ concepts to reestablish warfighting capabilities given the urgency of great power competition.

The analysis of juncture 1(J1) revealed a surprising result, with juncture 2 (J2) analysis reaffirming initial assessment on ICS. The modeling resulted in option B as the preferred choice, favoring separate large combatant program over the SC-21 family ships, inclusive LCS. It is unknown the insight that AI may have used outside the prompt guidance and reference provided, as a larger combatant was ultimately assessed to withstand the test of time with its capabilities, more than LCS could (OpenAI, 2026). A large combatant would additionally do what the battleship did back in the 1930s pre-WWII in preserving the industrial shipyard base (Clark et al. 2020, p. 15).

A total of 40 runs were completed, with option B the preferred choice in J1 (Figure 3) and Option C, the preferred choice n J2 (Figure 4). The AI model did what was expected in understanding the context and attached references of each prompt for J1 (Figure 5) and J2 (Figure 6). The following are the direct script/outcomes from the AI model with a researcher, human, post operative analysis.

A. J1 FINDINGS

Applying PT framing to AI as a test between behavioral effects and analytical effects generated useful results. The first prompt served predictably became the test run and framework of the result the model for follow-on outputs. The first set of 20 runs revealed that AI tracked all sources, data points and tasking and accurately analyzed the authors, dates, and source titles. There was no evidence of serious hallucinations in which the outputs would deviate from the context of the prompts. This could be extrapolated by



the AI identifications of two errors, in which a mismatch between a PDF source file name and the actual author of the document was revealed (OpenAI, 2026).

The analysis followed the sequencing of the AI output. Key to the analysis was the metric of variance, as it showcased the difference between the human and AI analyses relative to the loss-gain framing conditions and scenarios presented (Kahneman & Tversky, 1979; Kahneman & Tversky, 1981).

1. N=1 Through n=9, J1 LOSS Frame Condition Findings

The AI did recognize the intent to introduce psychological weighting in each of the runs on the prompts. All 9 run outputs were structured similarly. Table 4 shows the results from the first set of runs, n=1 through n=9, in a LOSS frame condition for J1:

Table 4. AI J1 LOSS framing outputs generated by OpenAI (2026).
Adapted from Kahneman and Tversky (1981)

Interpretation [LOSS/n=1 thru 9]
The behavioral majority favors Option A, 6 of 9 runs. That means the loss frame pulls planners toward the SC-21 family, mainly because it protects against perceived losses in fleet size, affordability, experimentation, and future adaptability.
The adjusted-score model still favors Option B, because Option B starts with the better objective score: 18 versus 20. Even when Option B receives higher loss-frame distortion in several runs, its objective performance advantage keeps its average adjusted score lower: 23.67 versus 25.00.
The objective model favors Option B, while the loss-framed behavioral majority shifts toward Option A. The loss frame creates measurable variance between objective scoring and perceived acquisition choice.
Program Choice: B

2. J1 LOSS Frame Variances

There were adjusted winners in each run, which meant there were no ties. The scores were close between programs A and B. A psychological pull toward A was observed, indicating loss-aversion behavior (Kahneman & Tversky, 1979, p. 269; OpenAI,



2026). In terms of decision-making, this indicates that cost was favored over schedule and technical risk, as affordability was valued over performance (Kahneman & Tversky, 1979, p. 269; OpenAI, 2026). Program A represented a singular, large, focused-mission option with lower technical risk and marketed better performance (Figure 3). The variance between the options was not significant, as the objective score ultimately remained lower than the subjective score. Table 5 depicts the range of scores for n = 1 through n = 9 in a LOSS-frame condition:

Table 5. AI J1 LOSS framing variance results generated by OpenAI (2026)

Measure	Option A	Option B
Declared choices	6	3
Adjusted-score wins	4	5
Tie	0	0
Average PT score	2.67	2.89
Average adjusted score	25.00	23.67
Adjusted-score range	23–26	21–27

3. N=10 Through n=20, J1 GAIN Frame Condition Findings

A psychological pull toward Program A, noting “up-front affordability” was observed. Similar to the LOSS condition, the AI subjective pull did not overcome the objective HD component. Even with the adjusted score, both AI and HD declared Program B as the preferred choice (OpenAI, 2026). As shown in Table 6, the pull toward Program A was recognized, but the AI model ultimately declared Program B as the preferred program choice under the gain-frame condition.



Table 6. AI J1 GAIN framing outputs generated by OpenAI (2026).
Adapted from Kahneman and Tversky (1981)

Interpretation [GAIN frame/n=10 thru 20]
The gain frame pulls the model back toward the objective matrix. Unlike the loss-frame set, where the behavioral majority shifted toward Option A, the gain-frame set produces a slight declared-choice preference for Option B and a strong adjusted-score preference for Option B. Gain framing reduces distortion. Loss framing increased the behavioral pull toward Option A, but gain framing restored alignment with the objective score and favored Option B. Option B wins because it has the better objective score, stronger performance score, and lower average adjusted score. Option A remains analytically important because it captures the transformation logic: affordability, adaptability, distributed operations, and future force-design experimentation. But under the gain-frame condition, that transformation logic does not overcome Option B objective advantage. Program Choice: B

4. J1 GAIN Frame Variances

Table 7 depicts the range of scores, runs n=10 through n=20, in a LOSS frame condition. Three ties were noted in n=12, n=14, and n=17 which through the PT multiplier resulted in the adjusted score, with program B the declared choice. The variance analysis essentially highlights the effect of the reference point.

Table 7. AI J1 GAIN framing variance results generated by OpenAI (2026)

Measure	Option A	Option B
Declared choices	4	6
Adjusted-score wins	0	7
Ties	3	3
Average PT score	1.82	1.45
Average adjusted score	22.82	19.91
Adjusted-score range	21–26	19–21



5. J1 Sensitivity Analysis

AI recognized the sensitivity inputs in the prompts, which supported the initial indications by the AI model that AI possessed faculty to grasp the task direction and consequently structure outputs relative to the prompt. A key finding was that AI produced outputs through the lens of PT effectively, with no hallucinations. Interpretations revealed AI awareness on psychological pulls that could have impacted decision making, a finding this research was after (Kahneman & Tversky, 1979, p. 269; Gourville, 2004, pp. 2–3).

The introduction of a behavioral change did seem to sway the system to consider a pull towards Program A but the score could not overcome the objective results for program B. The same occurred for n=19. Table 8 depicts the behavioral effect versus the analytical effect as follows:

Table 8. J1 sensitivity overview generated by Open AI (2026). Adapted from Kahneman and Tversky (1981)

Run	Frame	Behavioral Input	Declared	Adjusted Winner	Behavioral Effect	Analytical Effect
n=9	LOSS	Risk-averse	A	A	Strong Pull to A	Bias overrides objective logic
n=19	GAIN	Risk-seeking	A	B	Slight pull to A	Objective logic overrides bias

6. J1 Cumulative LOSS-GAIN Variance

Table 9 shows the cumulative LOSS-GAIN variance for J1, with both frames selecting Program B, a version of a focused-mission, large combatant. Of note is how close the scores were. Within this first set of tests, the AI model grasped the concept, revealing that PT framing has potential in interpreting acquisition decision-making relative to a scenario and reference point. Where differences were small, the AI model produced reliable first actions to decipher the variances. In PT terms, these differences can be overlooked if left to HD, relative to the perception of type of reference points/scenario presented at the time of the decision (Kahneman & Tversky, 1979, p. 269).



Table 9. AI J1 GAIN framing variance results generated by OpenAI (2026)

Frame Set	Declared		Avg. “A” Adjusted	Avg. “B” Adjusted	Final Adjusted Choice
	A	B			
Loss n=1–9	4	5	25.00	23.67	B
Gain n=10–20	4	6	22.82	19.91	B
Combined n=1–20	11	9	23.80	21.60	B

7. J1 Cumulative Result

The overall takeaway is that the surface warfare community’s institutional norms were “resolute in their defense of large combatants” (Work, 2014, p. 2). Small warships were not even part of the Navy’s 2001 Cost and Operational Evaluation and Analysis (COEA), with the Navy steadfast in defending the DD-21 land-attack destroyer and follow-on multi-mission CG-21 cruisers (Work, 2014, p. 2). With the reference point set on large combatants, the psychological pull would naturally, without any other factors involved, favor the highest possible prospect for winning approval for a new large-combatant class of ships (Kahneman & Tversky, 1979, p. 269; Work, 2014, p. 2).

However, the reference point shifted quickly. The effects of the post-Cold War budget-constrained environment, combined with the Office of the Secretary of Defense (OSD) quietly signaling that a singular DD-21 would not be supported unless an alternative option included a small-combatant variant, effectually shifted the decision-maker into loss-aversion behavior; that is, what could be salvaged given the new baseline (Kahneman & Tversky, 1979, p. 269; Work, 2014, p. 2). In the end, the reference point shifted toward “salvaging” anything that could resemble something like the DD-21 through a proposal for an SC-21 family of ships, which included a small combatant. Seemingly, this was a “ransom payment to OSD” for presenting a more affordable option for force-structure improvement and transformation. Conversely seen through the lens of PT, it was just a pig covered in lipstick (Work, 2014, p. 3; Kahneman & Tversky, 1979, p. 269).

Table 10 depicts the raw results from the AI model as follows.



Table 10. AI J1 cumulative analysis generated by OpenAI (2026). Adapted from Kahneman and Tversky (1981)

Interpretation [LOSS/GAIN/n=1 thru n=20] The gain frame pulls the model back toward the objective matrix. Unlike the loss-frame set, where the behavioral majority shifted toward Option A, the gain-frame set produces a slight declared-choice preference for Option B and a strong adjusted-score preference for Option B. The key result: Gain framing reduces distortion. Loss framing increased the behavioral pull toward Option A, but gain framing restored alignment with the objective score and favored Option B. Final gain-frame choice: Option B (Large Combatant [DD-21]) Option B wins because it has the better objective score, stronger performance score, and lower average adjusted score. Option A remains analytically important because it captures the transformation logic: affordability, adaptability, distributed operations, and future force-design experimentation. But under the gain-frame condition, that transformation logic does not overcome Option B's objective advantage.

B. J2 FINDINGS

The findings are strictly stripped from the AI outputs following inputs for prompts n= 20 through n=40, which include all J2 (reference point 2) and sources (Figure 6). There was some deviation in how the AI model showcased its output. Words like “interpretation” were left out but the overall structure of the outputs remained similar in structure to the J1 results. A factor for the slight change could be the change in prompt scenario/language and time of day/date/.

1. N=20 Through n=30, J1 LOSS Frame Condition Findings

Table 11 depicts the outputs in a LOSS frame condition for J2 runs n=20 through n=30. Of note is the perception by the AI model on the reference points (Figure 6). There was no mention of imminent, which is not the case present day. Should war be imminent this would create a dramatic shift in the reference point.



Table 11. AI J2 LOSS framing findings generated by OpenAI (2026).
Adapted from Kahneman and Tversky (1981)

[LOSS/n=20 thru n=30]

Final program choice: Option D-Hybrid Fleet / ICS / mixed combatants.

The key finding is:
In J2, the loss frame creates some behavioral pull toward Option C, especially when the planner emphasizes imminent conflict, proven large combatants, and lower technical risk. However, the objective-score gap is too large for the framing effect to overcome. Option D wins every adjusted-score comparison and remains the final recommendation.

2. J2 LOSS Frame Variance

Table 12 revealed a strong correction toward Program D, a hybrid fleet option, over Program C, which prioritized integration of the fleet's combat system (Figure 4). Of note is that the average PT scores differed by a full point, from 3.10 to 2.10. In J1, the difference was meager, at less than 0.5 (see Tables 5 and 7). This included the adjusted score, which in the J2 framing clearly pulled toward Option D, not only because of the objective results but also because the subjective results were better aligned with the reference point of prioritizing fleet integration. Considering the emergent great-power struggle, warfighting readiness becomes the imperative for any risk-seeking new platform, transformation effort, or combat-system architecture. The key driver is schedule: getting the fleet integrated into one common, netted, scalable system (Franchetti, 2024, paras. 32–33).

Table 12. AI J2 LOSS framing variance generated by OpenAI (2026)

Measure	Option C	Option D
Declared choices	3	7
Adjusted-score wins	0	10
Ties	0	0
Average PT score	3.10	2.10
Average adjusted score	35.30	16.40
Adjusted-score range	32–38	14–19



3. J2 N=31 Through n=40, J1 GAIN Frame Condition Findings

Table 13 revealed a option C, but the adjustment pulled the decision back to option D. Option C, in terms of performance, is a viable pathway but schedule and delivering at the speed of relevance is the imperative (Hegseth, 2025). Given the emergent strategic environment, time cannot be wasted, with performance and schedule the priority in fielding capabilities to the fleet (Hegseth, 2025).

Table 13. AI J2 GAIN framing results generated by OpenAI (2026). Adapted from Kahneman and Tversky (1981)

[GAIN/n=31 thru n= 40]
The J2 GAIN frame condition produced a strong preference for option D, the hybrid fleet / ICS / mixed-combatant pathway. Across n=31 through n=40, the AI selected option D in 9 of 10 declared choices. Program C appeared only once, in n=35, where the AI recognized the gain-frame appeal of visible high-end combat mass and traditional large-combatant deterrence. However, even in that run, Program D remained the adjusted-score winner

4. J2 GAIN Frame Variance

The key finding in Table 14 is that the GAIN frame reduced the behavioral pull toward option C (OpenAI, 2026). The AI model treated option D as the better choice given the value it would bring to the fleet through ICS, JADC2 alignment, unmanned integration, and scalable, netted, and mix of systems optimized for distributed lethality (OpenAI, 2026).

Table 14. J2 GAIN frame variance generated by OpenAI (2026)

Measure	Option C	Option D
Declared choices	1	9
Adjusted-score wins	0	10
Ties	0	0
Average PT score	2.30	1.20
Average adjusted score	32.90	14.40
Adjusted-score range	32–35	14–16



5. J1 Sensitivity Analysis

A key takeaway is the aim to achieve cohesion in J2, which AI did not overlook. Option C presented familiarity, especially at both the objective and subjective level, with the Navy in 2011 declaration to build more Flight IIAs DDG-51 Arleigh Burke ships and follow-on advanced Flight III versions to replace the aging Ticonderoga cruiser class (CGs) (Work, 2014, p. 32). At the time there was no emergent great power threat and focusing on high capability platforms and advertently on the industrial base were defensible and reasonable.

With the shift in the strategic environment, where delivering upgrades and warfighting readiness at the speed of relevance became the imperative (Chief of Naval Operations [CNO], 2024). Any pull toward a platform-centric approach should, even in an HD analysis, reveal Option D as the preferred choice. As Adm. Franchetti, the former Chief of Naval Operations (CNO) asserted at WEST 2024, the key is to provide the architecture first, test extensively, and then procure the systems (CNO, 2024, paras. 50–55). A risk-averse pull within a J2 context would always be overridden by the analytical finding that building a new combatant would delay warfighting readiness. Table 15 demonstrates the overwhelming alignment in integration of the force with option D:

Table 15. J2 sensitivity analysis generated from OpenAI (2026). Adapted from Kahneman and Tversky (1979, p. 269)

Run	Frame	Behavioral Input	Declared	Adjusted Winner	Behavioral Effect	Analytical Effect
n=29	LOSS	Risk-averse	C	D	Strong Pull to C	Overridden by objective logic
n=39	GAIN	Risk-seeking	D	D	No pull	Aligned

6. J2 Cumulative LOSS-GAIN Variance

There were no ties, with final adjusted scores yielding Option D as the overwhelming preferred choice. The variances were smaller in J2 than in J1. One reason could be attributed to the scenario and decision sets being clearer in J2. In J1, affordability



was a key driver, so any discriminator other than cost could be overlooked. Technical risk was more favorable for Option D in J2, given the enablers and business model developed by IWS and sound acquisition strategies utilizing COTS, OA, and CI/CD approaches (DeLuca et al., 2013).

Table 16. J2 cumulative LOSS-GAIN variance report. Analysis generated from OpenAI (2026). Adapted from Kahneman and Tversky (1979, p. 269)

Frame Set	Declared		Avg. “A” Adjusted	Avg. “B” Adjusted	Final Adjusted Choice
	A	B			
Loss n=21–30	3	7	35.30	16.40	D
Gain n=31–40	1	9	32.90	14.40	D
Combined n=21–40	4	16	34.10	15.40	D

7. J2 Cumulative Result

A key finding is that the AI model recognized the urgency of integrating the fleet through the given prompt. The AI results validated the sentiments documented in the various program literature and analysis, promoting modular, incremental design of weapon programs. More specifically, they reinforced the importance of oversight and leadership engagement in assessing and monitoring program development intently (GAO, 2010). What was revealed is that the enablers and key factors in stable weapon programs, including current acquisition reforms, provide the necessary impetus, guidance, and guardrails to ensure institutional norms are not carried forward into decision sets. In J2, one could argue that any PT analysis would be superfluous, but it is still worth assessing to determine whether any variance exists, especially when objective scores are narrow.

C. RESEARCHER ANALYSIS (HUMAN)

The “past and present contexts of experience” helps explain how decision-makers adapt to a shift in perception—that is, how the reference point changes (Kahneman & Tversky, 1979, p. 277). This was less evident in J2 because the reference point, including institutional norms, had already shifted toward integration efforts and a high-low mix of combatants (Work, 2014, p. 32).



Both J1 “loss” and “gain” yielded Option B: separate, large-combatant-focused ships. The interpretations reveal alignment between AI and the prompt and that it drew from the content of the sources considering that language from the sources attached were included in the interpretations/outputs. Naturally, AI is an analytical tool but it did consider the psychological inputs provided. Furthermore, it successfully recognized PT as the primary behavioral framework and AI analysis and interpretations produced outputs in a PT context.

Per PT, weighting is an important component of how a decision maker arrives at a decision (Kahneman, 2003, p. 1468). The information presented is the cue. For this experiment, it cannot be known what AI cued in on, except what was given. Therefore, the decision output for Option B, or in J2, for Option D, is “only as salient as the information presented,” and even if adjusted through a new reference point, the “final judgments . . . remain anchored on the initial intuitive impression” (Kahneman, 2003, p. 1468). In this research, that was Option B, given evidence that this is what the warfighter really needed, such as the Sixth Fleet commander in the late 1990s desiring more DD-21-like ships in greater numbers. For Option D, it was the decision to integrate first, then build platforms to the integration standard.

Option B would have been the logical choice, if reframed around the imperative of preserving U.S. shipyards. “Construction and repair shipyards” provide a critical footing for American sea power and, consequently, national security implications (Clark et al., 2020, p. 13). With a PT analysis, the “carriers of value” for each gain or loss, or what needs to be given up to achieve gains could be identified to ensure that the programs chosen affect shipyard viability.

Transformation requires specialization, and government-oriented shipyards are specialized to build a variety of ships, which helps to “reduce cost and improve performance” (Clark et al., 2020, p. 15). Nevertheless, with specialization comes risk, where shipyards building LCS become a niche endeavor. If the government cuts funding from LCS, the shipyard will cease to exist. It is here where Option A increases the risk to the industrial base and schedule, and eventually to costs. With the industrial base geared toward large combatants, small shipyards are hard to maintain; therefore, a small surface



combatant would be beholden to the forces of force-structure and strategy changes (Clark et al., 2020, p. 16). This is where Option A bears a lot of switching costs, with minimal gain, as further examined in the next section.

Given the cost implications and the need, buying into large, higher-capital ships such as the conceptual DD-21 yielded old Navy thinking or “Economy A” thinking (Work, 2014, p. 52). Option B, as a final judgment through the AI analysis, may have revealed that the surface community, despite cost constraints and risk-averse tendencies in the 1990s given the post-Cold War demobilization chasms, may have been staunchly “anchored on the initial intuitive impressions” of the garrison-like Navy (Kahneman, 2003, p. 1468). More specifically, it revealed the persistent idea of large combatants’ operational effectiveness for force structure.

D. SWITCHING COSTS

A case in point is the example of future workload at the two LCS shipyards. In FY2020, the Navy intended to shift procurement of small surface combatants from the LCS program to a new frigate, the FFG(X), which also raised concerns about future workloads and employment levels at the two LCS shipyards (O’Rourke, 2019, p. 6). There are only so many shipyards in the U.S. and the question of where to build the new frigates was relevant, as one of the two LCS shipyard would be awarded the contract for FFG (X). Once the LCS focused shipyards finished their workload of previously procured LCS ships, only one of the two LCS shipyards would end up with work once the FFG(X) was awarded for FY2020 (O’Rourke, 2019, p. 6). Despite a gain for the Navy the net loss may be more significant than first realized as skilled labor (welders, engineers) may become unrecoverable.

This relates back to PT argument about “switching costs” and the difficulty consumers face in accepting a new product over what they already possess (Gourville, 2004, p. 2). Research has shown that consumers typically protect what they already have out of fear of incurring additional costs. That perception can lead to overprotecting current holdings, even when the new product may offer long-term gains. Despite the potential for improvement, the appearance of losing something already in possession can lead decision



makers to choose the options that only appear to offer more gains, when it quantitatively or objectively doesn't.

It is here where PT could make an impact, in the space of analyzing all the alternatives, especially where the margins up front are very small but big in the long-term. It may seem counter argumentative, as PT argues that given the limits on human capacity, we are bound to the last best reference point and effectively one alternative. To relate this to LCS, proponents wanted a small combatant and critics argued that the money would be better served for DDG procurement and for a future additional large combatant. The upfront costs of each of the two programs would be higher. LCS was about one third the cost of a DDG, where DD-21s were roughly double the cost of a DDG for the first DD-21 procured but then assessed to come down to about 1 billion for subsequent DD-21s, equal to a DDG (O'Rourke, 2005, pp. 13–14). O&M costs were also analyzed to be lower for DD-21 by about 30% (Work, 2002, p. 65). Up front the costs appeared and were higher which would naturally trigger dissatisfaction for the consumer, such as Congress or OSD, but if reframed in terms of O&M, mission requirements or even future IB/shipyard viability, a DD-21 would have provided the Navy a bigger gain than an LCS, as it packed double the punch of a DDG with its new Advanced Gun System (AGS) and additional VLS cells (Work, 2002, p. 65). Maybe even a bigger gain for the U.S. IB. The lessons here is how PT can be applied to reveal initial misconceptions that may lead to a path dependency.

Too late for LCS but it seems that the lessons and reforms are making an impact today, where the arguments are being reframed for decision makers on program suitability relative to the needs of the times. With requirements creep and assessed risk on a number of issues, to include the IB, cost and schedule slippage, the Navy terminated FFG-62 without hesitation, cutting losses before the program would become another iteration of LCS (LaGrone, 2025, paras. 8–10). What is central are the perceptions, especially in the first presented decision sets. Hasty decisions are a cause of perceptions or in PT terms, the imminent “cue of information” or reference point presented to the decision maker. The psychological effect is an inclination to “overprotect [ing] current holdings” or in the case of the policy makers protecting a hardened bias, norm or position such as affordability. When presented with a new better product, or in the case of DD-21, it is rejected due to a



subjective feeling or “cue of information” of higher-costs (affordability) when it would have in fact offered more objective, long-term gains (Kahneman, 2003, p. 1468). In the case of J1, avoiding alternatives that could have worked in the interim were rejected, even a long-term solution with DD-21.

E. FRAMING EFFECTS

The isolation effect discounted viable components with “shared alternatives” that could have brought the Navy an immediate counter-littoral option (Kahneman & Tversky, 1979, p. 271). To secure funding at a time when budget cuts were prominent, leaders selected a platform that appeared to save costs, given how it was sold to policy makers: as a Swiss Army knife. The concept, through minimal manning and modularity, was argued to reduce operating costs, thereby offering up more savings to a greater number of ships faster and lead to a path to satisfy proponents of the Cold War metric to get more ships (Work, 2004, p. 4). The initial frame would lead one to think that more ships would equal more capability in which integration, seen as a mere software-related problem, could be resolved after the fact. The mistake was that framing effects of using “minimal manning” or modularity were an assumed subjective feeling for potential of reduced costs. However, no one had tested the operating concept of LCS, neither put real numbers behind the operating concept through an analysis of alternative (AoA) or proper cost estimation of all program elements (O’Rourke, 2005, p. 12). Instead, the isolation effect took hold as preferences towards requirements were cherry-picked. Preferences were broken down into different components that were not fully vetted or understood, leading decision makers to ignore alternative options, even current platforms that could have gapped filled the littoral space while more data could have been collected on the LCS operating concepts. More so, the overlooked success of stand-off weapons, which multi-mission combatants such as the DDG, and aircraft such as the B-2, that could entirely have avoided the littoral as each can operate from sanctuary spaces (Work, 2004, p. 4).

If network-centric warfare was the major transformative effort to be pursued, one could have argued for “superimposing” network-centric capabilities onto the existing force, at least for the time being, until different platform options and needs could have been



studied and tested (O'Rourke, 2001, p. 11). It may have been only a temporary “veneer” but it was something that could have exposed the type of platforms and TTPs before committing to a platform, which has a service life between 30 and 50 years (Martin, 2025, p. 1). The problem resided on chasing certainty through loss aversion behavior, so that a program could get through the JCDIS decision cycle before an analysis would have reframed LCS in a different light that would have risked formalization/approval. The last thing a decision maker would want is to experience more loss and dissatisfaction, acting to avoid it (Kahneman & Tversky, 1979, p. 271).

The alternatives, including current operational platforms could have experimented with off-boarding systems (unmanned systems) and first iterations of the ICS efforts in embracing OA/COTS HW/SW components for testing/experimentation. The fleet, in the absence of a final decision for a vessel, could have been tested in the real-world laboratories, what would become the standard all vessels should be optimized and built to (Franchetti, 2024, paras. 52–53).

Such possibilities, which bore comparable alternatives and operational effects, were underweighted or overlooked to chase certainties in funding. Likely, even reputations were involved, given that LCS became the face of the Navy's transformation efforts. Furthermore, this drove “risk-averse” behaviors by avoiding combatants that could have provided better gains for the force structure, such as a revived frigate program. Instead, defense planners sought to pursue a risky concept with LCS, which resulted in losses, specifically sunk costs and performance losses.

J2 may have seemed obvious that Option D would prevail. It would make sense, even from a subjective or objective standpoint, to focus RDT&E dollars and eventually procurement dollars on a new platform after having experimented, tested, and integrated essential HW/SW components of ICS into the fleet. The lesson from J2, effectively ICS, was that defense planners refocused their efforts on systems based on “how they make sense within a future force architecture” (O'Rourke, 2001, p. 15), not whether they swap a new capability for an old capability being retired (O'Rourke, 2001, p. 15).



Framing effects matter because they can provide indicators for how a program should be justified and assessed. More importantly, they can help reveal how a program is perceived and whether that perception is overriding objective net value through institutional biases, distortions, and pressures, or whether the perception is warranted because the reference point has shifted. What this study revealed is that AI did not consider the reference point, but considered the sources listed and likely its own analytical reasoning in determining its own version of the more suitable analysis. AI revealed itself to be objective, despite an attempt to bias it with the PT multiplier to influence or weight the objective values.

More surprisingly, the AI system's preferred choice was Program B, over Program A. Program A provided what the human based researcher believed as a compromise. It may have been known that CG(X) or DD(X) would have been surprising gains and prospect but not realities given the budget environment. Presented with the choice set, without an AI tool, the researcher would have applied a PT frame of 2 (minor distortion) which would have driven the overall adjusted score down 24, equal to Option B. Given the reference point that may have been more realistic, e.g., fear of budget cuts (a form of risk aversion), the decision maker (without an AI tool) would have given Option A more weight given what could be seen as a compromise. This would have been independent of the ensuing acquisition strategies developed surrounding LCS. The reference point shift could come in many forms, a new overarching strategy, or, more severely, a war requiring immediate decisive operations. In that case, framing may matter less than overall utility, as costs become somewhat irrelevant at this stage. However, where schedule becomes very relevant to ensure systems are field to help prosecute the war and achieve the required strategic effects.

F. TRANSFORMATION FALLACIES

Maintaining a competitive technological advantage is not only critical to enacting sea control, but also to retaining influence in exercising global leadership (Rowden et al., 2015, para. 2). The LCS concept may have been introduced as a reactive response and risk-



averse behavior, given the terminations of the Arsenal Ship and DD-21 programs (Kahneman & Tversky, 1979, p. 264; O'Rourke, 2005, p. 19).

The fact is that the Navy was institutionally biased toward larger combatants. In the early 2000s, as a new juncture emerged, heavy debates followed. For one, the multi-mission DDG-51 Arleigh Burke destroyer class was a very successful program, providing capability in anti-access environments through powerful sensors such as the SPY radar, offensive strike capability through its array of VLS cells, and sonar equipment (Work, 2002, p. 64).

The debate, however, carried over into whether to build more focused-mission ships, such as the Arsenal Ship as a littoral battle cruiser with 500+ VLS tubes, a smaller single surface combatant such as the LCS, or a mid-range frigate option that, for some reason, was often overlooked in the large-versus-small debate (Work, 2002, p. 64). What resulted was neither the Arsenal Ship nor a continuation of the Oliver Hazard Perry-class frigate, but an entirely new small surface combatant (Work, 2002, p. 64). As the PT analysis revealed, the reference point remained hinged on a large-combatant Navy.

In the 1942 attempt to bombard Dieppe, a northern French town situated by the English Channel, the use of heavy ships was called off because the risk of using capital ships was too high (Benbow, 2021, p. 689). There are surely many other examples of successful bombardments, but those are beyond the scope of this research. Nevertheless, this example highlights how “framing” can affect perceptions around a program. At first, it makes perfect sense to build a large, heavy ship that, on paper, can provide long-range naval bombardment. This had relevance, or tremendous gain in World War II, even if tacticians would not end up using capital ships given the shifting operational objectives. With the United States becoming the largest economy and world power in 1890, capital ships have since become a “symbol of patriotism” and an instrument of power in protecting overseas assets that were beginning to form as the United States became the world’s largest economy in the late 19th century (Fordham, 2019, p. 436). It is why Navy leaders continue to see large combatants as integral in that “tailoring deterrence” (Bunn, 2007, p. 4).



Frontline commanders, the very customers acquisition aims to serve, rejected notions of using a smaller combatant to bolster fleet numbers. With the then-commander of the U.S. Sixth Fleet (CSF6) in 2001 disapproved of the idea for a greater role of small combatants in the future fleet (Work, 2002, pp. 20–21). This is arguably an example of subjective bias that was hesitant (i.e., loss averse) in the aid of transforming the Navy through a new novel concept. Given the findings of the PT experiment, the issue was psychological in nature. Appearances mattered, which is why DD-21 may have been favored by the then-commander of the U.S. Sixth Fleet in 2001, who called for more DD-21s (Work, 2007, p. 2). Objective realities did not carry the same weight, as a small combatant may not carry the same national prestige or play the same critical role in foreign policy as an instrument of power and power projection (Fordham, 2019, p. 437).

The mistake in the 1990s was that institutional biases constrained potential alternative options in formulating requirements that could have survived the pace of the fiscal chasms at the time. Naval leaders were not eager to accept small combatants but eventually were met by genuine efforts to find a compromise. This was not so much a compromise in capability, but in how it could be framed so that a new transformative program, with whichever novel concept and design, could make it over the hump for approval. With the SC-21 announcement in November 2001, LCS was effectively born as the “low-end” side of the new naval architecture, with the proposed DD(X) and CG(X) representing a seemingly compromised effort to hold on to Cold War relics of a multi-mission, high-capability ship (Work, 2007, p. 22). This would constitute the “high-end” of the fleet, and notions for a 375-ship or even larger fleet were then possible.

The initial frame should have separated from the Cold War reference point and established a more relevant one based on capabilities rather than total force levels. If network-centric warfare was the solution, rather than Naval fires, then why spend time working a concept in the mid-1990s that would be terminated and, if built, provide little value to distributed maritime operations? In the end, the Navy would still require a small combatant as an escort vessel. Similarly in World War II, battleships were fortified not by their own defensive capability alone, but by smaller escort vessels capable of maneuver, anti-air warfare, surface warfare, and submarine attack.



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V. CONCLUSION

The experiment revealed some anticipated results, but also some notable findings that will require further research. Regarding the first research question—whether PT could assist in acquisition strategy development and decision-making—the answer through the document analysis and AI experimentation is unequivocally yes. A key finding between the J1 and J2 is that the difference in scenarios and framing influenced the decision-maker, in this case the AI as a simulated responded. What becomes useful is understanding this behavioral dynamic so that decision sets can be reevaluated, whether through a series of human-decision (HD) analyses or, in relation to the second research question, with the assistance of an AI tool.

Regarding the research question of whether AI-assisted applications are useful in acquisition decision sets, the AI model tracked each of the frames and tasking provided. The model demonstrated an ability to interpret the framing effects presented in the prompts (Figures 5 and 6), consequently structuring outputs similarly across all 40 runs, which included useful and consistent analysis. A key finding was that the AI model can be trained to apply complex behavioral frameworks, such as PT, structure around simulated acquisition themed scenarios. Of note, it is uncertain how much AI relied on the prompts and whether it relied on its built-in programming baselines to shape its outputs, as it is its mission to provide analytical, neutrally based answers. In effect, programming a prompt to that was human induced invariably may only add another layer of bias. The very thing PT aims to identify and ultimately avoided. However, this is where future research could further explore the effect by breaking the scenario into smaller increments rather than using the overarching scenarios presented in this experiment.

The interpretations revealed AI awareness of psychological pulls that could have impacted decision-making, which was a finding this research sought to identify (Kahneman & Tversky, 1979, p. 269; Gourville, 2004, pp. 2–3).



A. CONTEXT

The lessons of the collapse of the Soviet Union caused ripple effects for planners. This research's experimentation showcased the effects of defense planning hesitancy. Essentially loss aversive behavior that may have led to false assumptions carried forward in the analysis of the strategy, the warfighting requirements and requisite platforms. With one threat defeat, another significant threat, possibly the same that sank the Soviet Union reared its head for U.S. policy makers. As evidenced in hearings at the time, the biggest threat was "resource allocation" and the growing national deficit (U.S. Congress, 1990b, p. 14168).

The ratio of LCS versus ICS documentation with approximately 25% for ICS and 75% LCS is striking. The justifications and program recommendation came too late and from the wrong place, instead of from experimentation and testing. LCS received a lot of attention post-approval but little attention pre-approval in 2001 (Work, 2014, p. 2). The program was rushed not from a bona fide need in the littorals, but arguably due to pressure to deliver a program. The LCS dynamic, specifically the conceptual phases of the program provided a good foundation and argument for the introduction of PT into acquisition practices. With "information search and acquisition tend [*ing*] to be goal oriented," Navy leaders did their best given the constraints and pressures, in organizing alternatives for a program of compromise with SC-21 (Halevey & Chou, 2014, p. 399; Work, 2014, p. 2). In J1, the DD-21 fared better for several reasons, among the biggest, the lower technical risk and arguable schedule. With DD-21 initially approved in 1997, the plan was to utilize the similar "DDG-51 building profile," with roughly 3 ships per year (Lewis, 2001, para. [DD-21]). The DDG-51 analyzed building profile of 2.5 per year would maintain two shipyards (O'Rourke, 1994, p. 59).

The decision on LCS was risk-seeking and ended up with a poor prospect. The mistake made was the platform centered approach that was not equipped to plug into any system of systems, even its own envisioned CONOPs. ICS, through IWS's modernized business model approach, on the other hand, was a needed antidote in a time of urgency and requisite warfighting readiness. Instead of a bottom-up approach starting with platforms, ICS implement a top-down approach, creating the ecosystem, the standard that



all weapons systems and platforms could adapted and built to. Modularity not just in warfighting concept but in acquisition strategy should have been pursued as a major metric to transformation overhaul. If transformation was the goal and imperative, first and foremost, is to “draw the box on the right” (Flyvbjerg, 2023, p. 48). Effectively, determine first the bubble you are going to plug in the systems. In the case of the Navy, DMO. The key is to take a top-down approach and determine the most “cost-effective force architecture—that is, the optimum combination of surface platforms, air platforms, [JADC2] systems, and logistics systems,—that technology now permits” (O’Rourke, 2001, p. 12). This became ICS in a nutshell. With the CNO at the time confirming better acquisition practices of procurement decisions after the testing and integration efforts have been completed (Franchetti, 2024, para. 52–55).

B. MISTAKES

To achieve not just any *system of systems* but the best one will require not just bottom-up evolution but top-down concept generation as well.

—Ronald O’Rourke

The mistake was taking a platform centric approach and then packing in a grand strategy and warfighting concept. What should have happened was testing and experimentation of the elements of the network.

LCS did not meet its “operational capabilities” to perform its mission sets almost two decades after the formalization of the program in 2005 (GAO, 2022, p. 1). Nor has it performed well in operational testing, revealing insufficiencies in defensive capabilities and “high failure rates of mission-essential equipment” (GAO, 2022, p. 1). The Office of the Director, Operational Test and Evaluation’s in 2015 casted doubt on the endurance of both variants, which effectively limits an assets operational range and inevitably a cornerstone of DMO, sustainment (Carillo, 2023, “Promise vs. Reality,” para. 3). Additional disappointments came with the cancellation of the ASW module and MIW delays, which given that the CONOPs was a performance requirement, withered the LCS program even further into a single, non-specified mission hull (Carillo, 2023, “Promises vs. Reality,” para. 7).



From its inception, the LCS program did not perform a rigorous analytical analysis (O'Rourke, 2016a, p. 1). As a result, the program had to be restructured twice as questions on costs versus capability became a growing concern (O'Rourke, 2020, p. 3). The program lacked a good analytical foundation and did not adequately address capability gaps (O'Rourke, 2020). The goal was to achieve initial operation capability (IOC) in 2010 for the sea frames and mission modules (GAO, 2022, p. 15). Yet, despite two lines of efforts, IOC never materialized, even with additional funding of 14 billion (FY2016 dollars) (House Armed Services Committee [HASC], 2016, p. 2).

Recovery efforts were noble but generated a false fallacy that adding more money, or even reframing LCS into a frigate would recover the program. Some corrective efforts on crewing (manning), maintenance and training were implemented, including a crewing requirement of the 3:2:1 to a blue/gold rotation (GAO, p. 15, 2022). However, performance issues on lethality and survivability remained unresolved (GAO, p. 15, 2022). Despite efforts to reassess the overall maintenance concept, crewing and training, the cost estimates remained staggering. An initial 2011 cost estimate of \$38 billion (in constant FY2019) dollars to maintain 35 LCS through their 25-year service life cycle grew by nearly double to \$60 billion to maintain 35 LCS through year 2018 (using FY2019 constant dollars) (GAO, p. 2, 2022).

Two key lines of effort were missing from transformation equations for the LCS. The first was an emphasis by Naval leaders for increased research, development, testing and experimentation (RDT&E) efforts and funding. Instead of pursuing the Arsenal ship or DD-21 to resurrect the Cold War garrison Navy, RDTE&E budgets should have been the priority. A greater emphasis should have been placed on “clean sheet” designs and prototyping (O'Rourke, 2001, p. 99). Second, greater experimentation was required (O'Rourke, 2001, p. 99).

Experimentation at the fleet level could have revealed some basic utility issues regarding LCS CONOPS. First, questions on manning levels and its implementation on deployments such as the 3–2-1 model were never really practiced by the Navy before yet established as a workable operational concept (O'Rourke, 2014, p. 5). Second, if the littorals are contested and the performance requirements revealed an over 50% decline in



endurance capability from 30 days to 14 days, no operational and tactical advantage would be gained from LCS having to retrieve modules or crews in foreign, contested environments/ports (GAO, 2016, p. 20). Such operational issues could have been exposed with proper framing of various scenarios and testing.

C. THE GOOD

To juxtapose the mistakes, the planners behind ICS have seemingly taken on some of the hard lessons learned from past programs and acquisition strategies. During an address to WEST 2024 CNO, Admiral Franchetti noted several key efforts, with one particular:

The [second] area we're focusing on is expanding, extending, and bolstering the reach, the depth, and the lethality of our conventionally manned fleet by exploring and integrating new, disruptive and emerging technologies [...] to include unmanned systems. (para. 31)

It is as if the CNO had read O'Rourke's advice on the key tenets to successful transformative efforts, in which she highlighted how 4th Fleet, 5th Fleet, and 7th Fleet have in effect become "real world laboratories of learning to develop tactics, techniques and procedures" in and around learning, refining and developing future manned and unmanned command and control infrastructure (Franchetti, 2024, para. 32). Even more taking initiative in getting technology into the warfighter hands, which is further reiterated as a focus area in the recent acquisition reforms (Franchetti, 2024, para. 32).

PT did not necessarily reveal that LCS was a poor-performing program compared to ICS. Rather, given the abstracted reference points from the literature, it revealed that objective studies through wargames, "requirements school" proposals, academic studies, and even discussion forums or seminars were subverted by likeminded, institutionally driven subjective distortions of objective realities, resulting in poor decisions. Among them a debatable requirement for littoral operations and need for a resurrected battleship copy with DD-21 and the *Arsenal* ship. The decision outcome LCS, largely through funding pressures, resulted in a poor foundation and thus, poor performance outcomes.

Similar objective alternatives were ignored, such as a mid-range, workable solution that could have extended the service life of the FFG-7 class through modernization and



upgrades from around 17 years to between 24 and 32 years, while allowing time for high-end capability typically found on DDGs to mature enough to fit on smaller frigate-sized vessels (United States General Accounting Office [GAO], 1997, p. 49). What seemed like a gain ended up as a failure. These efforts could have been aligned through a continuous approach, by better aligning funding cycles with that of the backfit or transformation efforts of the Navy the at the time.

This is where ICS picked up the broken pieces by creating and doing the practice of a continuous, incremental, and modular development approach. Through a sound acquisition strategy, via “continuous planning and re-baselining practices,” the overarching IWS organization was able to maintain a continuous approach and funding stream to accomplish its fleet integration efforts (Dunlap, n.d., p. 108; Franchetti, 2024, para. 53–54). This approach allowed aligned with funding phases, specifically in Future-Year Development Plan (FYDP). First was the foundation through learning, experimentation and testing, a key transformational (O’Rourke, 2001, p. 99; Franchetti, 2024, para 53–54). Then was the hardware in procuring the systems, such as unmanned systems and in the third FYDP increment, operations at “speed and scale” (Franchetti, 2024, para. 54).

D. CAUSES

Modularity failed not because the concept of modularity was bad, as it was in fact a good solution to the payload fraction problem (Work, 2004, p. 49). It effectively allowed smaller combatants to carry a greater load. The LCS CONOPS failed because the program never had a chance to investigate the feasibility of *battle modularity* (Work, 2004, p. 140). That included the crew rotations, the impacts on crew, force protection requirements for overseas “reconfiguration stations/facilities” and distances to cover for a mission change to be even cost effective or worthwhile losing on station time for a combatant.

The modularity concept was designed to incorporate multi-mission, swappable packages for Anti-Submarine (ASW)-, Anti-Surface (ASuW), and Mine Interdiction Warfare (MIW) operations, including an aviation detachment with a helicopter (U.S. Navy, n.d.). With delivery delays on the modules, testing was delayed.



Arguably and partially due to LCS, the Navy was unprepared for what may be to come in a great power competition era and forward (Martin, 2025, p. 13). The LCS failures between 2010 and 2020 led to the decision in 2016 to cap the numbers of LCS in procurement in favor of a new frigate program and redesignated the LCS into a frigate itself (HASC, 2016, p. 2).

Loss aversion behaviors, characterized by the budget constraints of the 1990s where programs would be terminated seemingly on impulse, perhaps led to overselling the LCS concept, or maybe even overselling the SC-21 family of ships (DD(X), CG(X) and LCS), for the prospect of one (GAO, 2016, p. 12). This psychology behind the “need to oversell” may have occurred due to the nearest reference point of the post-Cold War environment of budget constraints and loss of a peer threat for which a lot of the program arguments were made against and approved for. It is here that PT can explain decision maker behavior itself, which is driven by the “carrier of values” relative to a loss or gain not the total outcome (Kahneman & Tversky, 1992, p. 299).

The framing effect between Program A and B for J1. Program A presented with the entire family of ships, concentrated for the littoral mission. Program B, not necessarily more expansive but purely larger combatants with DDG-1000 maintaining a multi-role capability and DD-21 and Arsenal focused-mission ships for Naval fires and littoral operations. The difference up front is miniscule but reframed in terms of cost three separate ship classes would prove impossible for the long term. Program A (SC-21) would preserve large combatants but reduce the costs in favor of sequencing the procurements of each member of the family.

LCS was sold on appearances. Despite Congress’s concerns “(t)here is no definition of the (LCS) requirement and no ‘road map’ of how the Navy will achieve the system required,” the CNO the then-year of 2002, continued to advocate for the program as primary budget priority (Work, 2004, p. 2-3).

Modularity seemed appealing as a gain frame in, decreasing operating, procurement and overall life-cycle cost as it would fulfill the prospect of getting most “bang for your buck” in mission effectiveness (Work, 2004, p. 2). Furthermore, the idea of building a



small platform that was agile and faster than all other ships was additionally appealing and sold as a requirement, not to mention a prospect to the shipbuilding industry that needed the work (Work, p. 2, 2004). The problem lies in the framing effects. Why even get close to shore of an adversary? It makes sense in defending the littoral space of your own country but if a multi-role capability exists that can remain in a sanctuary position, why push vessel close in, near coastlines? In theory you don't need an LCS to clear the littorals if you have stand-off weapons.

On the surface, LCS in the PT framing sense, provided a gain that would boost ship force levels quickly given its positive procurement and schedule rate. The program was moved out at lighting speed without an analysis (Work, p. 3, 2004). It gave planners some level of satisfaction but at a cost. The switching costs were high given the new training requirements and more so, the requirement to figure out how to pre-position reconfiguration facilities world-wide. A heavy cost financially but a greater burden on diplomacy in ensuring that other countries would allow prepositioned bases, maintenance facilities and loading stations.

E. WINNING TRAITS

The question of payload capacity and warship design matter. Back in the 1930s, the combat systems development focused on space and weight (Sutherland et al., 2018, p. 29). Take for example the following notation:

The characteristics of a warship are derived in response to an identified threat which has been translated to some selective specific set of missions, and derived into a prescribed set of units, i.e., ships. (Sutherland et al., 2018, p. 29)

As these threats become more pronounced, so will the complexities of the systems. The interactions between systems, sub systems and sub-sub systems, even with the external interactions must be considered in the ship design so that ship, can support the total Naval Force (Sutherland et al., 2018 p. 33). One emphasis on the ICS architecture is the the “relationship” between units and that each are operating on the same common access library and COTS SW/HW systems (NAVSEA 2022; Deluca et al., 2013). Likely well given the evidence in utilizing best practices of putting online a scalable, “netted” combat



systems into action at speed by using open architecture, “common software and compute infrastructure,” to rapidly field capabilities to the fleet (Lockheed Martin, n.d.). The AEGIS, even on a monolithic framework, did not lock-in a design that was irreversible. The old monolithic AEGIS development pathway was a product of the times, constrained by computing power, not so much by a lack of brain power given the early foundation that was set with quality engineering practices (Sutherland et al., 2018, p. 29).

What made ICS a winner today was its business model, but its focus on “evolutionary or incremental acquisition strategies:” and “leveraging mature technologies” first before heading off for the procurement phases (GAO, 2010, p. 2; Franchetti, 2024, para. 52–55). More specifically, ICS incorporated commercial off-the-shelf (COTS) and open architecture (OA) principles in an effort to keep pace with the “refresh rates” of COTS development and, essentially, “Moore’s Law”—the unending expansion of technological “quantum leaps” that can only be reined in through dedicated, iterative, modular integration efforts (Sutherland et al., 2018, p. 26). Critical to this approach is the design of the cloud, or total system, with the platform designed as one system within the larger system.

Breaking down “complex” components into smaller units allows for things to be tested and maintained, which defines what ought to be the preferred acquisition strategy: modular and an open architecture (Dunlap, n.d., p. 229). With evolving threats, adaptation of the combat system to defeat these threats will be crucial (Dunlap, n.d., p. 229). It is critical to update the software mid-flight, which in the case of surface combatants could be mid-ocean. Furthermore, costs and time can be reduced as each module relative to the threat it needs to face can be tested and maintained independently (Dunlap, n.d., p. 229).

The idea of a modular surface combatant would then be in practice is not so bad. However, the key isn’t hardware but software. Again, the relationship is key not the platform itself. The idea around mission modules for LCS wasn’t entirely faulty. If developed right, at-sea reconfiguration could have been a possibility. LCS should have been treated as a subsystem to the whole system, like what IWS did with ICS. By sequencing the phases in parallel with funding cycles, a business model of continuous development achieved what LCS could not, in transforming the fleet.



F. FUTURE STUDIES

Further research could create arbitrary scenarios, even by simply considering each criterion—cost, schedule, performance, and risk—as a separate scenario in which the AI model would use reference points for its analysis. Inputs for each scenario could include cost data, performance metrics, testing results, and risk analysis. What is useful for PT is that no matter how many times something is reframed, the reference point is what matters. With AI systems having tremendous value in “processing large data sets more efficiently,” treating each criterion as a separate reference point at different stages in the life cycle of a program could arguably provide insight into “relationships and patterns” relative to a PT value function in a very short period of time (Kahneman & Tversky, 1992, p. 302; Madanchian & Taherdoost, 2025, “Data Analysis and Statistical Modeling” section).

Lastly, PT framing could be of use in ethics. Given that perception can drive decision-making, one could study the influence of ethical and unethical choices in a LOSS-GAIN frame set. If framed from an ethical context, PT could help decipher how ethical decision-making is justified and assessed.



APPENDIX. DECISION MATRIX AND AI PROMPTS

A. J1 DECISION MATRIX

Criteria Options	Schedule	Cost	Performance	Technical Risk	Objective Score	PT Frame	Multiplier	Adjusted Score
RP 1 Transition: The Navy must transition from the post-Cold War era to a new security environment shaped by new opportunities, uncertainty, and budget constraints using new platforms to both modernize and transform the navy force structure.								
Weight	2	2	2	3				
Program A: SC-21 Family of Ships (DD(X), CG(X) & LCS)	2	2	3	2	20	3	2	26
Program B: Large Combatant (DD21, DD(X), <i>Arsenal</i> Ship or DDG-1000)	2	3	1	2	18	3	2	24
Objective Scoring (Low is Better)	1 – favorable, 2 – mixed, 3 – unfavorable							
PT Framing (Low is Better)	1 – aligned perception, 2 – minor distortion, 3 – moderate distortion, 4 – high distortion							
PT Multiplier	1 = 1.0, 2 = 1.5, 3 = 2.0, 4 = 2.25							

Figure 3. J1 decision matrix. Adapted from Mortlock (2019)

B. J2 DECISION MATRIX

In Figure 4, two programs were evaluated, program C and D, also depicted as Option C or D. The objective scores were measured against the criteria of schedule, cost, performance and technical risk using criteria multipliers.

Criteria Options	Schedule	Cost	Performance	Technical Risk	Objective Score	PT Frame	Multiplier	Adjusted Score
RP 2 Warfighting Readiness: The Navy must field interoperable, survivable, and lethal capabilities to meet the reemergence of peer adversaries in a contested maritime environment and support the Joint Warfighting Concept (JWC) and Joint All-Domain Command and Control (JADC2).								
Weight	3	3	3	2				
Program C: Platform Centered (Cold War Garrison Navy v2.0)	3	3	3	1	29	3	2	35
Program D: Hybrid Fleet (off boarding systems, ICS, mix of combatants)	1	1	1	2	13	2	1.5	16
Objective Scoring (Low is Better)	1 – favorable, 2 – mixed, 3 – unfavorable							
PT Framing (Low is Better)	1 – aligned perception, 2 – minor distortion, 3 – moderate distortion, 4 – high distortion							
PT Multiplier	1 = 1.0, 2 = 1.5, 3 = 2.0, 4 = 2.25							

Figure 4. J2 decision matrix. Adapted from Mortlock (2019)

C. EXAMPLE AI PROMPT CONSTRUCT

The following depicts an example of an AI prompt in a LOSS frame condition for juncture 1 (J1) and an AI prompt in a GAIN frame condition for juncture 2 (J2). The runs depicted are n=9 and n=39 which includes the behavioral sensitivity inputs. AI simulated the actions of a defense planner working for the surface warfare directorate. All J1 runs n=1 through n=20 utilized the same scenario and same template. The same for J2, where all runs n=21 through n=40 included the same scenario representative of J2 with the small exception that runs n=9, n=19, n=29, and n=39 included a behavioral sensitivity input (a small word change: risk seeking or risk adverse). The prompts acted type of “playing cards” that were inserted along with the sources and decision matrix into the OpenAI “prompt window.” Each of the prompts were supplemented with a quick reminder text in the OpenAI prompt window to kick start the experiment and each run. The following text was used for each run: “please follow tasks introduced by the word file [RPX_Gain/Loss_Frame_nx_[risk seeking or risk averse] and conduct an analysis of attached sources and decision associated with the word file/task direction under juncture [1 or 2]. Please provide consistent format of the analysis for all prompt runs IAW with the task direction in the attached word file.”

1. Juncture 1 Example Prompt

The following depicts run n=9 example of a prompt in a LOSS frame condition and risk averse behavior:

RUN 9 OF 40

RP 1 — LOSS FRAME

Reference Point 1: Post-Cold War Transition

Juncture:

You are part of the Surface Warfare Directorate (N96), tasked with providing the N8 and N9 directorates of the Chief of Naval Operations (CNO) with new concepts for a surface ship design and preliminary requirements that can enable new warfighting concepts, such as distributed fleet operations, anti-access/area denial (A2/AD) challenges in near-shore waterways, and reduced overall life-cycle costs for surface ships. Among the previous ideas discussed in forums and wargames were smaller combatants, but these ideas have met skepticism from those who argue for a continued and enhanced focus on larger, multirole combatants. The U.S. remains the dominant power, but there is evidence of China's emergence and indications that Russia's decline may be reversing.

Your role is to evaluate acquisition options for a new surface combatant program. You will be presented with a strategic context and two options. You must choose one option and explain your reasoning in two to three sentences. Do not augment or enhance the prompt. Respond as a defense planner would in the initial conceptual phases of a program, trying to propose a solution for the Navy to adapt under conditions of scarce resources and uncertainty (Work, 2007, pp. 3–6), and during grand transformation efforts from a TSBF to a TFBN (Work, 2007, p. 3).

Relevant References and Instructions: Attached are relevant references for Juncture 1 (J1). Please utilize them as the primary source material in your decision making. They are attached via pdf. You are a **[Risk Averse]** defense planner.

J1.1 EveryCRS report LCS (CRS, 2014)

J1.2 The Challenges of Maritime Transformation Is Bigger Better (Work, 2002)

J1.3 LCS How we got here (Work, 2014)

J1.4 Know When to Hold them (Work, 2007)

J1.5 Challenges and Tough Choices (O'Rourke, 2001)

FRAMING CONDITION: LOSS FRAME



Scenario:

The Cold War has ended. The U.S. Navy has shrunk from over 500 ships to under 300 in a short period of time, while trying to build an affordable, balanced, effective, and highly capable future battle force (Work, 2007, p. 32). Budget cuts threaten further reductions. The Navy risks losing its warfighting edge if it does not act now. You must choose between the two options listed below in the previously evaluated decision matrix, which is attached along with the relevant sources

Option A — SC-21 Family of Ships (DD(X), CG(X) & LCS)

Option B — Large Combatant (DD21, DD(X), *Arsenal* Ship or DDG-1000)

Given the strategic context above, which option would you choose and why?

After your reasoning, assign a PT Frame Score to each option using the following scale:

PT Frame Score:

- 1 — Aligned (gain frame, no distortion)
- 2 — Minor Loss Aversion (slight loss frame)
- 3 — Moderate Loss Aversion (clear loss frame)
- 4 — High Loss Aversion (deep loss frame, risk-seeking behavior likely)

Format your response as:

Choice: [Option A or Option B]

*for the option not chosen, please provide PT frame score

Reasoning: [2-3 sentences]

Pending Choice [A or B] issue a **PT Frame Score**:

- *if* Option A: [1-4] — [one sentence justification]
- *if* Option B: [1-4] — [one sentence justification]



2. Juncture 2 Example Prompt

The following depicts run=39 example prompt in a GAIN frame condition and risk seeking behavior:

RUN 39 OF 40

RP 2 — GAIN FRAME

Reference Point 2: Great Power Competition Warfighting Readiness

Juncture:

You have just read the National Security Strategy (NSS) from the new administration, which claims that the world is re-entering great power competition (Trump, 2017). In addition, the National Defense Strategy (NDS) states that there has been an “emergence of strategic atrophy and eroded warfare capabilities” (DoD, 2018). The NDS further acknowledges that China and Russia are entering into strategic competition with the U.S. (DoD, 2018). Recognizing this urgency, DoW is attempting to carry forward wholesale innovation for U.S. forces through overarching concepts and approaches such as the Joint Warfighting Concept (JWC) and Joint All-Domain Command and Control (JADC2). It is up to the services, here the U.S. Navy, to develop the capabilities and warfighting concepts needed to support JWC (Mahnken et al., 2023, p. 61). The long-range shipbuilding plans must also be balanced against available resources (Eckstein, 2013, p. 5). DOW leaders have expressed frustration over the excessive amount of time needed to develop and “field high-impact, next-generation capabilities and operating concepts that can offset emerging threats” (Gunzinger et al., 2017, p. 10).

A recent keynote speech at WEST 2024 by the Chief of Naval Operations (CNO) indicates that efforts are underway in “pursuing fleet-wide connectivity...scalable, netted combat system, through the Integrated Combat System” to effectively support Distributed Maritime Operations and achieve decision superiority and lethality at machine speed (Franchetti, 2024, paras. 32–34).

You are the Surface Warfare Directorate (N96) and were at WEST 2024. You are tasked with providing the N8 and N9 directorates of the Chief of Naval Operations (CNO) with new concepts for surface ship design. One option is that new surface ship design may need to wait until the fleet is more fully integrated. Under this approach, creating a hybrid manned-unmanned fleet becomes the priority, which may pull funding from other possible ventures, such as large combatants. Or, vice versa, the Navy could focus on new surface ship designs, specifically large combatants and unmanned systems. You must also consider how to develop a new business model for modernizing the fleet to achieve readiness (DeLuca et al., 2013).



Your role is to evaluate acquisition options and determine what needs to be the priority: a hybrid fleet quickly integrated with ICS, or a fleet similar to what was envisioned during the Cold War, the Garison Navy v2.0 with higher numbers of large combatants.

Relevant References and Instructions: Attached are relevant references for Juncture 2 (J2). Please utilize them as the primary source material in your decision making. They are attached via pdf. You are [risk seeking] in your decision making.

J2.1 Innovation for the Great Power by Mahnken 2023

J2.2 Open arch aegis model 2013

J2.3 CNO_NavPlan2024_v2

J2.4 CNO Delivers Keynote Address at WEST 2024

J2.5 CBO Analysis on Navy Shipbuilding Design

FRAMING CONDITION: GAIN FRAME

Scenario:

The U.S. warfighting edge has atrophied. The United States is again facing great-power, peer competition in the military realm, with China making tremendous gains in capability. The question is not simply one of budget cuts, but which systems must be innovated to achieve the warfighting capability and capacity needed to execute Joint All-Domain Command and Control (JADC2) under the Joint Warfighting Concept (JWC). A war with China may be imminent. You must choose between the two options listed below in the previously evaluated decision matrix, which is attached along with the relevant sources.

Option A — rebuilding a Cold War Garison fleet v2.0, platform centered, high capability, large combatants, high numbered fleet

Option B — combination of combatants, unmanned, small, medium and large to create a smaller, scalable, connected hybrid fleet

Given the strategic context above, which option would you choose and why?

After your reasoning, assign a PT Frame Score to each option using the following scale:

PT Frame Score:

- 1 — Aligned (gain frame, no distortion)
- 2 — Minor Loss Aversion (slight loss frame)
- 3 — Moderate Loss Aversion (clear loss frame)
- 4 — High Loss Aversion (deep loss frame, risk-seeking behavior likely)

Format your response as:



Choice: [Option A or Option B]

Reasoning: [2-3 sentences]

Pending Choice [A or B] issue a **PT Frame Score**:

- *if* Option A: [1-4] — [one sentence justification]
- *if* Option B: [1-4] — [one sentence justification]



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