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**CAPSTONE APPLIED PROJECT REPORT**

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## **AN ANALYSIS OF FACTORS INFLUENCING DEFENSE ACQUISITION DECISION MAKING: NOUSMAKING AND THE DEFENSE PROGRAM MANAGER**

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**June 2023**

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**AN ANALYSIS OF FACTORS INFLUENCING DEFENSE ACQUISITION  
DECISION MAKING: NOUSMAKING AND THE DEFENSE PROGRAM  
MANAGER**

Brooke L. Adame, Civilian, U.S. Navy

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## **ABSTRACT**

Defense program managers play a critical role in managing major defense acquisition program outcomes. Although the defense acquisition management system and defense program manager have been topics of analysis for decades, not enough research focuses on defense program manager sensemaking in the defense acquisition management system. The purpose of this research is to build upon the research of professor of practice and retired Army Colonel Raymond Jones and his nousmaking concept. Further exploration of nousmaking and decision making and the application of these concepts to the defense program manager dilemma can enhance our understanding of these interrelated topics, expand the scope of existing defense acquisition management research, and influence DOD's future assessments of defense acquisition program outcomes.

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## LIST OF ACRONYMS AND ABBREVIATIONS

CRS	Congressional Research Service
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
DOTMLPF	Doctrine Organization Training Materiel Leadership Personnel and Facilities
FAR	Federal Acquisition Regulation
GAO	Government Accountability Office
JCIDS	Joint Capabilities Integration System
MDAP	Major Defense Acquisition Program
OODA	Orient Observe Decide Act
PD	Prisoner's Dilemma
RDTE	Research, Development, Test, and Evaluation
USA	United States Army
USAF	United States Air Force
USN	United States Navy
VUCA	Volatile, Uncertain, Complex, Ambiguous

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## I. INTRODUCTION

The United States Department of Defense (DOD) strategic priorities are to “defend the nation, take care of our people, and succeed through teamwork” (Department of Defense [DOD], n.d.). The central tenet of the 2022 National Defense Strategy (NDS) is “integrated deterrence” and the fiscal year 2024 President’s Budget of \$842 billion outlines the “critical investments to revitalize the defense industrial base, drive innovation, and take care of our people” (DOD, 2023, p. iv; Austin III, 2023, para. 11). Deterrence involves acquiring defense capabilities that will “modernize and strengthen the military so it is equipped for the era of strategic competition with major powers” (DOD, 2023; White House, 2022, p. 11). To effectively defend the nation within the constraints of finite resources, “the primary objective of DOD acquisition is to acquire quality supplies and services that satisfy user needs with measurable improvements to mission capability and operational support at a fair and reasonable price” (Defense Federal Acquisition Regulation Supplement [DFARS], 2023).

*Defense program managers* play a critical role in managing defense acquisition program outcomes as they are responsible for the overall cost, schedule, and performance of programs (DAU, n.d.). The defense acquisition environment in which *defense program managers* must perform is inherently complex and continually influenced by unpredictable threats, rapidly advancing technologies, and volatile political and economic activity. Although the defense acquisition management system and *defense program manager* have been topics of analysis for decades, not enough research focuses on the individual thought process *defense program managers* go through to make sense of the defense acquisition environment.

This research report examines the *defense program manager* operating within the context of these DOD strategic priorities in the defense acquisition management system. The report is organized into four chapters. Chapter I introduces the background of the subject matter, defines the purpose and scope, and outlines the research methodology utilizing three primary research questions. Chapter II reviews *defense acquisition*, *nousmaking*, and

*decision making* literature. Chapter III discusses and analyzes the research questions and the literature review. Chapter IV concludes the report with a summary and recommendations.

## A. BACKGROUND

As the largest government agency in the world, the DOD employs an estimated 3.4 million uniformed and civilian personnel (U.S. Department of Defense [DOD], June 2023) and allocates approximately forty percent of its annual defense budget to procurement and research, development, test, and evaluation (RDT&E) which includes budgeting for major defense acquisition programs (MDAPs) (DOD, March 13, 2023). The Government Accountability Office (GAO)<sup>1</sup> reported an estimated collective cost of \$1.69 trillion dollars for eighty-two MDAPs (Government Accountability Office [GAO], 2019). DOD budgeting and spending continue to be significant subjects of attention as approximately 13% of federal taxes are allocated to DOD (Center on Budget and Policy Priorities [CBPP], 2022).

For over 100 years, the GAO has provided oversight on federal operations and spending (GAO, n.d.). Considered the “congressional watchdog,” thousands of reports and recommendations inform improvements to federal resource managers and policy makers (GAO, n.d.). DOD weapon systems acquisition is on the GAO High-Risk Series<sup>2</sup> which reports on subjects that require additional “congressional attention and oversight to improve management and accountability” (GAO, 2023, p. 1). This year’s High-Risk Series reported “as of December 2021, the DOD is expected to spend more than \$1.9 trillion dollars to acquire weapon systems” (GAO, 2023).

Professor of Practice and retired U.S. Army (USA) Colonel Raymond Jones’s (R. Jones) acquisition research report, *The creation of nous through the interaction of sensemaking, trust, tacit knowledge and explicit knowledge and its relationship to decision making in complex and chaotic environments*, introduces the concept of *nousmaking*, a model encompassing the interrelationship of sensemaking, trust, explicit and implicit

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<sup>1</sup> GAO was established in 1921 after Congress approved the Budget and Accounting Act in response to increasing debt and federal expenditures after World War I (GAO, 2023).

<sup>2</sup> The GAO High-Risk Series was established in 1990 to report on government spending and management of critical public resources (GAO, 2023).

knowledge to better understand how *defense program managers* make sense in complex and chaotic environments (2015). These elements all interact to increase situational awareness, cognitive recognition, and analytic sophistication depending on the experience and technical training and background of the *defense program manager* (R. Jones, 2015). The purpose of this research is to build upon Jones's *nousmaking* concept and follow on research to further examine the model and application to the *defense program manager* and *defense acquisition management decision making*.

## **B. PURPOSE AND SCOPE**

This research builds upon the *nousmaking* concept introduced in R. Jones's 2015 acquisition research report. The purpose of this research is to further examine R. Jones's *nousmaking* concept and its application to defense program managers. This is important because defense program managers play a critical role in managing major defense acquisition programs. The problem this research investigates is the *defense program manager dilemma*, a term utilized in this research report to contextualize the science and art of a defense program manager's *nousmaking* and decision making in the defense acquisition environment.<sup>3</sup> The dilemma for the defense program manager is the ability to make sense of the defense acquisition environment, and through *nousmaking* and *decision making*, process information to inform judgements and decisions that lead to optimal defense acquisition program outcomes.

Various areas of study were considered to tie these topics together yet the broad areas of study that emerged during the literature review were defense acquisition, *nousmaking*, and decision making. The scope of this research report seeks to explore and increase situational awareness of processes a *defense program manager* goes through to make sense of reality in the defense acquisition management system.

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<sup>3</sup> The *program manager's dilemma* has been referenced in other defense related articles and alludes to the premise of the well-known *prisoner's dilemma* originating in 1950 from game theory researchers. The term *defense program manager's dilemma* is utilized specifically in this research project to build upon these concepts and apply to the interrelationships between the defense program manager, *nousmaking*, and decision-making within the defense acquisition management system.

Extensive research has examined the defense acquisition management system and defense acquisition workforce, and much of the research does examine various factors that influence defense program manager decision making, such as rapidly evolving requirements, technological maturity, budgetary restrictions, political influences, and workforce management; however, not enough research focuses on the individual thought processes defense program managers experience. Further exploration and application of *nousmaking* and the *defense program manager dilemma* can inform more effective defense resource management strategies which have longstanding implications in national security.

### C. METHODOLOGY

The methodology of this research report is a qualitative literature review of how defense program managers make sense of reality within the scope of the defense acquisition management system. The literature review builds upon the qualitative research of Raymond Jones's 2016 acquisition research report, *The creation of nous through the interaction of sensemaking, trust, tacit knowledge and explicit knowledge and its relationship to decision making in complex and chaotic environments*, and other graduate theses related to this topic.

The literature review included books, scholarly journal articles, graduate theses, and publicly available resources in the subject matter areas of defense acquisition, *nousmaking*, and decision making. The following research questions guided the structure and scope of the Chapter II Literature Review and are examined further in the Chapter III Discussion and Analysis:

1. What are the common themes in literature related to *nousmaking* and decision making in defense acquisition?
2. What correlations or distinctions does the literature make regarding *nousmaking* and decision making for defense program managers operating in volatile, uncertain, chaotic, and ambiguous (VUCA) environments?
3. How can defense program managers and other defense leaders, leverage *nousmaking* and decision making within defense acquisition?

## II. LITERATURE REVIEW

Chapter II provides a literature review of the key subject matter areas, *defense acquisition*, *nousmaking*, and *decision making* which emerged from the research questions identified in Chapter I.

### A. DEFENSE ACQUISITION

The origins of both *defense* and *acquisition* date back to the 15<sup>th</sup> century (Merriam-Webster, n.d.e.; n.d.a.). *Defense* is “the means or method of defending or protecting oneself, one’s team, or another” and *acquisition* means “the act of acquiring or gaining possession” (Merriam-Webster, n.d.a.). In the context of the Department of Defense (DOD) today, the act of acquiring defenses encompasses “the conceptualization, initiation, design, development, test, contracting, production, deployment, integrated product support, modification, and disposal of weapons and other systems, supplies, or services (including construction) to satisfy DOD needs, intended for use in, or in support of, military missions” (Department of Defense [DOD], 2020). This broader definition that includes the entire life cycle of interdependent activities from conception to disposal will be the *defense acquisition* frame of reference throughout this report.

The defense acquisition literature review investigated three areas of focus. The first area explores the defense acquisition management system. The second area analyzes complexity and volatile, uncertain, chaotic, and ambiguous (VUCA) characteristics of the defense acquisition environment. The third area examines the defense program manager in the defense acquisition management system.

#### 1. Defense Acquisition Management System

Sixty years ago, former Secretary of Defense Robert S. McNamara declared “the sole purpose of the military industrial complex was to “act as a servant of the United States foreign policy. Our responsibility is to provide this nation with the means to safeguard its legitimate interest and to meet its commitments at home and around the world” (1963, p. 508). The military industrial complex is defined by *Encyclopedia*

*Britannica* as a “network of individuals and institutions involved in the production of weapons and military technologies” (Weber, 2023, para. 1). McNamara goes on to provide an outline of how the DOD can make decisions that align with this responsibility and the recognition that these

decisions will inevitably and properly remain the subject of searching, even harsh, criticism. We are after all, dealing with issues which could affect the very life of this nation, indeed the life of a great part of this planet. We cannot and do not claim infallibility. Only the future can tell when and where we have been right, when and where we have been wrong. We can only do our best to approach these problems as sensibly and realistically as we know how. (1963, p. 509)

This statement is the crux of the *defense program manager dilemma* and underscores the importance of the continued examination of *nousmaking* and *decision making* in the *defense acquisition management system*.

As defined in Chapter IIA, the broad definition of defense acquisition in DOD is visualized in Figure 1, Big “A” Acquisition (Mortlock, 2021). The figure has been a longstanding image in defense acquisition studies and depicts the three interrelated systems: requirements generation system, resource allocation, and the defense acquisition management system (Mortlock, 2021). The fundamental element of Big ‘A’ Acquisition is it is an “open system” and susceptible to many variables and influences which increases the complexity of *nousmaking* and *decision making*. Although all three interrelated systems are relevant to this research, the emphasis of the literature review focused on the *defense acquisition management system*.

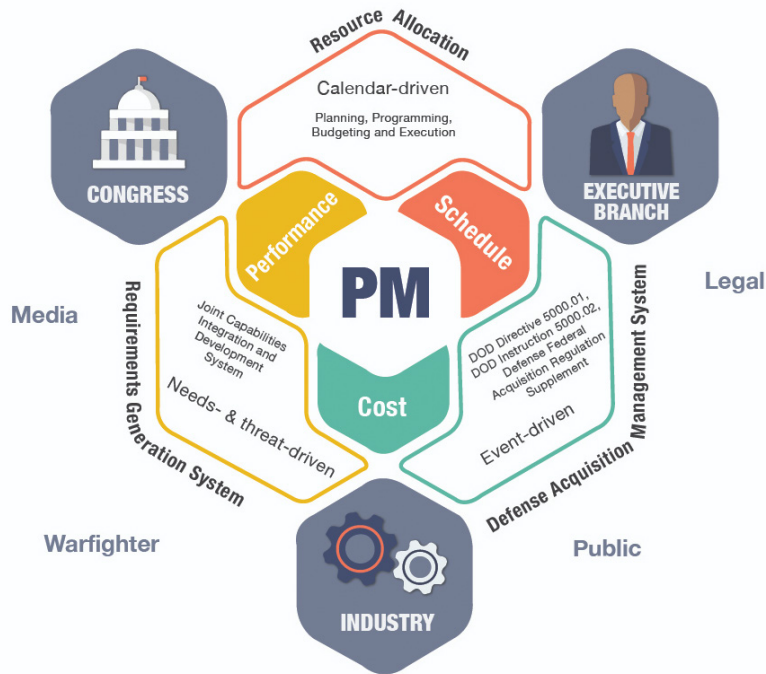


Figure 1. Big “A” Acquisition. Source: Mortlock (2021).

The primary objective of the *defense acquisition management system* is to acquire defense requirements and capabilities that defend the nation within budget (cost), schedule, and performance. The U.S. National Security and Defense Strategies provide the framework from which defense requirements are generated (White House, 2022; DOD, 2022). One of DOD’s influential leaders, former Secretary of Defense General George C. Marshall highlights the sentiment of the prevention of war, “war is a sudden and terrible business. We must be prepared to defend ourselves ... [and] almost every War Department problem involves consideration of dollars and cents” (Shanahan, 2017, para. 15). Nearing a century later, Marshall’s remarks remain relevant to defense decision makers today, “artificial constraints still hold our national defense hostage, from budget stresses, like continuing resolutions and Budget Control Act caps to disagreements in Congress that affect timely decision making” (Shanahan, 2017, para. 16).

The inherent tensions between the requirements generation system, resource allocation, and the defense acquisition management system are best understood by understanding the magnitude of threats themselves. Figure 2 illustrates the Military

Spectrum of Conflict which provides a common framework to visualize the range of acquisition programs that may be developed to defend the nation (Torruella, 2014). DOD and the services have the responsibility of analyzing alternatives and various courses of actions to acquire the best balance of capabilities within practical resource and time constraints.

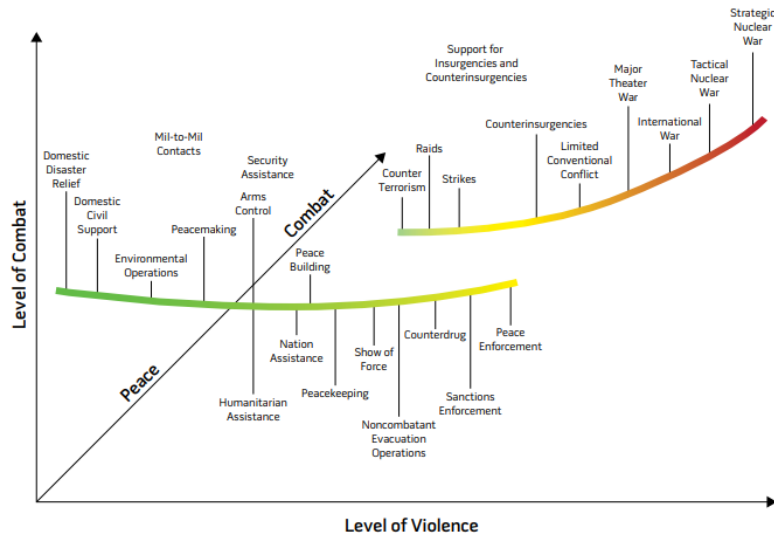


Figure 2. Military Spectrum of Conflict. Source: Torruella (2014).

To federally regulate this complex system, the DOD administers the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS),

the defense acquisition management system exists to manage the investments of the United States in technologies, programs, and product support necessary to achieve the national security strategy prescribed by the President pursuant to section 108 of the National Security Act of 1947 (50 U.S.C. 3043) and to support the United States Armed Forces. (Defense Federal Acquisition Regulation Standard [DFARS], 2023)

In addition to FAR and DFARS, the DOD Instruction 5000.02 provides more specified policy and guidance for defense acquisition (Office of the Under Secretary of Defense for Acquisition and Sustainment [OUSDAS], 2022). The Adaptive Acquisition Framework (AAF), shown in Figure 3, depicts the various defense acquisition pathways in which

DOD acquires services, software, and major defense acquisitions (OUSDAS, 2022). The purpose of this new framework is for key decision makers, including the defense program manager, “to develop acquisition strategies and employ acquisition processes that match the characteristics of the capability being acquired (OUSDAS, 2022, p. 4).

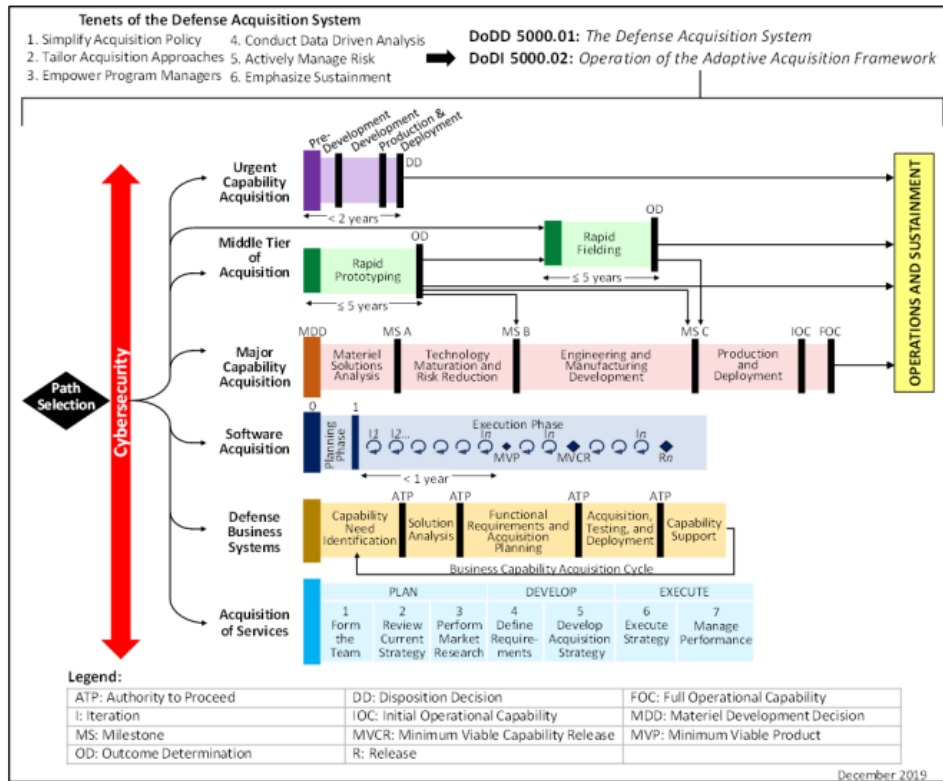


Figure 3. Adaptive Acquisition Framework. Source: OUSDAS (2022, p. 10).

A more in-depth view of Major Defense Acquisition Programs (MDAPs) or Major Capability Acquisition (MCA), is depicted in Figure 4 (OUSDAS, 2022; DAU, n.d.). The chart depicts various activities, reviews, decision points, and milestones that a defense program manager must actively manage and underscores the complexity of analysis and decision making that takes place throughout the acquisition life cycle (OUSDAS, 2022; DAU, n.d.).

### Lifecycle View of Major Capability Acquisition

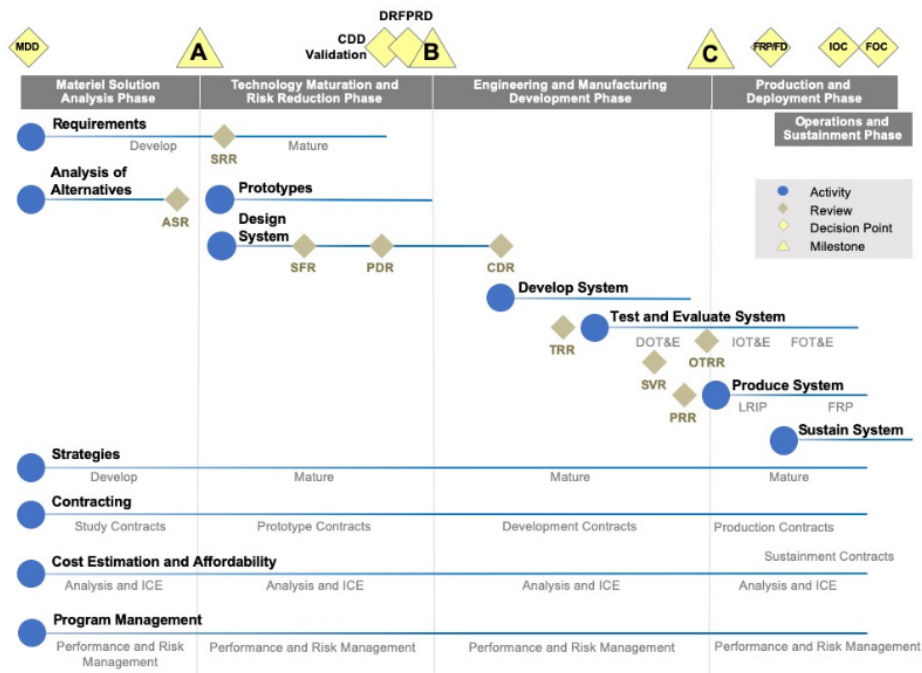


Figure 4. Life Cycle View of Major Capability Acquisition. Source: DAU (n.d.).

Decades of reports and public commentary underscore the *defense acquisition management System* is failing to successfully operate and obtain defense capabilities within its means (GAO, 2019; Schwartz, 2019; Kendall, 2017). As cited in Chapter IA, GAO established the High-Risk Series in 1990 and Major Systems Acquisition was included for failing to follow management controls, “DOD continually buys higher cost systems which substantially exceed original estimates, are delivered much later than originally scheduled, and do not meet the capabilities advertised” (Bowsher, 1990, Enc. p. 5).

In 2011, a comprehensive report on defense reform spanning fifty-years highlighted the significant investments on improving defense acquisition management (Fox). The following list is an abbreviated version of initiatives that have impacted defense decision making since the 1960s:

- The *Defense Reorganization Act of 1958* “authorized the defense secretary to assign the development, production, and operational use of weapon systems to any military department or service [and] provided the groundwork for expanding the role of the Office of the Secretary of Defense (OSD)” (Fox, 2011, p. 35).
- *DOD Directive 5000.1 in 1971* “[ensured] programs identified technological risks and documented the solution to engineering problem” (Fox, 2011, p. 76).
- The *Packard Commission* published a final report in 1986 which highlighted four key areas for continued improvement: national security planning and budgeting, military organization, and command; acquisition organizations and procedures, and government-industry accounting” (Fox, 2011, p. 130).
- The *Goldwater-Nichols Department of Defense Reorganization Act in 1986* continued “centralization of weapons acquisition management in OSD” as established in 1958, yet “the authority embodied in the legislation enacted by Congress in 1986 to reform acquisition in the Defense Department did not immediately translate into effective compliance at the working level” (Fox, 2011, p. 132).
- *Competition in Contracting Act, Defense Procurement Act, Defense Procurement Improvement Act, and Defense Acquisition Workforce Improvement Act (DAWIA)* were launched by Deputy Under Secretary for acquisition reform during 1984–1986 (Fox, 2011, p. p. 154–155).

The report concludes with four key areas that encapsulate lessons learned from defense reform (Fox, 2011). First, the government and defense industry contractors are in a unique partnership and have distinct perspectives (Fox, 2011). For example, the government defense program manager is negotiating with the industry program manager to deliver the best value within the budget limitations and federal acquisition regulations,

while the industry program manager is still part of the free-market enterprise and seeking to maximize profit while delivering upon contractual agreements to continue business (Fox, 2011). Second, rotating leadership which can shift directives and policies can undermine continuity in defense industry relationships and contractor performance (Fox, 2011). Iterative and incremental progress between the government and contractor on major defense acquisition programs can be negatively impacted with changes in defense priorities, requirements, or resources (Fox, 2011). Third, as will be discussed in more detail in the defense workforce and defense program manager section, the DOD human capital strategy for acquisition personnel is at the forefront of meaningful progress (Fox, 2011). Lastly, ensuring balanced incentives exist to drive human behavior and decision making for optimal program outcomes (Fox, 2011).

DOD reform efforts have long targeted reforming the defense acquisition management system and with every leadership change, policies are rebranded, and areas of focus evolve. RAND published a report in 2022 that investigated their research for more than thirty years and their partnership with the Air Force through their federally funded research and development center for studies and analyses. The summary indicates four trends impacting the defense acquisition management system: geopolitical changes, globalization, changing national priorities, and advancing commercial technologies (Wong, 2022, p. v). The report links these trends to specific areas of actions DOD can take in implementing a comprehensive plan to mitigate weapon system acquisition challenges, “responding to evolving missions, leveraging a changing defense industrial base, accommodating interoperability, building in cybersecurity, planning for technology refresh and insertion, rebuilding the acquisition workforce, managing the acquisition cost of systems” (Wong, 2022, p. v).

Nearing a century of defense acquisition reform efforts, the United States defense acquisition management system continues to emerge as a leading cause of research and discussion given the significant costs and dollar values that are reported annually. A 2010 Congressional Research Report (CRS) estimated the total cost of U.S. wars since September 11, 2001 is over \$1 trillion (Daggett, 2010, p. 1). In FY22, Crawford (2021) found the figure was closer to \$8 trillion with an estimated \$6.5 trillion in interest.

In an increasingly unpredictable and hostile international arena, taxpayers rely on the DOD to manage resources to meet the objectives for which those resources were designated. Although the literature suggests a myriad of responses to managing defense resources more effectively and efficiently, some of the findings indicate “the persistence of acquisition problems is not due to lack of understanding or what practices need to be changed...the underlying stumbling block has been and continues to be one of implementing and institutionalizing the recommendations required to bring about more professional management” (Fox, 2011, p. 206).

## **2. Volatility, Uncertainty, Complexity, and Ambiguity**

The term VUCA is often associated with the military, but the term was introduced in 1985 by Warren Bennis and Burt Nanus to describe volatility, uncertainty, complexity, and ambiguity (Gläser, n.d.). This research utilizes VUCA to underscore the underlying complexity with the defense acquisition management system. The Merriam-Webster definitions of the VUCA terms are summarized as follows:

- Volatile, characterized by or subject to rapid or unexpected change (n.d.k.)
- Uncertain, not known beyond doubt, not having certain knowledge, not clearly identified or defined, not constant, not certain to occur, not reliable (n.d.j.).
- Complex, a whole made up of complicated or interrelated parts (n.d.c.).
- Ambiguous, doubtful, or uncertain especially from obscurity or indistinctness, capable of being understood in two or more possible senses or ways, inexplicable (n.d.b.).

The themes of change, doubt, and variability underscore the challenges of the defense acquisition management environment. The Project Management Institute (PMI) describes VUCA as “dynamic and situational—sometimes things can be fairly clear but then suddenly shift due to outliers, adjacencies, and” (2022).

David Snowden developed the Cynefin framework, depicted in Figure 5, which is both a sensemaking and decision making tool that emphasizes four primary levels of complexity: obvious, complicated, complex, and chaos (1999). In a more recent publication, Snowden and Mary Boone underscore the relevance of the Cynefin framework today and cite “the complex domain is much more prevalent in the business world than most leaders realize—and requires, different, often counterintuitive, responses...leaders who understand that the world is often irrational and unpredictable will find the Cynefin framework particularly useful” (2007, para. 6).

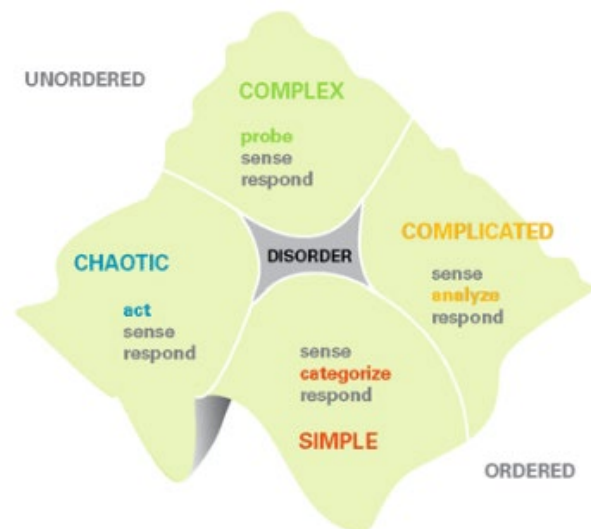


Figure 5. Cynefin Framework. Source: Snowden and Boone (2007).

The distinguishing factor amongst identifying which of the four domains a person is in resides within the clarity of the “cause-and-effect relationships” (Snowden & Boone, 2007). Butrico et al. examined the Cynefin Framework in an associated research project on defense program manager sensemaking in defense acquisition and surmised the defense program manager operates within the simple to complex (2021). The chaotic domain is described by Snowden and Boone as more of a survival environment in which *decision making* is more reactive and “a leader must first act to establish order, then sense

where stability is present and from where it is absent, and then respond by working to transform the situation from chaos to complexity” (2007, para. 28).

One critical takeaway from the Cynefin framework in the literature review was the situational awareness needed to manage complexity,

since the Leaders who don’t recognize that a complex domain requires a more experimental mode of management may become impatient when they don’t seem to be achieving the results they were aiming for. They may also find it difficult to tolerate failure, which is an essential aspect of experimental understanding. If they try to overcontrol the organization, they will preempt the opportunity for informative patterns to emerge. Leaders who try to impose order in a complex context will fail, but those who set the stage, step back a bit, allow patterns to emerge, and determine which ones are desirable will succeed (Snowden & Boone, 2007, para. 26).

This perspective is applicable to the defense program manager as well as the team composition and higher levels of leadership. DOD organizations are in a constant state of flux and rotating personnel are a critical consideration in understanding the relationship dynamics of an organization and components within that organization. For example, “the cynefin framework helps leaders understand how the social complexity and adaptability of problems fit into defined categories and what behaviors arise as problems emerge to become increasingly more complex” (English, 2017, Four Operational Domains section).

To build upon the concept of complexity in the literature and application to defense acquisition management, R. Jones’s (2016) experimental design “Understanding Complexity and Self-Organization in a Defense Program Management Organization” examines decision making with the context of the defense program office. Figure 6 illustrates a descriptive model that utilizes ten variables or inputs that result in a “self-organizing communications process relationship” (R. Jones, 2016, p. 3). The experiment examined “the extent to which a defense program office self-organizes as a program becomes more turbulent and how the complex network of social interaction and decision making changes from its perceived base state as defined by regulation and law (R. Jones, 2016, p. 8).

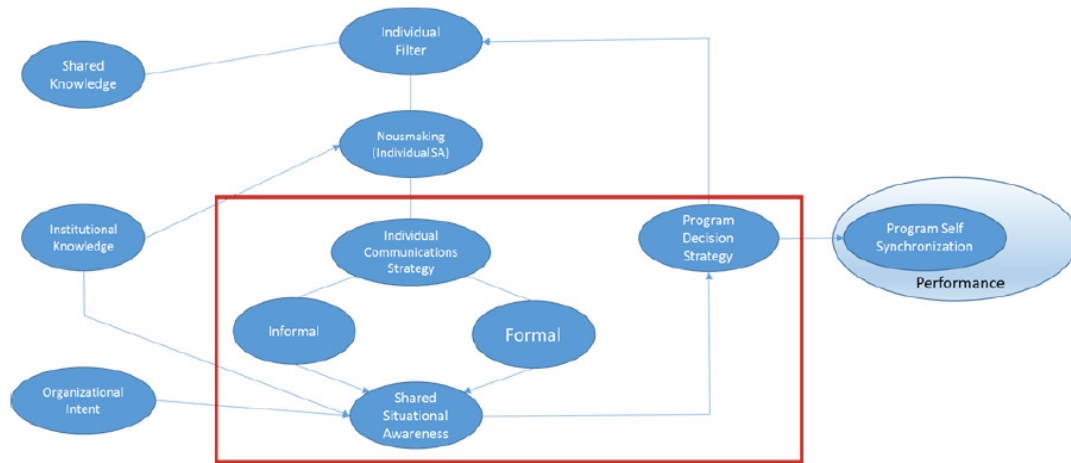


Figure 6. Self-Organizing Descriptive Model for a Defense Acquisition Program Office. Source: R. Jones (2016).

### 3. The Defense Program Manager

The DOD defense acquisition workforce includes an estimated 185,000 personnel and the defense acquisition program manager plays a leading role (DOD, n.d.). Professionalization of the workforce and the defense program manager have been a central component of DOD strategy to improve acquisition outcomes. *Defense program managers* serve in a pivotal leading role, yet they rely on many subject matter experts to inform their decision making. Given the exploration of the defense acquisition management system, “if the complex defense acquisition process is to be managed more effectively and efficiently, the Defense Department must develop better trained and more experienced acquisition managers and support staffs to manage the complex, continuing negotiations between one part of government and another and between government and large industrial firms” (Fox, 2011, p. 195).

Figure 7 illustrates the multi-disciplinary nature of the defense acquisition workforce and identifies personnel who are not considered part of the “acquisition” workforce. This image identifies a fundamental issue with efforts to professionalize the workforce when key personnel are omitted from those efforts (Scwartz, 2019b, p. 5).

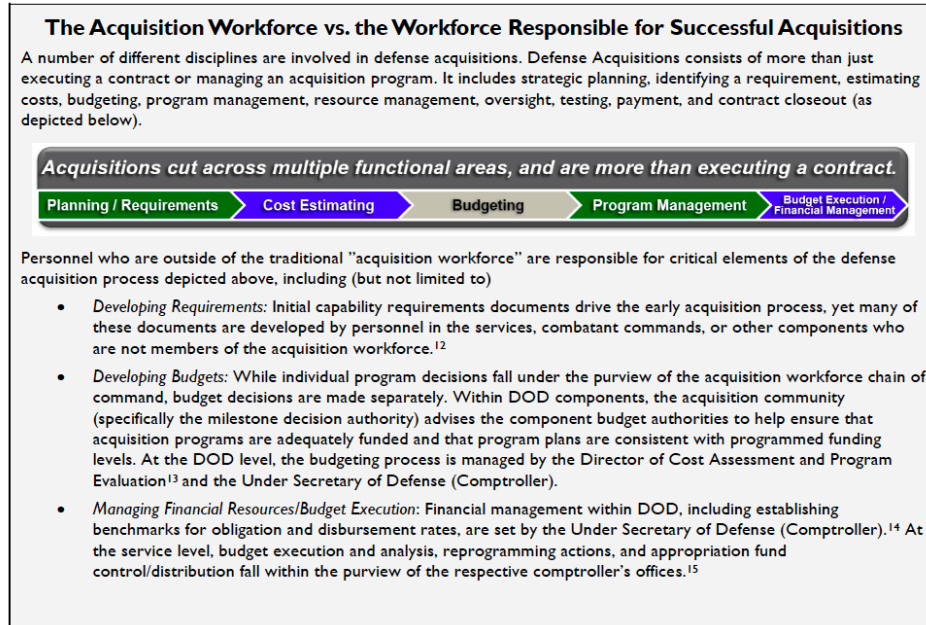


Figure 7. The Acquisition Workforce vs. the Workforce Responsible for Successful Acquisitions. Source: Schwartz (2016b, p. 5).

Competency and technical skills are instrumental. Program Manager Certification became a requirement with the advent of DAWIA. The Defense Acquisition University (DAU) provides certification and in the civilian / contractor world, The Program Management Institute (PMI) is an equivalent certification. Emphasis on technical training and leadership programs have enabled defense program managers to develop skills to better prepare them for the challenges of managing multi-billion-dollar programs. DOD made the most significant upgrade to their acquisition certification in three decades (Bistarkey & Howard, 2022, para.4).

In their article, *Does the program manager matter? New public management and defense acquisition*, Eckerd & Snider analyzed data from various MDAPs between 1997 and 2010 and concluded there was little evidence to suggest that defense program managers have a significant influence on defense acquisition program outcomes (2015).

The Government Accountability Office (GAO) published a report in February 2018 citing opportunities to improve practices for developing program managers aligning with best practices from PMI. The report cites that of the approximately 80 defense

programs that were assessed, collectively projected to cost approximately \$1.5 trillion dollars, and initial operational capability (IOC) was delayed by over two years (GAO, 2018, p. 1). IOC is defined as when “a system can meet the minimum operational (threshold and objective) capabilities for a user’s stated need” and these delays in capability demonstrate the fiscal outlay in respect to the moment in which a minimum.

A Defense Acquisition University report surveyed defense industry program managers to get their perspective on government *defense program managers*. competencies and quality of performance. “How Well are PMs doing? Defense Industry View of Defense Program Manager Counterparts,” surveyed to assess Source (Wood, 2010)- Competencies- hard skills, soft skills, interesting survey of *defense program managers* who provided observations of their performance.

The *defense program manager dilemma* resides within the balance of the resource investment and the commensurate level of defense preparedness, coupled with the very practical workforce and system limitations such as budgetary and contacting systems. Defense program managers are required to be very skilled in decision making, which relies on their ability to accurately and consistently assess realities that are constantly changing (Russo & Schomaker, 2002).

## **B. NOUSMAKING**

*Nous* means “mind or reason” and “common sense or alert” and *making* means “the act or process of forming, causing, doing, or coming into being” (Merriam-Webster, n.d.h; Merriam-Webster, n.d.g.). In the context of this definition, the act of *nous* or *nousmaking* is using the mind, rationale, and attentiveness to make common sense decisions. R. Jones first identified the *nousmaking* term in 2015 as part of his research to better understand how Special Operations Forces (SOF) team leaders who were engaged in direct fire combat operations make sense in these environments to make critical and life-threatening decisions. As a result of Jones’s (2015) study, four aggregate categories emerged as common themes amongst the interviewees in how they made decisions in volatile, uncertain, complex, and ambiguous (VUCA) conditions: sensemaking, trust, explicit knowledge, and implicit knowledge. Jones (2015) defines *nousmaking* as, “the

creation of nous through the interaction of sensemaking, trust, tacit knowledge and explicit knowledge and its relationship to decision making in complex and chaotic environments.” Figure 8 depicts the interaction of these four aggregate categories (R. Jones, 2015, p.14).

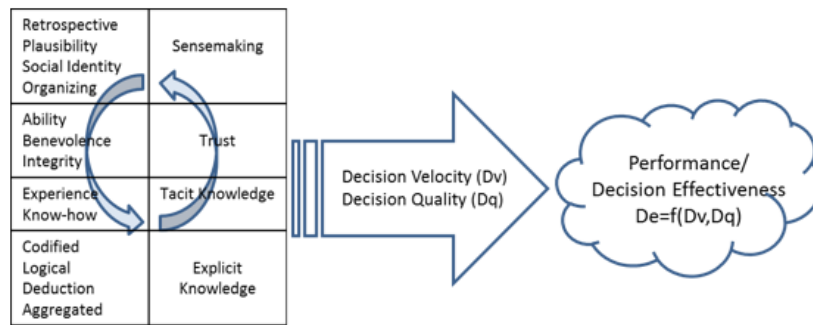


Figure 8. Interactive relationship between four aggregate categories and decision effectiveness. Source: Jones (2015, p.14)

The four *nousmaking* categories identified by Jones (2015, 2016, 2017, 2018), sensemaking, trust, tacit knowledge and explicit knowledge, were examined in the literature review. The trust and knowledge categories were later modified to trustmaking and knowledgemaking. Building upon Jones research and other NPS graduate research projects exploring sensemaking and *nousmaking* in complex and chaotic environments, this section expands upon sensemaking, trustmaking, and knowledgemaking in the context of defense program managers operating in the defense acquisition environment (Jones, 2015; Baker, 2018).

### 1. Sensemaking

*Sense* is defined as “a meaning conveyed or intended, conscious awareness or rationality, and a motivating or discerning awareness” (Merriam-Webster, n.d.i.). To make sense then implies the act of making meaning of information or bringing awareness to an understanding. Synonyms of this concept of “sense” in sensemaking include feeling, perception, insight, and foresight (Merriam-Webster, n.d.i.). Sensemaking roots can be found in organization studies and information and computer sciences, yet often

considered interdisciplinary since research includes relations to sociology, communication studies and the cognitive sciences (Manning, 2013; Turner, 2023;). The following description was published in the Encyclopedia of Management Theory,

sensemaking is not interpretation because it involves noting, noticing, picking, and plucking out cues that are then interpreted. People generate what they interpret. Sensemaking is not a metaphor: It is literally how people make sense. It is a process that is grounded in identity construction; it is retrospective, enacted in sensible environments, social, ongoing, focused on, patterned by extracted cues, and driven by plausibility. Because all deciding is fraught with ambiguity, making sense may only require that the deciding be plausible and acceptable (Manning, 2013).

The foundations of the Organizational Behavior discipline began at Harvard University with faculty who created a “human relations” school “in which employee attitudes, formal team dynamics, informal groups, and supervisor leadership style strongly influenced employee performance and well-being” (McShane & VonGlinow, 2014, p.5).

Most of the literature review credited Karl Weick, a social psychologist who published “The Social Psychology of Organizing” in 1969, for initial research on *sensemaking*. More than three decades later, Weick asserts the fundamentals of *sensemaking* remain interrelated to organizing,

to make sense of something is to begin to provide a plausible platform for sharing mental models, coordinating activities, and interacting to produce relationships. To organize around something is to converge on an event whose articulation and preservation feels beneficial and of joint relevance. Sense makes organizing possible. And organizing makes sense possible (2001, p. 95).

Brenda Dervin explains “sense-making focuses on how individuals use the observations of others as well as their own observations to construct their pictures of reality and use these pictures to guide behavior (1983, pg. 6).” Dervin expressed that “information is not a thing that exist independent of and external to human beings but rather is a product of human observing” (1983, p.4). At the same time, she indicates there are “[assumptions] that sense-making behavior is responsive to and mandated by changing situational conditions (Dervin, 1983, pg. 6).” She also extends sensemaking

beyond rational choice, “instead of conceptualizing information as relevant only to cognitive and so-called rational frameworks, Sense-Making conceptualizes all aspects of human being – cognitive, spiritual, physical and emotional. – as informative” (Dervin, 1983, p. 1000)

In an essay by Klein et al., five psychological perspectives associated with the sensemaking concept were explored: creativity, curiosity, comprehension, mental modeling, and situation awareness (2006). Although these perspectives can influence or contribute to sensemaking, the authors distinguish “sensemaking is a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively” (Klein et al., 2006).

In Figure 9 the methodology or theory of five authors: Karl Weick, Daniel Russell, David Snowden, Brenda Dervin, and Gary Klein, is organized to demonstrate the differences in approach to the way sensemaking is investigated (P. Jones, 2015). In a simplified summary, “each methodology can be seen as describing a different unit of analysis, of internal or external representations of meaning, and of more of an individual or collective interpretation of outcome of sensemaking as ‘observed’” (P. Jones, para. 6).

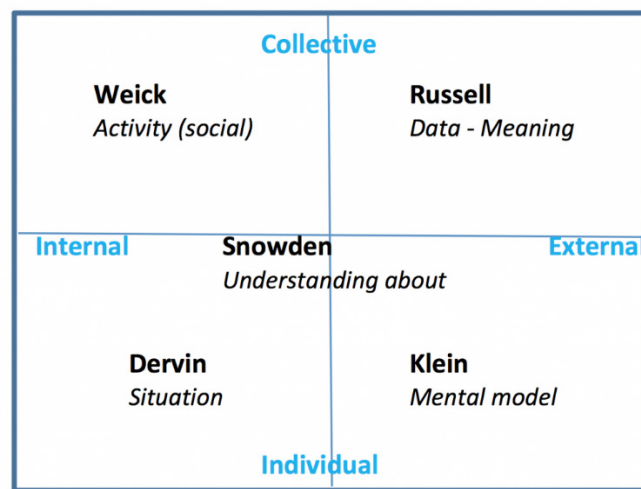


Figure 9. Sensemaking Units of Analysis. Source: P. Jones (2015)

Ntuen and Leedom (2007) described sensemaking as “contain [ing] two main logical moments: the retrospective process of interpretation (sense) and prospective one of enacting a new configuration of the environment (making).” Figure 10 depicts the key process of sensemaking which involves cyclical feedforward and feedback of sensemaking elements (Ntuen & Leedom, 2007).

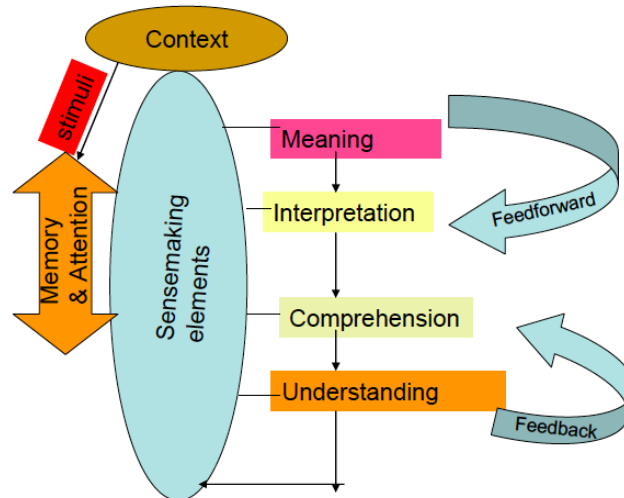


Figure 10. Key processes of sensemaking. Source: Ntuen and Leedom (2007, p 6).

Keller et al., (2014) researched the disciplines of sensemaking and narratology. They focused on “the sensemaking process and the narrative in a broad trust sense to understand information” and how information can be used to better inform the capabilities defense planning (p. 3). Their research highlighted the discipline of narratology. In Figure 11 the sensemaking-experience-narrative-sensemaking-information (SENSI) model illustrates the interrelationship between how people use experience to develop stories which is fundamental to how individuals make sense of their environments since they apply meaning to those experiences. The model depicts individuals, in this case soldiers, making assessments of fielded equipment which become their interpretation and reality, referred to as narrative (Keller et al., 2014, p. 5).



Figure 11. Sensemaking-Experience-Narrative Sensemaking Information (SENSI) model. Source: Keller et.al (2014).

Other research has indicated that although sensemaking is applicable in many fields, the primary application thus far in the defense context is command and control (Jensen, 2009).

In their article, “Making sense of sensemaking narratives,” Brown et al., advocate “although sensemaking is inherently social, it is fundamentally tied to processes of individual identity and generation maintenance” (2008, p. 1037). They go on to explain individual sensemaking can expand our understanding of organizational sensemaking, “by attending to individual differences in sensemaking we may ultimately be better able to explain how organized activities emerge from dissensus, ambiguity and disagreement” (Brown et al., 2008, p. 1057).

## 2. Trustmaking

The Merriam-Webster Dictionary defines trust as the “assured reliance on the character, ability, strength, or truth of someone or something” and “one in which confidence is placed” (n.d.j.). The concept of trust has existed since the 13<sup>th</sup> century and synonyms include confidence, faith, and credence (Merriam-Webster, n.d.j.). These words evoke a sense of belief in something as real and reliable. Trust enables individuals to share information and communicate.

One of the central assumptions in developing and building trust is “people’s decisions about whether to trust others—are based on their estimates of the probability that others will reciprocate that cooperation” (Tyler & Kramer, p. 10). This aspect of trust resonates deeply within the context of this research as developing trust within the social

context of a complex acquisition environment is fundamental to a defense program manager's sensemaking of how team members will participate in the system. Another aspect of the defense acquisition environment is the "hierarchical" structure of the military and authority in the decision making process.

Several schools of thought view trust as a foundational skill that increases understanding and awareness in working within complex and chaotic environments. A Harvard school psychologist, Amy Cuddy, identified trust as one of the first elements a person thinks about when they first meet someone (Goudreau, 2016). In groups, "according to the social model of trust, an authority's intentions to maintain respectful relations in decision making processes are central to trust. Attributions of positive intent lead group members to trust the authority and take the obligation to accept his or her decisions on themselves" (Tyler & DeGoey, 1996, pp.332-333)

In consideration of trust in the context of DOD, the United States (U.S.) Military Code of include the terms faith and trust. Article 4, "If I become a prisoner of war, I will keep faith with my fellow prisoners," and Article 6, "I will trust in my God and in the United States of America" (Association of the United States Army [AUSA], n.d.).

There is a trust game<sup>4</sup> where two players role-play as investors (trustors) and recipients (trustees) (Gächter, 2013, p. 49). In the game,

"The investor has an endowment of, say, \$10. The investor's task is to decide how much of this endowment to transfer to the recipient. Any amount  $x$  the investor transfers gets tripled by the experimenter—that is, the recipient receives  $3x$ . The recipient has then to decide on the amount  $y$  (between 0 and  $3x$ ) to back transfer to the investor, who receives  $y$  (Gächter, 2013, p. 49)."

The game incentivizes investing, "in daily life the largest part of trust is probably created through repeated interactions or within networks—that is, trust offers in embedded relationships. If trust is combined with reputational incentives, trust and trustworthiness should increase" (Gächter, 2013, p. 49).

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<sup>4</sup> Developed by Berg, Dickhaut, and McCabe (1995), also known as the "investment" game.

“people prefer to develop incomplete but satisfactory answers rather than engage in complex cognitive processing of events” (Tyler & Degoey, 1996, p. 336). This idea aligns with the concept of bounded rationality, “the view that people are bounded in their decision making capabilities, including access to limited information, limited information processing, and tendency toward satisficing rather than maximizing when making choices” (McShane & VonGlinow, p. 114).

Trust is a dynamic subject that Tyler and Kramer describe on three levels (1996, p. 6) that are applicable to DOD, “on the macrolevel, this issue involves a concern for the influence of social organization on patterns of trust. On the meso-level, it involves an exploration of social networks (Tyler & Kramer, 1996, p. 6). Finally, on the microlevel, it involves consideration of the psychological basis of trust and distrust” (Tyler & Kramer, 1996, p. 6).

Once relevant concept to this research is how an individual’s trust in others affects their own reputation within a larger social environment,

“the occurrence of reputational effects depends on the existence of ongoing interactions and stable social networks through which reputational information can be spread. Hence, trusting is linked to social context, and trusting behavior changes as social context changes” (Kramer & Taylor, 1996, p. 4).

This is a critical consideration when thinking about trust from the perspective of the defense program manager in which the social context is constantly evolving. There is an elevated level of visibility on defense acquisition programs, spending, and performance, positive working relations are highly instrumental to key program performers. “social trust mechanisms play an important role in cooperative behavior” (Kramer and Tyler, 1996, p. 5). A survey was used to measure levels of trust “between units in organizations or between organizations (Kramer & Tyler, 1996 p. 319).” The underlying argument is that trust is “transactional” in nature and is developed through these transactions with other individuals or groups of individuals (Kramer & Tyler, 1996).

Edelenbos and Klijin identify that it is “difficult to achieve joint decision making among actors, given the fact that complex interorganizational networks are ambiguous

and unpredictable” (Administration and Society, March 2007). Their review of literature across several domains identifies trust as one of the key elements in making informed and innovative decisions in increasingly complex environments. So how does this translate to the individual level of the defense program manager? Their research indicates that modern governance is trending toward horizontal rather than vertical structures. We have seen this in the U.S. military with the establishment of joint services, and the Defense Acquisition Management System. The defense program manager relies on many people to inform their reality and in this respect, trusting the people and/or information they receive is a key element.

The two aspects of trust that were explored were how trust is valued in making complex decisions and furthermore how trust is developed or how it can change over time. In their research, Edelenbos and Klijn identify that “both empirical and theoretical arguments support the importance of trust for complex decision making networks” (2007). Although their research only examined one case study and utilized theory across various disciplines, they offer that increased and/or higher quality cooperation, information exchange, innovative solutions, and satisfactory outcomes were all key attributes related to prominent levels of trust within actor networks (Edelenbos and Klijn, 2007, p. 45). They also identified a need to look in more detail at the “influence of trust” in complex decision making, “with the growing importance of horizontal governance in policy making and decision making, we should look more at the influence of trust in these processes” (Edelenbos and Klijn, 2007).

In Figure 12, an example of the Program Manager’s Dilemma is provided in the context of the relationship between the Government Program Manager and the Contractor Program Manager. The critical component of this relationship, trust. Defense program managers Often in the spotlight, *defense program managers* face many challenges in navigating the open system that is defense acquisition.

	Government PM trusts	Government PM does not trust
Contractor PM Trusts	Optimal outcome for both	Maximum government benefit. Contractor is exploited.
Contractor PM does not trust	Maximum contractor benefit. Government is exploited.	Minimally effective outcome for both.

Figure 12. The Program Manager’s (PM) Dilemma. Adapted from Ward (2004).

In summary, trust enables individuals to share information and exchange ideas which can increase their ability to increase their understanding of their operating environments. Several research studies identified that having a better sense of an operating environment significantly increases individual ability to make informed decisions.

### 3. Knowledgemaking

The term *knowledge* originated in the fourth century BC with Aristotle who took “an empirical view of knowledge that values information gained through the senses and deductive reasoning,” followed by Descartes in 1641 who “proposed that reason is superior to experience as a way of gaining knowledge and established the framework for the scientific method” (Baker and Benjamin, p. 8). Several definitions from Merriam-Webster are relevant for exploration in the literature review,

the fact or condition of knowing something with familiarity gained through experience or association, acquaintance with or understanding of a science, art, or techniques, the range of one’s information or understanding, apprehending truth or fact through reasoning, and the sum of what is known: the body of truth, information, and principles acquired by humankind. (n,d.f.)

A theme of elements can be extracted from these definitions: knowing, experience, understanding, range, information, truth, fact, and reasoning. The concept of “knowledge can be seen as an intangible asset which is unique, path dependent, casually ambiguous, and hard to imitate or substitute. These characteristics make knowledge a

potential source of competitive advantage, and, consequently, the logical target of managerial attention” (Cabrera & Cabrera, p. 688). To create a common thematic nomenclature for the report, the term *knowledgemaking* will be utilized for this larger elusive term that includes knowledge creation, explicit knowledge, tacit knowledge, implicit knowledge, and knowledge management.

*Knowledge creation* is a significant component of nousmaking as it includes its own subset of processes and dynamics that are outlined in Figure 13. Choo and Bontis summarize knowledge creation is

precipitated by the recognition of gaps in existing knowledge. Such knowledge gaps can stand in the way of solving a problem, developing a new product, or taking advantage of an opportunity, Organizations then create new knowledge by converting tacit to explicit knowledge, integrating, and combining knowledge, and acquiring or transferring knowledge across boundaries. (2002, p. 81)

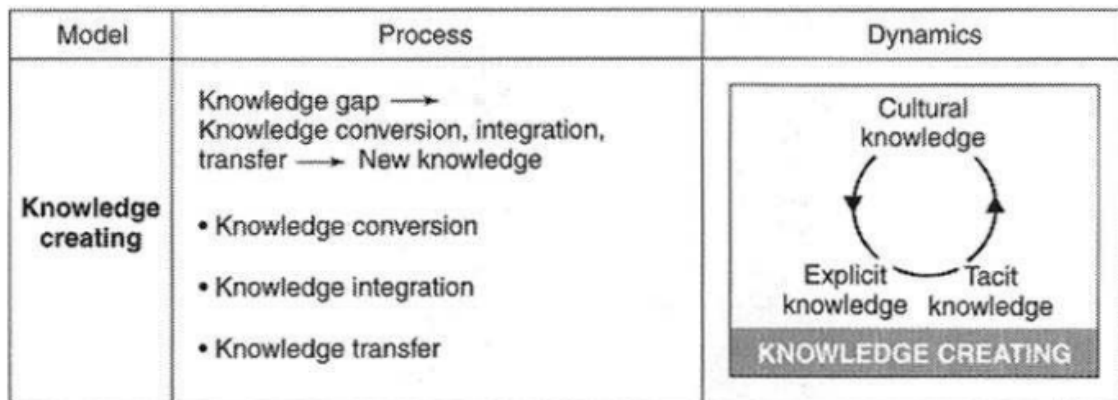


Figure 13. Knowledge Creating. Source: Choo and Bontis (2002, p. 81).

In this context of DOD, knowledge creation is a continual iterative and cyclical process as depicted in the knowledge creating dynamics. As evidenced in the references in this research report alone, countless reports serve to create and share knowledge to further advance the field and profession of defense acquisition program management.

*Explicit knowledge* can be described as baseline knowledge or ground truth information that is often objective, easier to communicate, document, and arrive toward a

universal understanding. Explicit knowledge includes experience and the potential for that experience to develop and improve over time (Source).

For the defense program manager, most of the explicit knowledge is learned in education and training. Defense Acquisition Workforce Improvement Act (DAWIA) certification for defense program managers is a requirement, as well as other key defense acquisition functional areas, budget and financial management, contracts, logistics, engineering, etc. In the private sector the Program Management Professional (PMP) certification offers additional credentials to distinguish proficiency in explicit knowledge.

*Implicit knowledge* is the application of explicit knowledge and involves using the knowledge to complete a task or action. Explicit knowledge is needed before a person can implement it so having accurate explicit knowledge will inform implicit knowledge. Reber argues,

implicit learning is characterized by two critical features: (a) It is an unconscious process and (b) it yields abstract knowledge. Implicit knowledge results from the induction of an abstract representation of the structure that the stimulus environment displays, and this knowledge is acquired in the absence of conscious, reflective strategies to learn. (1989, para. 2)

*Tacit knowledge* is defined as knowledge that is collected through technical or on the job training over time and is difficult to replicate. Russo and Schoemaker discuss this in their book, “Winning Decisions,” that a key indicator of highly accomplished leaders is “the ability to learn from experience” (2002, p. 197). Tacit knowledge can also be cultural knowledge,

Tacit expertise is organized around the mental activities of pattern recognition and hypothesis testing. Pattern recognition reflects the ability of an actor to (1) “recognize” a set of cues—or situational features—from his available information environment and (2) use these cues to activate a specific mental framework for interpreting some aspect of the situation. In short, pattern recognition involves a mental process of “fitting” available information and experience-based mental models together into a cohesive structure. (Ntuen & Leedom, 2007, p. 3)

Another component of knowledgemaking and applicable to the *defense program manager* is the consideration of knowledge and privacy. In their article, “Between

Concealment and Disclosure: Approaches to the History of Privacy in Knowledge-Making,” da Silva Perez and Kafer introduce a critical consideration,

we tend to associate knowledge with the mind, the intellect, or the brain, but much of what we come to know starts with concrete engagements with the world. Experimentation, rehearsal, repetition, habit formation—all of these are intrinsic to getting to know something and getting to know it well. Because it often involves trial and error, knowledge development is done more comfortably in private, where the knowledge-maker remains unobserved while learning or developing something new. Even when practices of knowledge-making achieve a stage where they require social engagement, there might still be a concern for maintaining a certain level of privacy. (2023, para. 1)

The article highlighted “possibilities for knowledge in their entanglement with practices of privacy in order to highlight how privacy, at times, can hinder or help knowledge-makers reach their objectives” (da Silva Perez & Kafer, 2023, para. 3).

In summary, *knowledgemaking* is a critical component of nousmaking and is already in practice in defense acquisition. The continued challenge of *knowledgemaking* for the defense program manager, is there are many factors that limit individual control of *knowledgemaking*.

### C. DECISION MAKING

The definition of *decision* is “the act or process of deciding” (Merriam-Webster, n.d.d.). Over thirty years ago, Miley W. Merkhofer (1987) published “Decision Science and Social Risk Management: A Comparative Evaluation of Cost-Benefit Analysis, Decision Analysis, and Other Formal Decision-Aiding Approaches.” In his preface, Merkhofer cited that broad communities of interest such as economists, decision analysts, management scientists, and others were pressing the imperative for the government “to take a more scientific approach to decision making” (Merkhofer, 1987, p. xi). Today, we still see these themes particularly in reports by the Congressional Research Office and Government Accountability Office advocating that DOD can do better in collecting and analyzing data (Schwartz, 2016a).

The literature review of *decision making* examines three key areas: rational choice, decision theory, and game theory; uncertainty and risk; and the OODA loop.

## 1. Rational Choice Theory, Decision Theory, and Game Theory

Encyclopedia Britannica defines *Rational Choice Theory* as the belief that individuals in principle make choices or decisions that align with their own preferences (Amadae, 2016). Gächter's research asserts "the rational choice model aims to explain the decisions of individuals and the individual and, in particular, the social consequences of those decisions" (2013, p. 60). Gächter's conclusion results in three predominate themes about social interactions:

1. majority of people use both selfish and non-selfish motives, reciprocity is "not motivated by strategic concerns" (2013, p.60).
2. incentives to motivate people and people interacting with the same people gravitate toward more "prosocial behavior...because selfish people also have an incentive to cooperate" (2013, p.60).
3. the cost of prosocial behavior will influence the occurrence give the rational choice approach and "there is a tradeoff involved between one's own welfare and the welfare of others" (2013, p. 60).

In a much earlier study, Eisenhardt (1989) asserts "people are boundedly rational but are also capable of engaging in sensible problem-solving strategies to help compensate for their limitations" (p.573)

The relationship between *Rational Choice Theory* and *Decision Theory* is articulated well by Steele & Stefánsson,

decision theory typically makes a conceptual distinction among preferences, beliefs, and constraints. Preferences describe how individuals rank the available alternatives according to their subjective tastes. Beliefs are the second conceptual building block behind the rational choice model... Constraints are the set of alternatives that are available to an individual. (2015, p. 34)

Figure 14 illustrates this conceptual framework in which preferences, constraints, and beliefs are weighed against optimal decisions. The preferences, constraints, and beliefs section of this framework can be linked to *nousmaking*.

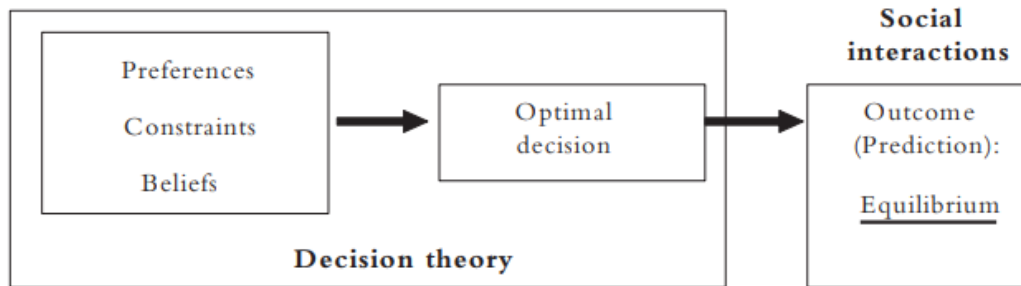


Figure 14. The Rational Choice Framework. Source: Gächter (2013, p. 35).

In game theory, “the study of the ways in which interacting choices of economic agents produce outcomes with respect to the preferences (or utilities) of those agents, where the outcomes in question might have been intended by one of the agents” (Stanford Encyclopedia of Philosophy, 2019, para. 1). The principal context of game theory in this literature review is as “an explanatory account of actual human strategic reasoning processes” and is illustrated through the ‘the Prisoner’s Dilemma’ (Stanford Encyclopedia of Philosophy, 2019, 2.1, para. 4).

The Prisoner’s Dilemma premise is one of two people who have committed a crime together, yet the police have limited evidence for a jury to convict them both (Stanford Encyclopedia of Philosophy, 2019). The police offer each prisoner choices on confessing to the crime and implicating the other person as to committing the crime (Stanford Encyclopedia of Philosophy, 2019). The outcomes of the varying offers strongly rely on how both people respond to the offers. For example, if both people confess, they will receive 5 years (Stanford Encyclopedia of Philosophy, 2019). If neither person confesses, each will get 2 years (Stanford Encyclopedia of Philosophy, 2019). If one confesses, and the other does not, the one who did not confess will get 10 years (Stanford Encyclopedia of Philosophy, 2019).

Gächter discusses two aspects of the PD, the degree to which cooperation existed and the importance of strategic incentives (2013, p. 49).

The observation that there are strong effects of repeated interaction suggests that straightforward strategic incentives are very helpful for successful cooperation. There can thus be no doubt that the strategic gains

from cooperation that come from repeated interactions are a powerful force in explaining real-world cooperation in small and stable groups. However, the success of repeated game incentives in sustaining cooperation may be limited if groups become larger. The intuition is as follows. In the bilateral prisoner's dilemma a player can punish a defector by defecting as well. In larger groups such targeted punishment is not possible: defection punishes not only defectors but also other cooperators, who, as a consequence, might then defect as well. For this reason it is worthwhile to move beyond dyadic relationships. (Gächter, 2013, p. 51).

In this context the PD can be a useful tool to examine the constraints within the defense acquisition management system. The *defense program manager dilemma* does not imply a bilateral relationship, but one in which there are many consequences for decision making and utilizing this tool can improve how further research focuses on the rationality of decisions within the context and constraints of the defense acquisition management system.

## **2. Uncertainty and Risk**

Merkhofer summarizes the meaning of risk in its broadest sense and form, "risk is defined as an uncertain situation in which a number of possible outcomes might occur, one or more of which is undesirable" (1987, p. 2). He goes on to say, "uncertainty is clearly fundamental to the concept of risk" yet there is a difference between the possibility or probability of a risk occurring and experiencing the risk come to fruition (Merhofer, p. 2).

To manage uncertainty and risk in decision making there are alternative strategies. For example, the Federal Acquisition Regulations (FAR), Defense Federal Acquisition Regulation Supplement (DFARS) and DOD Instruction 5000 provide a governing framework for federal and defense acquisitions and thereby directly mandate human behavior to manage and mitigate risk to the government. Other strategies to influence human behavior are through incentives or providing information such as warnings yet "selecting an appropriate alternative for government risk management is extremely difficult because of the complexity of deriving estimates of risk levels and determining the acceptabilities of these levels" (Merhofer, 1987, p. 16).

For the defense program manager, mitigating and managing risk is a mandated requirement and part of the major defense acquisition program Acquisition Strategy (AS) (DAU, n.d.). Yet there is often a challenge in defense as there is significant scrutiny and public interest on the expenditure of defense resources. Former Secretary of Treasury, Robert Rubin, advocates “the way decisions are evaluated affects the way decisions are made. I believe the public would be better served, and their elected officials and others in Washington would be able to do a more effective job, if judgments were based on the quality of the decision-making instead of focusing solely on outcomes” (Russo & Shoemaker, 2002, pp. 4–5).

Multi-criteria decision making (MCDM) is one of the methods utilized to analyze alternatives to make the best possible decision. Benjamin Franklin is credited for the initial observations of this method when he utilized a “simple paper system for deciding important issues” (International Society on MCDM, n.d.). One research study determined,

multiple objective decision problems arise very frequently. Their solution requires the decision maker to first determine what really matters and list the issues or consequences of concern. This process of discovery should be pursued through the construction of an objectives hierarchy. It is the single most important step towards a solution. Without doing this we run the risk of not knowing “what is the real problem” and of not asking “the right question. (Wall & MacKenzie, 2015, p. 28)

Captain (USAF) William S. Angerman’s 2004 thesis, “*Coming full circle with Boyd’s OODA loop ideas: an analysis of innovation diffusion and evolution,*” examines the history of the OODA loop. Origins of the OODA Loop concept trace back to as early as 1974 during Colonel (retired USAF) Boyd’s evaluation of air-to-air combat in the Korean War (Angerman, 2004). In the 21<sup>st</sup> century, the concept is being applied in many fields such as cognitive engineering and complex adaptive systems (Angerman, 2004, pp.3-5). Figure 15 outlines the four key interacting steps that comprise the OODA loop, observe, orient, decide, and act.

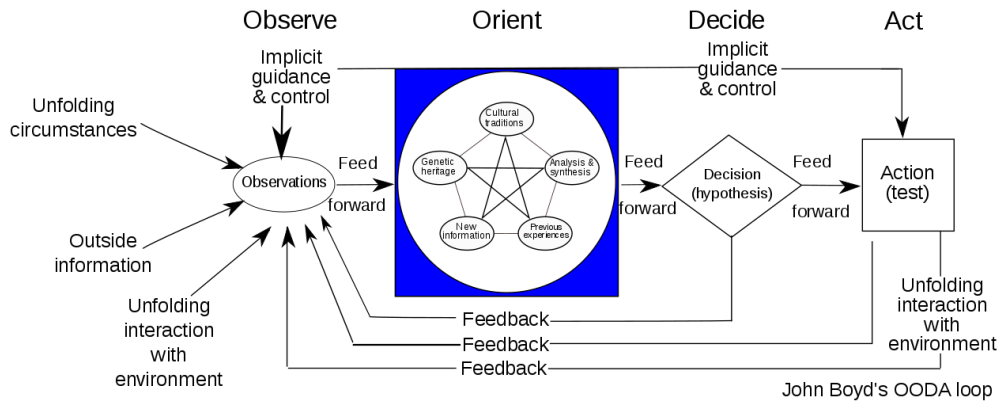


Figure 15. John Boyd's OODA Loop. Source: Moran (2008).

The OODA loop incorporates *nousmaking* (observe and orient) and *decision making* (decide) and is another illustration of how iterative and cyclical the cognitive processes of a defense program manager can be.

Russo and Schomaker identify four stages of the decision making process: framing, gathering intelligence, coming to conclusions, and learning from experience (2002). Like the observe and orient stages of the OODA loop, the framing stage is where decision-makers gain a sense of their view of the issue and what criteria or preferences may arise to address the issue. Observing, orienting, and framing all align with the *nousmaking* concept, “cognitive scientists believe that we organize our understanding of the world into ‘mental models’ – a rich network of concepts and relationships that capture the essence of both concrete objects, such as a car or a computer, and abstract constructs such as democracy, family, competitor, and leadership” (Russo & Schomaker, 2002, p. 37).

While all these stages are instrumental, Russo & Schomaker allude to an Albert Einstein quote “make things as simple as possible, and no simpler” and summarize there are three main factors that determine outcomes: deciding, doing, and chance (2002). Russo and Schomaker utilize their experience and research to offer a solution for decision makers and provide a strategic framework that can be applied in any context: “good decision outcome is a good decision process ... [and] decision makers must focus on what is actually under their control” (Russo & Schomaker, 2002). This is applicable to

the defense program manager as not all decisions are within their control. The myriad of variables that influence *decision making* within Major Defense Acquisition Programs (MDAP) in particular, such as budget authority, political will, public perception, highlight a few of the many factors that can negatively impact a successful program outcome (Russo & Schomaker, 2002). Technological advances also contribute to the volatility of defense programs as this can impact design and development when threats or requirements change. Documenting program successes and failures with enough complexities of our ability to fully understand how program outcomes can be these individuals can improve clearly define the post positive outcomes program outcomes (Russo & Schomaker, 2002).

### III. DISCUSSION AND ANALYSIS

This chapter provides a discussion and analysis of the three research questions identified in Chapter I and the Chapter II.

#### A. RESEARCH QUESTION 1

The first research question is, what are the common themes in the literature related to *nousmaking* and decision making in defense acquisition?

The common themes in the literature review related to *nousmaking* and decision making in defense acquisition are in their broadest form the collection of: sensemaking, trustmaking, and knowledgemaking. Other themes that arose include but are not limited to information seeking and sharing, data collection and management, data-driven decision making, strategy, negotiation, communications, and leadership. Sensemaking was arguably the most common theme when reviewing commonalities in the literature review and is central to the *nousmaking* concept.

The *defense program manager dilemma* was a useful framework to identify the common themes. Continuing to examine the *defense program manager dilemma* within the context of *nousmaking* and *decision making* within defense acquisition can increase awareness and understanding of underlying cognitive processes and mental models. In an era where criticality in quality, effective, and efficient decision making is fundamental to an organization's success and competitive advantage, the defense department and defense program managers who are directing resource heavy programs must be analyzed more intentionally and strategically, to include the organizational and environmental factors of influence.

In reviewing related NPS Acquisition Research Program reports, Neterer and Patrone (2018) and Duong et. al (2018), utilized the same project title as R. Jones's 2017 report, *Why Do Programs Fail? An Analysis of Defense Program Manager Decision Making in Complex and Chaotic Program Environments*. Neterer and Patrone (2018) identified five themes that correlated with defense program manager decision making,

motive, culture, process, relationship, and risk. Our hypotheses suggest that a combination of both culture and regulated environments shape and greatly influence the critical milestone decisions for a PM. Further understanding of the five categories and the outliers behind PMs' decisions can guide future DOD acquisition programs to become more successful in the eyes of the customer and the DOD. (p.43)

Duong et al.'s report identified four main categories that influence a defense program manager's nousmaking in complex conditions: leadership, attitude, accomplishment, bureaucracy, and reputation (2018, p.28).

Lastly, *sensemaking* contributes significantly to the larger nousmaking concept and is represented by two areas that are interdependent within the context of defense acquisition decision making– individual sensemaking and organizational sensemaking. Sensemaking in both contexts is the process of making meaning, which then leads to decision making (Manning, 2013).

## **B. RESEARCH QUESTION 2**

The second research question is, what correlations or distinctions does the literature make regarding *nousmaking* and *decision making* for defense program managers operating in volatile, uncertain, chaotic, and ambiguous (VUCA) environments?

The correlations and distinctions in the literature review regarding *nousmaking* and decision making for defense program managers in VUCA environments emphasized required competence, experience, and training. The research examined cognitive processes and social sciences as literature recognizes the limits of humans in organizations. The macro, meso, and micro levels were also key distinctions in the literature for examining DOD, the defense acquisition management system, and the defense program manager.

The environment in which defense program managers operate is inherently complex and involves many stakeholders from whom the defense program manager must consider such as the end-user, the engineers, the contracting office, the financial manager, etc. To be successful, the defense program manager must the

Several frameworks and models were identified to help increase the understanding of how a defense program manager could orient themselves to make decisions in chaotic environments, such as the Cynefin framework and the SENSI model.

Heavy emphasis on the importance of leadership, technical and social skills, providing education and certification. The literature did not provide evidence that significant studies have been conducted on the cognitive aspects of a defense program manager's ability to make sense in complex and chaotic environments.

### C. RESEARCH QUESTION 3

The third research question is, how can *defense program managers* and other defense leaders leverage *nousmaking* and *decision making* within *defense acquisition management*?

The literature review suggests defense program manager *nousmaking* and *decision making* are fundamental frameworks from which to further investigate influencing organizational behavior and incorporating into management strategies in major defense acquisition programs. The literature indicates *defense program managers* leverage and utilize elements of *nousmaking* to make sense and organize their reality. For example, a commonly used document within military environments, “a standard operating procedure is a schema that structures dealing with an environment. A standard operating procedure is a frame of reference that constrains exploration and often unfolds like a self-fulfilling prophecy” (Weick, 1979, p. 156).

A clear example from the literature of how a *defense program manager* and other defense leaders leverage *nousmaking* and *decision making* within defense acquisition management is covered in the research of Keller et.al (2014). Utilizing sensemaking and narratives as a feedback mechanism to better inform decision makers, such as defense program managers, increases their understanding of warfighter requirements which can improve defense acquisition outcomes (Keller et.al, 2014). Inputs from soldiers and warfighters during the requirements generation system can inform equipment development in the defense acquisition management system (Keller et.al, 2014). Their conclusions and recommendations indicated sensemaking techniques such as those using

the SENSI model and deconstructing individual narratives, can provide more meaning and potential context for *decision making* than without (Keller et al., 2014, p. 51). Their research did highlight two limitations, the first being the highly labor-intensive nature of analyzing human judgement; and the second is the inherent subjectivity of the data which can lead to multiple interpretations (Keller et.al, 2014, p. 52).

Another example from the literature of leveraging *nousmaking* and *decision making* is illustrated in Figure 6, a research study by Tyler and Tyler that studied performance of Special Operations Forces within highly complex environments (2015). Tyler and Tyler argued it is possible to influence performance degradation in these environments through sense conversion as personnel gain training, experience, and cohesion within teams (2015, p. 64). Examining the *defense program manager dilemma* within the context of *nousmaking* can continue to advance our understanding of how the defense acquisition management system supports the mission objectives.

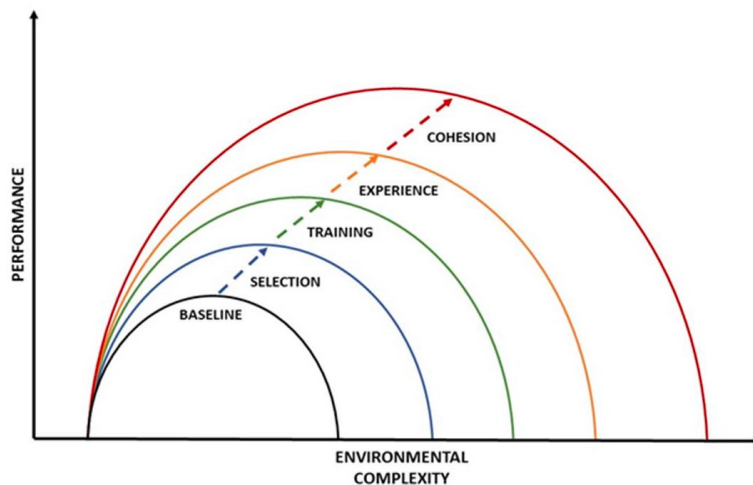


Figure 16. Special Operations Forces Inverted U-Model. Source: Tyler and Tyler (2015, p. 64).

The literature review underscored *defense program managers* must possess a range of technical skills, experience, training, and social skills that enable them to make rapid and accurate judgement and decisions. Since they operate in extraordinarily complex and chaotic environments, including the defense acquisition system, they have

many internal and external influences affecting their situational awareness. R. Jones (2016) describes “the process of individual situational awareness (SA) as Nousmaking, which is the degree to which the decision maker optimizes four aggregate categories; explicit knowledge, tacit knowledge, trust, and sensemaking and is able to make high quality decisions in ambiguous environments” (p.3). In this research report, the literature review built upon this concept and expanded its use for application to both the *individual nousmaking* and *organizational nousmaking*.

Capturing all the complexities of a program evolution is intended to provide a more accurate snapshot of how program outcomes can be improved is another example of leveraging *nousmaking* and *decision making* in defense acquisition (Russo & Schomaker, 2002). Another great example is from a Congressional Research Service (CRS) report published in 2016 recommended the use of data to improve defense acquisition outcomes,

despite the importance of data, most observers believe that the DOD, and other government agencies lag behind the private sector in effectively incorporating data analyses into decision making. These analysts argue that by using data more efficiently and effectively allocate resources and improve the effectiveness of military operations. (2016a, Schwartz, par. 1)

Although data-based decision making is utilized in early milestone and technology readiness level review, the report commented that “DOD culture must not only value using data to drive decisions, but also integrate data gathering and analysis into the fabric of the organization, making it part of standard routines and operating procedures.” (Schwartz, 2016a, para. 4).

A more recent study interviewed professional experts to better understand types of competencies in which resiliency in an environment, and some of the conclusions of the study included “competence in the emotional, relational and interpersonal makes individuals and organizations more resilient..., a social environment built on trust, psychological safety, emotional and moral support is also of great importance, in which an adaptive and beneficial learning culture where an acceptance of failure and a desire to learn can be created” (Herberg & Torgersen, 2021).

Defense program managers must possess a range of skill sets to successfully fulfill the objective of satisfying the requirements of the warfighter, within resource constraints, and enhancing military capability. The criticality of decision making within DOD is highlighted now more than ever. It is within the spirit of national interest that this joint applied project reviewed the literature to better understand how program managers gain insight and awareness in the complex defense acquisition management system. The factors that influence how defense program managers experience *nousmaking* which leads to more informed and strategic decision making within defense acquisition. Increasing our understanding of *nousmaking* and the defense program manager can build a greater awareness of critical attributes required for applicants into a defense program manager role.

## IV. CONCLUSION

The purpose of this research report was to investigate factors that enable a defense program manager to make sense of the defense acquisition management environment to make informed decisions that result in successful program outcomes. Chapter II explored the background of the problem<sup>5</sup> and identified three guiding research questions.<sup>6</sup> Chapter II provided a literature review of three central subjects: defense acquisition, *nousmaking*, and decision making. Chapter III examined the research questions and literature review with were guided by the *defense program manager dilemma*. This research report contributes to the broader study of defense program manager sensemaking and decision making in VUCA environments and the *nousmaking* term (R. Jones, 2015, 2016, 2018).

### A. RESEARCH SUMMARY

The findings in this report indicate that increasing our understanding of the defense program manager's *nousmaking* and *decision making* within the defense acquisition environment requires further examination and study. Although there are many sources of investigation and samples of application within the DOD, there appears to be an inconsistent use or application of the concepts to improving defense acquisition program outcomes. Formalizing the *defense program manager dilemma* term to contextualize the act and art of a defense program manager's *nousmaking* and decision making in the defense acquisition environment will benefit further discussion and exploration of the research. This term can represent the more complex and holistic expression of the defense program manager role.

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<sup>5</sup> Chapter 1.B. par 1: The problem this research investigates is the defense program manager dilemma, a term utilized in this research report to contextualize the science and art of a defense program manager's *nousmaking and decision making in the defense acquisition environment*. *The dilemma for the defense program manager* is the ability to make sense of the defense acquisition environment, and through *nousmaking and decision making*, process information to inform judgements and decisions that lead to optimal defense acquisition program outcomes.

<sup>6</sup> Chapter 1.C. par. 1: 1) What are the common themes in literature related to *nousmaking* and *decision making* in defense acquisition? 2) What correlations or distinctions does the literature make regarding *nousmaking* and *decision making* for defense program managers operating in volatile, uncertain, chaotic, and ambiguous (VUCA) environments? 3) How can defense program managers and other defense leaders, leverage *nousmaking* and *decision making* within defense acquisition?

The complexity of the defense acquisition management system will continue to be an area that requires highly qualified defense program managers that are effective in dynamic and high stakes situations. Weick warns that “as an organization increases in size it becomes its own selection system and quite literally does impose the environment that imposes on it. It should be apparent that distinction between organization and environment becomes hopelessly obscured under these conditions” (Weick, 1979, p. 167). The utilization of *nousmaking* models can be useful in further research of the defense acquisition decision making and the defense program manager. As Weick underscored, this pursuit of investigation or “inquiry in general is based on the assumption that the paths to understanding may be infinite and characterized by unique problems, but that all of these paths lead to a goal, an understanding of one nature” (1979, p. 29).

## **B. RECOMMENDATIONS**

Continued research should analyze the *defense program manager dilemma*. This term was useful in this report as a framework to illustrate in a single term the tremendous challenge the *defense program manager* has in the *defense acquisition environment*. This dilemma in the broadest sense is grounded in nousmaking, sensemaking, trustmaking, knowledgemaking, and decision making. Continued exploration of these elements in the macro (e.g., organization), meso (e.g., sub-component, integrated program team), and micro (e.g., defense program manager) levels can enhance future perspectives of DOD and defense acquisition research.

Recommend further qualitative and quantitative investigation of outcomes driven by human behaviors in significant leadership roles, and within large organizations, and with varying degrees of complexity. The defense acquisition management system, the defense program manager, and the team of individuals that support the defense program manager in VUCA environments will continue to complement both quantitative and qualitative based studies of *nousmaking* within the defense acquisition management system. Qualitative and quantitative research are needed to comprehensively advance studies of *nousmaking* and the *defense program manager dilemma*.

Research also indicated limitations of differentiating defense program performance outcomes given the many variables that interplay to produce those outcomes. Longstanding constraints and challenges within DOD and the defense acquisition management system can limit defense program managers control since “the relationships between organizations and their environments tends to downplay the extent to which the boundaries between the two are blurred and the extent to which organizations produce their environments” (Weick, 1979, p. 153).

Areas for further research and application of the *nousmaking* and *defense program manager dilemma* concepts:

- defense program managers
- integrated project and product teams
- defense acquisition workforce
- major defense acquisition programs
- other defense acquisition relevant roles: logistics, contract, budget
- Senior Enlisted Advisor, Senior Enlisted Leader, Officers
- cooperation and collaboration between and within the services
- armed services, defense civilians, congressional representatives

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