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Complex Leadership Needs in the Defense Acquisition Workforce

30 November 2017

Stephen C. Trainor, Visiting Associate Professor

Graduate School of Business and Public Policy

Naval Postgraduate School

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Abstract

This project provides a conceptual overview of the theory, frameworks, and models, or “thinking,” that informs the leadership needs in the defense acquisition workforce (DAWF). The defense acquisition system is noteworthy for the scope and complexity of the challenges it must solve to support the national security needs of the operational military forces. But the DAWF, a specialized community focused on the business of acquisition, is regularly critiqued for its inability to implement widespread organizational and cultural change that achieves substantive and lasting improvements and efficiencies. This project addresses the complex challenges that emerge from the interactions and distinctions of modern warfare, the acquisition system, and the culture of the DAWF, and that make complexity and team leadership particularly relevant conceptual frames for defense acquisition. The project hypothesizes a gap in the theory, frameworks, and models, or the “thinking,” about leadership and teams within defense acquisition. Research and practical evidence suggests that teams and team leadership may be an effective means to undertake flexible, agile, and interdependent work in complex, dynamic contexts, such as defense acquisition. The project offers a review and synthesis of the literature on leadership and teams in complex adaptive systems.

Keywords: complexity; culture; defense acquisition; leadership; teams

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About the Author

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Introduction and Problem Statement

> *"We are fighting tomorrow's wars in today's program development offices."*
>
> —Lt. Gen. (USAF, Ret.) Henry A. "Trey" Obering III (National Academies of Sciences, Engineering and Medicine, 2016, p. 1)

The nature of modern warfare has changed, and the effects of those changes resonate across the American defense environment. Warfare has always been a dangerous and unpredictable activity, but modern warfare differs significantly from the conventional notion of combat forces engaging well-defined and similarly outfitted adversaries (Green, 2011). Attempts to rationalize or organize modern approaches to war tend to break down due to the "non-linear, unpredictable and emergent" properties of this complex and dynamic environment (Green, 2011, p. 1-4). One effect of this increasingly complex context is the need for greater flexibility to rapidly, if not continuously, engage a variety of threats and adversaries across dimensions of conflict (Department of Defense [DoD], 2016). Another effect of increasing complexity is the emergence of adaptive, or "hybrid," threats that combine unconventional "actors" and blur "traditional categories of conflict" (Cojocar, 2012, p. 24).

These new conditions and complexities present unique challenges and produce demands for advanced technologies, expanded operational capabilities, and support from an array of experts and skilled individuals, often separated from one another and far from the conflict (Green, 2011). However, the increasing complexity of modern warfare presents leadership challenges as well. The former chairman of the Joint Chiefs of Staff, retired General Martin Dempsey, described what may be the most important capability in modern warfare as "leaders who do not think linearly, but who instead seek to understand the complexity of the problems before seeking to solve them" (Dempsey, cited in Cojocar, 2012, p. 23). This project provides a conceptual study of the thinking about leadership in one area of modern warfare: the field of defense acquisition.

The Distinctions of Modern Warfare

The compositional changes and complexity of modern warfare present several distinctions, or contrasting ideas, which demand not only different perspectives on leadership, but flexible strategies and approaches to organizing and operating (Defense Acquisition Performance Assessment Project, 2006; Green, 2011). While conventional armed forces tend to organize and operate hierarchically, the American military is beginning to respond to complex challenges and adaptive threats with new methods and revised operating models (Gillespie, 2017; McChrystal, Collins, Silverman, & Fussell, 2015). For instance, it is not unusual to see combat units interacting and collaborating with a host of non-traditional players, like drone operators, intelligence analysts, and technical specialists (Hackman, 2011). A key attribute of these new organizations is that they are highly interdependent and cohesive, despite being scattered around the globe (Gillespie, 2017). One such model that describes such flexible operating strategies is the multiteam system (MTS). MTS consists of a "tightly coupled network of teams" with both independent functions and highly interdependent objectives, which enables the achievement of complex and challenging goals (Marks, DeChurch, Mathieu, & Panzer, 2005, pp. 964–965).[1] Increasingly, organizational approaches like MTS and other perspectives on team leadership are recognized as effective means to overcome the constraints and problems of bureaucracy, while providing the flexibility to integrate diverse interests across government (Hackman, 2011).[2]

A second important distinction of modern warfare is the need for organizational agility, or the ability to maintain readiness and capabilities, regardless of the presence of an enemy or a direct threat (DoD, 2016). In other words, there is an ever-present need for improving and evolving combat capability. The speed and destructiveness of warfare no longer allows enough time to methodically build and

[1] Retired Army General Stanley McChrystal's book, *Team of Teams: New Rules of Engagement for a Complex World* (2015), offers an example of how a change of assumptions about leadership and organization helped transform a traditional warfighting organization into a multiteam system to combat the Al Qaeda insurgency in Iraq.

[2] See Hackman's (2011) study of intelligence analysis teams in the post-9/11 environment as an example of how modern warfare has created new challenges for government organizations and how teamwork helps address those challenges.

mobilize forces and capabilities to address a threat (Gillespie, 2017). As a result, weapons systems and materiel need to be ready prior to the presence of an enemy or the commencement of fighting.

The opening quote from Air Force Lieutenant General (retired) “Trey” Obering, chair of the Committee on Owning the Technical Baseline for Air Force Acquisitions Programs, describes a core characteristic and challenge of the acquisition system. Decisions and actions made well in advance of a conflict, by individuals who may never engage the enemy or operate a military weapons system, have serious implications. But the quote also describes a fundamental structural challenge of the acquisition system, that the core components of the system—requirements, budgeting, and acquisition—are disconnected and subject to dysfunction (Defense Acquisition Performance Assessment Project, 2006). The Defense Acquisition Performance Assessment Report (2006) concluded that structural instabilities of the acquisition system impede the ability to “consistently develop and deliver combat systems and materiel (p. 15).” A recent review by the DoD Office of the Inspector General concluded that the “DoD regularly pays more than anticipated, buys less than expected, and in some case, delivers less capability than its contracts require” (Inspector General, U.S. Department of Defense, 2017, p. 20).

Consequently, the relevance of “fighting wars in office buildings and conference rooms” may not be so far-fetched. To fight this war, defense acquisition needs both stable systems to design, develop, test and field equipment, and agile mechanisms to respond to evolving challenges across a time dimension of many years. Such a structure may be as important to national security as the effective employment of those capabilities in combat (Acquisition 2005 Task Force, 2000; DoD, 2016; National Academies of Sciences, Engineering and Medicine, 2016). Given the complicated nature of defense acquisition, it seems unlikely that efforts to create an institutional structure that is both stable and agile will succeed, despite efforts to seek such solutions (Under Secretary of Defense for Acquisition, Technology, and Logistics [USD(AT&L)], 2017). Rather than continuing the search for the massive structural change or the perfect program to solve the problems of

modern warfare, the acquisition system might gain stability and agility by improving its capability to operate across “institutional boundaries” (Hackman, 2011).

A third distinction of modern warfare and the acquisition system is the ongoing concern about the quality and effectiveness of the people and programs in this “behind-the-scenes” combat.[3] Despite regular and substantial investments in programs, practices and policies for improvement, some argue that the stakes, needs, and costs of pursuing modern military capabilities demand higher performance and more successful outcomes from defense acquisition (National Academies of Sciences, Engineering and Medicine, 2016; Porter, Thomsen, Marlow, Geraghty, & Marcus, 2017). Still, others criticize the ability of the acquisition system to implement sustainable change or important shifts in organizational culture that lead to improved performance (Government Accountability Office [GAO], 2010).

Such calls for system-wide reform and improvements in the performance and professionalism of acquisition leaders have occurred since the mid-1980s and have come in the form of Blue Ribbon panels, independent reviews, legislative changes and internal policy and program initiatives.[4] Many of the reports highlight the importance of competent and stable leadership in the success of acquisition programs (GAO, 2010), while other studies question the impact of conventional attributes of professionalism and leadership, like tenure, experience factors and certification, on the outcomes of complex programs (Snider, 2011). Still, other reports call for changes to the culture of defense acquisition and the bureaucratic norms and values that influence performance across the entire defense acquisition workforce (DAWF; Defense Acquisition Performance Assessment Project, 200612).

While the question of professionalism and performance remains open, there is no shortage of language to suggest that leadership is central to solving the problems of defense acquisition (Acquisition 2005 Task Force, 2000; Defense Acquisition Performance Assessment Project, 2006; GAO, 2010). Unfortunately,

[3] Multiple sources highlight the importance of performance and professionalism in Defense Acquisition (Acquisition 2005 Task Force, 2000; DoD, 2016; Porter et al., 2017).
[4] See Porter et al. (2017) for a listing of studies and reports that offer recommendations and improvements to the Defense Acquisition Workforce.

most analyses and recommendations stop short of offering detailed explanations or evidence about how leadership and culture help solve the challenges of complex adaptive systems (Green, 2011). However, one area in an expanding field of study offers the potential for practical contributions to the acquisition system. Hackman (2011, p. 5) argued that teams and team leadership exist at the "nexus of the individual and the organization" and offer research-based means to improve the important work of government agencies, such as those within defense acquisition.

The three distinctions of defense acquisition (shown in Figure 1) illustrate the central problem addressed in this project, that is, how to think about the interactions and tensions resulting from (1) the challenges of modern warfare, (2) the structure of the acquisition system, and (3) the influence of DAWF culture and leadership? While acknowledging this problem, it is only fair to note that the acquisition system continues to deliver capabilities that make the U.S. military the most effective fighting force in the world (USD[AT&L], 2016). However, the impact of costly, high-profile acquisition failures and the drain on effectiveness that results from the inherent forces shown in Figure 1 remain significant challenges for defense acquisition (USD[AT&L], 2016).

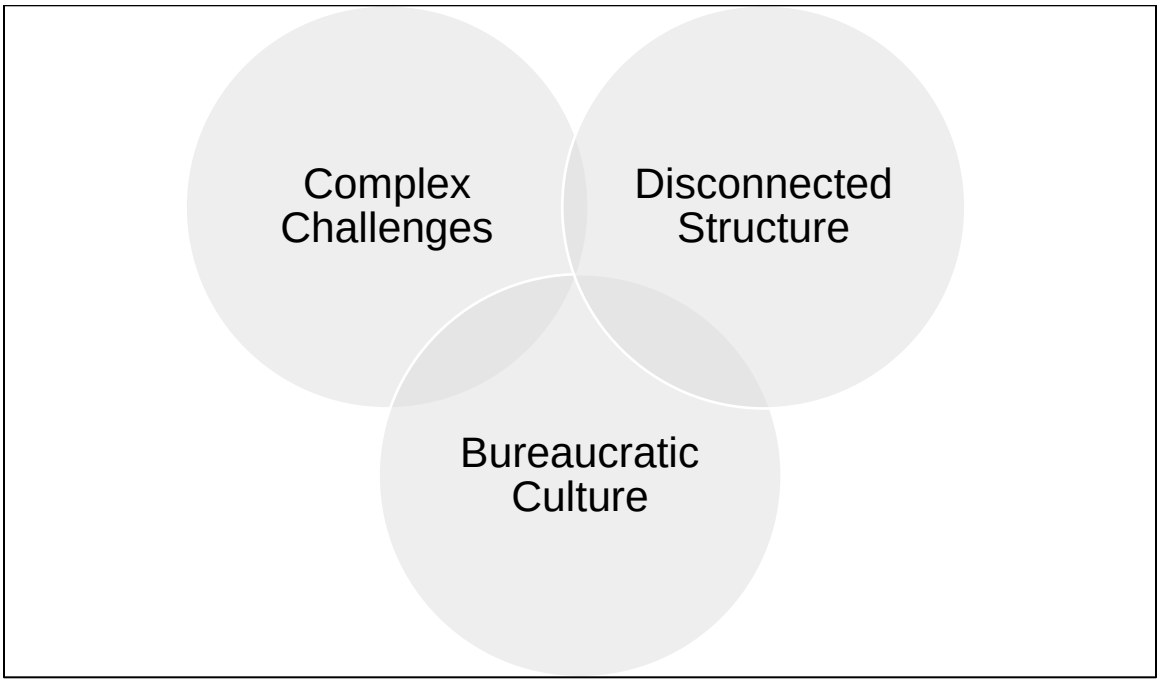

Figure 1: Distinctions of Defense Acquisition

The Issue for Defense Acquisition

If the distinctions and associated problems of defense acquisition are relevant and if conventional assumptions about leadership and acquisition success are real, *what thinking should ground the conceptual, practical, and developmental approaches to leadership in the DAWF?* The issue is timely and relevant because "thinking" about (or studying) leadership is an especially important consideration in a world that is increasingly shaped by information, knowledge, and ideas (Drucker, 1999; Senge, 1990). Former Under Secretary of Defense Kendall suggested that one of the top principles behind the Better Buying Power (BBP) 2.0 efforts to improve efficiency and productivity is the presence of "creative, informed thought" (USD[AT&L], 2013, p. 1). Secretary Kendall's call for improved thinking and General Dempsey's observation about how operational military leaders ought to think highlight a common thread, the need for a different approach to solving the challenges of modern warfare.

More than 50 years ago, organization theorist Douglas McGregor (2000) argued that to fully understand and influence human behavior in organizations, the same level of theoretical and scientific rigor that delivers the physical and technological breakthroughs of modern society must be applied to the field of management. Part of the current problem in defense acquisition may be that the thinking about leadership is not sufficiently rigorous to deal with the changing nature of modern warfare. Consequently, this project conducts a rigorous review of the field of leadership and the aspects that relate to the context of defense acquisition.

Systems theorist Peter Senge (1990) presented this challenge another way when he asserted that successful thinking is not merely emulating a model, but practicing thinking as a discipline. This is especially important for the DAWF, as scholars like Argyris (1991) have argued that a primary responsibility of leadership in the knowledge world is integrating the ideas, experience, and talents of different technical domains and a range of professionals. If acquisition leaders are incapable of understanding and practicing different approaches to thinking, they may lack an important capability needed for success in the complex knowledge environment. Still, other management scholars have argued that past conceptions (or thinking) of

leadership and management are inadequate, inaccurate, or very often completely absent from discussions of organizational performance (Argyris, 1990; Drucker, 1999; Heifetz, 1994). Quite possibly, the thinking about leadership in the acquisition system is outdated or lacking, given the dramatic change of the last half-decade.

The key issue is to understand both the "what" and the "how" of leadership thinking in defense acquisition. In fact, the inherent problems and tensions in defense acquisition may be both a cause and a result of inadequate thinking, or theory, and a lack of methodological rigor in the practice of acquisition leadership. This project seeks to understand this issue by gaining a better understanding of leadership and teams in complex and dynamic environments.

Project Purpose and Organization

This project reviews the relevant theory, frameworks and models of leadership and teams in complex and dynamic environments and compares that to the current thinking and context of leadership and teamwork in defense acquisition. With the theoretical and practical information at hand, the project addresses the following questions:

1. What gaps exist in the thinking (theory, frameworks, and models) about leadership and teams in the DAWF, given the dynamic interactions and complex tensions of the acquisition system?
2. What thinking (theory, frameworks and models) might inform the practice and development of adaptive and collaborative leaders and teams to address the dynamic interactions and complex tensions of defense acquisition?

The project hypothesizes a gap between the theory, frameworks, and models of leadership and the current thinking about leadership and teams in the DAWF. The project draws conclusions and offers recommendations for ways to support more flexible and agile approaches to leadership and teams and a conceptual framework to guide future research and practice of leadership in defense acquisition. Findings and recommendations developed in this study may inform changes or improvements in structure, processes, and culture to bridge existing gaps in thinking about leadership and teams in the DAWF and other areas of the American military institution.

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The Problem of Defense Acquisition

> *"Today's security environment is dramatically different—and more diverse and complex in the scope of its challenges—than the one we've been engaged with for the last 25 years, and it requires new ways of thinking and new ways of acting."*
>
> —Secretary of Defense Ashton Carter (Department of Defense, 2016, p. 7)

Long before the secretary of defense called for a change in thinking and acting in the Department of Defense (DoD), Albert Einstein is quoted as saying, "Problems cannot be solved with the same mindset that created them."[5] Einstein's famous saying has found relevance in many contexts; however the original comments were offered as a critique of the serious and ominous challenge of global thermonuclear war (Butcher, 2005). Instead of being a motivational charge for improvement, Einstein was presenting a dire warning of the consequences of continued thinking that a nuclear war was technologically or tactically winnable, much less even survivable. Yet, while offering this ominous prediction, Einstein suggested what might be possible with a shift in thinking about problems. Einstein's fundamental premise, that *a change in thinking is the key to solving the most difficult and complex problems*, provides a starting point for this study of the leadership challenges of defense acquisition.

Complex Challenges

Much has changed since Einstein argued for a new way of thinking about problems, but today's challenges are no less serious, and the stakes still range from basic survival to thriving success. A brief scan of news outlets and social media on any given day highlights the incredible array of make-or-break opportunities and dire threats facing leaders and organizations. On one hand, new discoveries and

[5] The original quote by Albert Einstein in 1946 was written as part of the debate on the development of thermonuclear weapons published in the Russell–Einstein Manifesto of 1955. "A new type of thinking is essential if mankind is to survive and move toward higher levels."

technologies such as artificial intelligence, the human genome project, and commercial space ventures offer dramatic achievements and innovations that, just a few years ago, were mere dreams. However, ongoing, serious threats such as global health emergencies, climate change, cybersecurity, and international terrorist activity offset those possibilities (World Economic Forum, 2017).

Social, political, and economic problems have always existed, but the interconnected and increasingly globalized nature of the world has uncovered the varied ways and many different forms that challenges now present. The most vexing of these problems are sometimes called "adaptive" and even "wicked" problems because they are so very different from previous challenges and they require new and often yet undiscovered abilities to solve (Auspos & Cabaj, 2014; Heifetz, 1994).[6] These serious, new problems are often described as "complex" because they present unique needs that most other problems lack, such as the following:

(1) solutions that require new learning

(2) interventions that lack predictability

(3) inability to fully frame problems, making some challenges unsolvable

(4) interaction and overlap with other problems that magnify effects and outcomes (Auspos & Cabaj, 2014, p. 7).

To begin thinking differently about the problem of defense acquisition, it is necessary to understand the range and types of problems that exist. As Schwartz, Francis, and O'Connor (2016) suggested, defense acquisition is much more complex than just executing a contract. The associated problems are more diverse and challenging than most realize or acknowledge. The framework developed by Auspos and Cabaj (2014, p. 11) helps explain the nature and effects of different challenges that organizations and leaders face. While the original framework was developed to explain the social challenges facing communities, the range and types of problems exist across most organizational contexts. Table 1 presents the Auspos

[6] See Rittel & Webber (1973). The idea of "wicked problems" was first addressed in the context of systemic social policy issues that, because of interdependencies and uncertainties, were beyond the capability of any one individual, program, or institution to solve.

and Cabaj (2014) framework, which is adapted to describe the range of problems and leadership responses found in the context of defense acquisition.

Table 1: Problem Contexts of Defense Acquisition. Adapted from Auspos & Cabaj (2014), p. 14.

Problem Contexts of Defense Acquisition			
Problem Context	**Characteristics**	**Leadership Model**	**Acquisition Example**
Simple	Problems and solutions are well known. There is no debate among stakeholders about whether or how the problem should be addressed.	Choose the right "recipe" or "best practice" and implement it with high fidelity	Contract execution
Complicated	Cause-and-effect relationships that contribute to the problem are uncertain but knowable. There are several different ways to solve the problem.	Bring in people with expertise in the problem and allow them to research and experiment to find a solution.	Design, test, and evaluation of new concepts
Social/Political	Cause-and-effect relationships are known, but stakeholders do not agree on whether or how to address the problem.	Build and nurture relationships among actors, manage conflict, address extreme power imbalances, organize people to take action.	Working across separate Requirements, Budgeting and Program Management processes
Chaotic	Cause-and-effect relationships are highly uncertain and moving quickly. Stakeholders' values, interests, and perspectives are all over the map.	Establish (or seek) temporary stability; manage crises; look for opportunities to innovate so that future events are more predictable/preventable.	Rapid Acquisition Projects
Complex	Cause-and-effect relationships are not always certain. Stakeholders' values, interests, and perspectives are sufficiently different so that alignment is difficult.	Engage stakeholders in a collaborative process of experimentation; be prepared to adapt approaches and solutions over time.	Big "A" acquisition for Modern Warfare environment

The array of problems that acquisition leaders face is broad, and the range of responses and abilities that are needed to lead in this challenging context are many.

Consequently, it is not difficult to imagine the challenge of effectively managing different types of problem contexts, much less leading across multiple contexts, simultaneously. As Table 1 illustrates, the nature of defense acquisition manifests a multitude of different forms of problems, and those challenges often exist simultaneously. The impact of this problem scope on acquisition leaders is significant.

For example, when the human brain faces an excess of information, it tends to simplify and identify common explanations and cause and effect linkages to make sense of changing situations, rather than apply flexible approaches and agile definitions to problem-solving (Mauboussin, 2011). As a result, a leader's perspective may be narrowed and his or her ability to deal with complexity limited. Heifetz's (1994) work on adaptive leadership highlights a tendency to categorize problems as complicated or "technical" challenges with predictable solutions, when in fact, they are complex problems requiring an "adaptive" or new response. A related factor that influences problem-solving is the role of shared cultural and organizational narratives that define who makes decisions and how problems are to be solved (Schein, 2004). Many organizational cultures and industries share models of thinking and problem-solving that have worked effectively in the past, but culture is a slowly evolving phenomena that may lag the rapid growth of complex challenges facing defense acquisition. Consequently, human tendencies and the natural forces in organizations may contribute to or even confound the challenges that acquisition leaders face.

Prolific management theorist Peter Drucker (1999) suggested that the challenges of the 21st century would not be solved by implementing technical or sophisticated economic, political, or managerial plans and policies. Instead, he argued that modern problems are often intertwined with outdated or inaccurate assumptions about how things ought to work (1999). Drucker (1999) concluded that such problems are best solved when, together, leaders and followers begin to think differently. Having a better appreciation for the differences in problem contexts and greater awareness of how leaders tend to miss these distinctions is an important consideration for leaders in an increasingly complex acquisition system.

Complex Adaptive Systems

While it is important to recognize the array of problems facing acquisition leaders in an increasingly complex world, it is equally important to understand the context of complexity in defense acquisition and how that shapes the thinking and practice of leadership. There are several basic assumptions and definitions that help ground this understanding. Auspos and Cabaj (2014) described *complexity* as "the interconnectivity of elements within a system or a situation" (p. 1). This basic definition highlights the general principle of connections and interactions that produce an outcome. However, this description fails to capture the essential distinction between things that are complicated and that which is complex.

Green (2011) offered a classic example of the jet aircraft to distinguish how thousands of component parts and interactions are combined to produce a complicated, but predictable technical and engineering outcome (p. 1-3). However, those same combinations and interactions will only produce another jet aircraft, rather than something entirely new or a jet that does something different. A key attribute of complexity is the unpredictable and new outcomes of interactions between agents or parts of a system (Green, 2011). This more nuanced understanding enables leaders to see this phenomenon operating around them. Complexity exists within living organisms, between living things, and in the interactions between people, such as within the organizations and institutions that build modern military weapons systems (Green, 2011). Consequently, to understand clearly and operate effectively in the context of defense acquisition, leaders must, as Drucker (1999) argued, unravel the outdated assumptions and inaccurate thinking that guide the approach to complexity.

Much of modern theory and research on leadership in organizations is grounded in the General Systems Theory perspective, which suggests the scientific study of the physical and social world should be guided by a hierarchical framework organized by levels of system complexity (Schneider & Somers, 2006). For many years, this general framework served as the foundation for research agendas and schools of management that portrayed organizations as open systems, or "self-

maintaining structures," that are designed for specific purposes (Boulding, 2004, p. 134). Such systems depend on a cycle of inputs, processes, outputs, and feedback that tend towards equilibrium that ensures steady achievement of the purpose (Boulding, 2004).

Leadership interactions within open systems are based on "stable patterns of relationships within clearly defined system boundaries (Schneider & Somers, 2006, p. 352)." While the system is designed for a function, the ultimate goal of the open system is preservation of the system, so that the function continues (Schneider & Somers, 2006). Activities and characteristics of the open system are designed to control or maintain the current state, even as that system grows. To avoid change or breakdown in the system, a continual input of energy is required to overcome forces (or challenges) that work against the prevailing structure (Schneider & Somers, 2006). For a human system, like acquisition, the additional energy consists of the interactions, knowledge, and talent that is applied to maintain the system, instead of the primary function to deliver warfighting capabilities.

The open system perspective delivers predictable outcomes of organizational activity and has dominated management research and practice for many years (Schneider & Somers, 2006). Consequently, the open systems approach to leadership has focused on the leader's role, or actions, in planning and directing activities that produce stable and predictable organizational outcomes (Uhl-Bien, Marion, & McKelvey, 2007). The influence of open systems thinking is still present in the models and methods of formal leadership that guide many large, hierarchical organizations, such as the DoD.

In contrast to the open systems model of organization, the complex adaptive system is much further up the hierarchy of the General Systems Theory and reflects the unique and dynamic network of organizations and agents that come together to address common needs and problems of complexity (Uhl-Bien et al., 2007). These networks and interactions form and operate in response to a need for action and change, instead of planning and stability for a predetermined function (Boulding, 2004). Much of the language about defense acquisition calls for action and change,

but the culture and structure of the system is designed for planning and stability. The underlying model of how the acquisition system operates may be at odds with evolving needs.

While both open and complex adaptive systems seek to survive, the complex adaptive system preserves itself by adapting to both the needs of the external environment and the interdependencies that comprise the internal systems (Schneider & Somers, 2006). Instead of using system energy for stability, the complex adaptive system invests energy in a search for organizational forms that produce better outcomes and as a result, improve survivability (Green, 2011).

Complex adaptive systems learn and adapt in response to the interactions of individual agents with differing properties and the unpredictable, changing patterns that those interactions produce (Schneider & Somers, 2006). However, the outcomes of those interactions are neither random nor chaotic, but patterns of knowledge that are discovered by engaging in ongoing experiments and tests to assess the effects of actions and interactions on plans and objectives. The change and transition in patterns is termed *emergence*, which occurs as agents learn new ways to deal with challenges in the environment (Green, 2011; Schneider & Somers, 2006).

In contrast to the stability of open systems organizations, emergence in complex adaptive systems is a non-linear characteristic (Green, 2011). The interactions and changes of agents in complex adaptive systems do not merely combine like two parts of a jet aircraft; the interactions are compiled in new ways, producing different properties and transforming the system. While the outcomes tend toward uncertainty, which is undesirable in most large organizations, it enables complex adaptive systems to be “poised” on the verge of chaos, but primed and ready for change and action (Green, 2011, p. 1-5; Schneider & Somers, 2006, p. 353). The idea of a poised system is central to the notion of agility in modern warfare and has relevant applications to defense acquisition. Table 2 provides a comparison of the major characteristics exhibited in open systems and complex adaptive systems.

Table 2: Characteristics of Open and Complex Adaptive Systems. Adapted from Schneider & Somers (2006), p. 353.

Property	**Open Systems**	**Complex Adaptive Systems**
Design	Steady-state preservation	Preservation through adaptation
Primary Force	Negative entropy (storing energy)	Interdependent emergence
Structure	Cyclical	Poised and chaotic
Differentiation	Greater specialization	Blending and integration
Interactions	Top-down; negative feedback	Bottom-up; need-based
Final State	Predictive	Path-dependent

This overview provided an introduction to some of the theories and concepts that help explain the nature of problems that organizations face and the systems and structures that are created to solve those problems. This information offers some frameworks to guide this project's assessment of the general thinking and basic assumptions about the context of defense acquisition. For example, to what extent are the problems of defense acquisition viewed as technical tasks that require planning, resources, and execution, when the challenges are, in fact, more complex and demand new learning and agile responses? Also, to what extent is defense acquisition seen as an open, stable system that is organized and structured to accomplish specific goals, when the actual operating environment is rapidly changing, and outcomes are increasingly uncertain? The concepts and frameworks presented in this section provide a basis to understand the context and thinking that guides defense acquisition.

Defense Acquisition as a Complex Adaptive Challenge

The responsibility for tackling the challenges of defense acquisition resides with the DoD, which is among the world's largest employers with more than 800,000 civilian employees serving across the United States and around the globe (Rude,

2012). The DAWF is a specialized community within the DoD of more than 150,000 civilian and military professionals in 14 different fields with specific responsibilities to develop, acquire, and deliver warfighting capabilities to the operational forces of the U.S. Armed Forces (Office of the Under Secretary of Defense for Acquisition, Human Capital Initiatives, 2017).

However, the system that comprises defense acquisition is much larger and more complicated than just the functions and processes executed by the DAWF. Figure 2 depicts this larger and more complicated model of defense acquisition, but it also provides insight into some of the underlying assumptions and thinking about how this system is expected to operate. The larger system has been described as covering Big "A" acquisition, which includes the development of operational capabilities to meet strategic priorities, the creation of budgets and plans that provide resources and support broader executive and political interests, in addition to the Little "a" acquisition functions and responsibilities of development, testing, fielding, and logistic support (Defense Acquisition Performance Assessment Project, 2006).

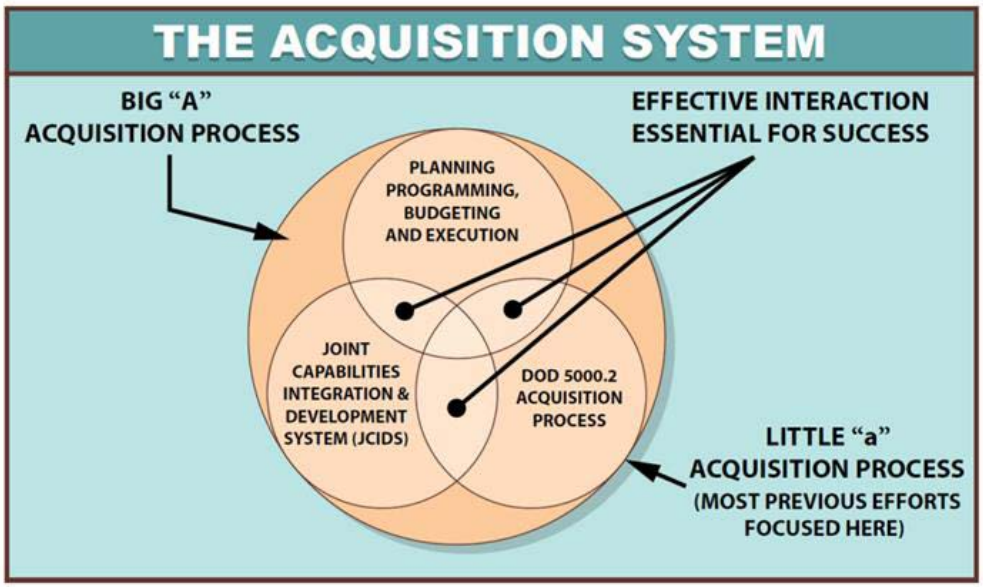

Figure 2: The Acquisition System. Source: Defense Acquisition Performance Assessment Project (2006), p. 4.

The construction of the diagram and the shapes used in Figure 2 describe the acquisition system and depict an environment that is bounded and organized around the differentiated and specialized functions of defense acquisition. The model is oriented distinctly inward, which suggests a priority on stability and system maintenance. The focus, or core, of the model is on a set of converging values and goals, while success in developing and delivering warfighting capabilities is dependent on effective interaction, which is described as the alignment of combined functional expertise. The model suggests a straightforward process of overlapping requirements, budgets, and activities that contribute to stable interactions and predictable outcomes. From these observations, the acquisition system appears to exhibit the characteristics of a classic open system, which is designed to solve a very straightforward and specific set of technical challenges by maintaining a stable and predictable environment.

While the conceptual model of the acquisition system in Figure 2 shows clear boundaries and well-defined conditions around both Big “A” and Little “a” acquisition, the actual environment in which defense acquisition operates is very different. The practice of defense acquisition, depicted in Figure 3, presents a far more fragmented, unbounded, and unstable system (Defense Acquisition Performance Assessment Project, 2006). Instead of a set of well-coordinated and aligned interactions, the model highlights differing values, goals, and assumptions (represented by fundamental questions).

The differing starting conditions (values, goals, and practices) of each sub-system result in a variety of unpredictable outcomes, many of which can negatively impact the successful development and delivery of warfighting capabilities. The system context is also influenced by the goals and priorities of other sub-agents and external players that interact with and influence the three specialized functions. Figure 3 shows a shift in focus from overall system maintenance to the maintenance and survival of the three subsystems, further contributing to the disconnection experienced in the overall system, leading to greater uncertainty and instability.

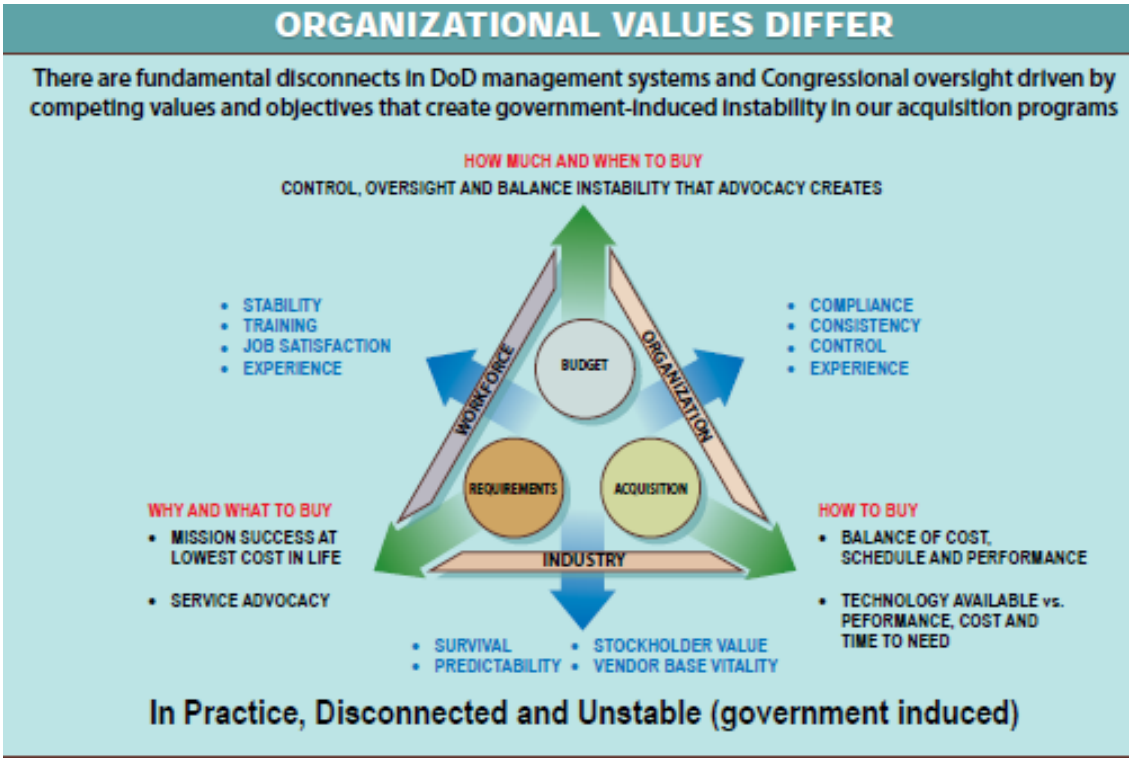

Figure 3: Divergent Forces in Defense Acquisition. Source: Defense Acquisition Performance Assessment Project (2006, p. 4.).

While the goal of the practical system model in Figure 3 remains stability and preservation, the arrows in Figure 3 indicate that the sub-systems are focused on functional, or individual system preservation. This interaction of sub-system survival forces with divergent forces and interactions between systems results in a complex challenge that drives the elements of Big "A" apart, rather than bringing them together. What makes this situation even more complex is the fact that the differing goals, values, and practices of elements and other agents are inherently difficult to assess, but the resulting tensions and competitive interactions are clearly visible to the outside. Consequently, the system experiences turbulence and unplanned change that, left unchecked, leads to goal failure and potential disintegration of the system. Like most large organizational structures, the acquisition system responds to complexity by applying additional energy (termed "negative entropy") in the form of new order, structure, and stability (e.g., plans, programs, and laws) that regulate

and guide more predictable behavior— or, as Uhl-Bien and Arena (2017) suggest, “fighting complexity with order” (p. 10). However, in most instances, this action creates more problems than it solves because the system uses important energy (human and capital resources) to overcome the forces and disconnections inherent in the system rather than investing energy in ways to shape and adapt the system to the challenges that exist in the environment (Schneider & Somers, 2006; Uhl-Bien & Arena, 2017).

In its theoretical form (Figure 2), the acquisition system is portrayed as a classic open system. However, the reality of defense acquisition indicates an environment that is characteristic of a complex adaptive system. But is a complex adaptive system the best fit to deal with the problems of defense acquisition? If the challenges facing the acquisition system were mostly complicated technical problems or even broader differences in perspective on the means to achieve similar goals, then the open systems model may be best suited for success in defense acquisition. The open system model was the prevailing perspective on organizational science for much of the period that defined the growth of the modern acquisition system, so it is not surprising that it continues to dominate thinking and practice. Recent efforts to legislate new organizational structures and designs that promise large-scale defense acquisition reform and process standardization are an example of outmoded or inaccurate thinking (in this case, the influence of open systems management) that seek system maintenance and stability over adaptation and change in the acquisition system (USD [AT&L], 2017).

The preceding section has offered analysis to suggest that defense acquisition exhibits many characteristics of a complex adaptive system and acquisition leaders are likely to operate in environments that, much like modern combat, are influenced by factors beyond the control of formal leadership. They are more likely to depend upon the support and expertise of individuals who are often outside of organizational boundaries and hierarchies. In addition, many of the problems that acquisition leaders now face cannot be solved by simple, technical plans, because the individual, social, and political implications of interactions and

decisions in the system result in an array of possible outcomes (Defense Acquisition Performance Assessment Project).

The dynamic changes of modern warfare, the disconnected structure of Big "A" acquisition, and the difficulties of sustaining a performance culture across the DAWF are all representative of an increasingly complex environment and the unique challenges that this environment poses. The term *VUCA* is used to highlight different attributes of a complex environment and is used as follows to summarize the challenges facing defense acquisition:

- Volatile: the impact of change in any one of the three primary functions of acquisition can produce critical impacts on the remaining system elements
- Uncertainty: the relative and dynamic influence of different sets of orienting questions and operating assumptions produces unpredictable outcomes
- Complex: the three Big "A" acquisition elements interact with other agents and systems and create interdependencies and relationships that change not only the outcomes, but even the very nature of the problem
- Ambiguous: the absence of shared priorities and the existence of differing values results in decisions, actions, and outcomes that are defined and assessed against competing standards and objectives, making it difficult to judge success.[7]

Many of the problems described in Figure 3 are increasingly common in a VUCA environment. However, the existence of more chaotic and complex problems does not mean that all aspects of defense acquisition should function as complex adaptive systems. Nor does it mean that acquisition leaders no longer have to deal with complicated technical problems of developing and delivering modern weapons systems. To the contrary, the reality of defense acquisition means that acquisition leaders must operate effectively across a variety of organizational contexts and face

[7] See Lawrence (2013) for a discussion about how the modern leadership environment is often described as increasingly volatile, uncertain, complex, and ambiguous. The term *VUCA* has been used to describe both the environment and the kinds of challenges that emerge from this sort of environment. VUCA was originally used to describe the operational military environment, but it is often used to describe the context and challenges that many organizational leaders face.

varying degrees of challenges. Such a level of effectiveness is no simple task and demands a new way of thinking.

This overview has confirmed that acquisition leadership is not a simple task. Rather, it is a challenging set of interactions that occurs in an increasingly dynamic and complex environment. It seems reasonable to conclude that defense acquisition will benefit from research and the application of theory, frameworks, and models of complex adaptive systems and the leadership capabilities needed to solve the complex and chaotic problems of the acquisition system. The next section provides an overview of the thinking about leadership and teams in complex adaptive systems and how that thinking might benefit defense acquisition.

Leadership in a Complex World

> *"Give a small boy a hammer, and he will find that everything he encounters needs pounding."*
>
> —Abraham Kaplan (2009, 28-29)[8]

History shows us that leaders have always sought better (and simpler) ways to master the art of solving problems, but the quote from Abraham Kaplan highlights how the thinking, or the perspective that leaders take, is often the limiting factor to finding solutions. While a key concern of organizational leadership has always been finding solutions to achieve goals, the approach has changed over time (Mintzberg, 1973). Those changes in perspective highlight key shifts in leadership and management thinking and associated social, political, economic, and technological trends of the past century.[9] This section reviews the thinking about problem-solving and leadership, and sets a foundation to understand how the evolution of theory, frameworks and models of problem-solving, leadership, and teams influence defense acquisition.

Organizations, Problems, and Leadership

One of the earliest modern sources on leadership and problem-solving is Frederick Winslow Taylor's study of work and the ensuing field of scientific management (Morgan, 1997). This approach to problem-solving shifted the focus of management from the external challenges of securing capital and resources to an internal focus on efficiency and the productivity of workers (Drucker, 1999). At the same time, the Great Man and trait-based views of leadership suggested that the primary job of leaders was to make decisions and solve organizational problems through an unemotional process of analysis and design (Drucker, 1999; Heifetz, 1994). The primary assumptions of this early management perspective were that

[8] Abraham Kaplan's "law of the instrument" (2009, pp. 28–29) critiqued the narrow-minded, parochial approach to behavioral science problem-solving.

[9] See Argyris (1990), Drucker (1969, 1995, 1999, 2002), Kegan & Laskow Lahey (2009), Malone (2004), Martin (2007), and Senge (1990) for descriptions of the major trends influencing leadership in organizations.

problems had predictable, rational, and technical solutions and that only certain types of leaders possessed the ability to effectively deal with those problems. This approach to organizational management and problem-solving contributed much to the dramatic growth of Western industry and society in the early 20th century, but it also fostered the emergence of a separate field and industry focused on the training and development of workers. However, by World War II, the mechanistic and leader-centric paradigms of problem-solving proved incapable of dealing with different challenges of expanding scale and impact.

A new form of management thinking emerged from research that began in the Great Depression and came into prominence during the massive expansion of industrial power in the United States during World War II. In stark contrast to the deterministic and rational methods of scientific management, the human relations perspective confirmed that the individual worker was a key variable in organizational problem-solving. Research conducted prior to and during World War II studied the relationships between leaders and followers and discovered important effects of those relationships on group dynamics and organizational performance.[10] The follower was no longer merely a tool that leaders applied to solve a problem, but part of a unique social system and a direct and important contributor in the problem-solving process (Anteby & Khurana, 2007). Leadership theory in this period sought the right conditions and the right behaviors to effectively motivate followers toward the leader's goal. But human relations theory also challenged leaders to consider, for the first time, the effects of their actions on followers as they shaped organizational systems to solve complicated problems. For example, the classic Hawthorne studies of group dynamics sought to understand how leaders could make work groups more productive, but discovered that leaders merely paying attention to workers influenced their motivation and productivity.[11] By mid-century, it was clear that leaders had both an operational imperative to consider the role of followers in

[10] The American Soldier Studies (Stouffer, Suchman, DeVinney, Star, & Williams, 1965), a four-volume series of research conducted for the U.S. Army, is considered by many to be the foundation of modern understanding of group dynamics and leadership and the source of many core theories of social psychology and social science research methods.

[11] See Anteby and Khurana's (2007) essay, "A New Vision" as an introduction to the dramatic impact of The Hawthorne Studies on changes in organizational research and leadership.

problem-solving and a professional imperative for the follower's well-being (Anteby & Khurana, 2007).

Despite the many important advances brought about by human relations theory, one thing remained constant. The leader was still responsible for solving organizational problems. But as the operating environment for many organizations expanded in the post-war period, so too did the need for effective problem-solving. And a new leadership perspective emerged that highlighted the interconnections and relationships of the organizational environment.[12] The organization was no longer static, but a dynamic, evolving, and life-like organism (Morgan, 1997). While the leader remained at the center of this organism, leadership and problem-solving was increasingly dependent, or contingent, on other factors like technology and communications that shrunk the world and expanded the nexus of problem-solving to the internal and external environments. Contingency approaches to organization and leadership theory emerged in the 1950s and 1960s in response to research that showed how organizational variables interacted in a dynamic environment to influence performance and outcomes (Morgan, 1997).

Armed with comprehensive knowledge of organizational workings and a variety of approaches to problem-solving, leaders were now able to tackle more conceptual challenges, such as quality and continuous improvement. The work of W. Edwards Deming in Japan following WWII, and the quality management movement that Deming's work inspired, brought new statistical methods and more complicated assessments to the practice of problem-solving in organizations (Drucker, 1999). Scholars attribute the dramatic rise of Japanese auto industry leaders, like Toyota and Honda, to the industry focus on quality at a time when U.S. auto makers focused primarily on efficiency and productivity (Drucker, 1999).

The organism perspective saw problem-solving as a reactive and evolving process, and leaders sought to understand how specific characteristics and qualities

[12] Gareth Morgan (1997, pp. 31–37) described the notion of *sociotechnical systems*, a term that originated in the Tavistock Institute in England, to highlight the interdependencies between the work, the people, and the environment. This early work contributed to the fields of organizational design and contingency theories of leadership that took hold in the 1960s.

of organizations, like values and norms, impacted problem-solving ability. Thinking from other disciplines, like evolutionary biology and cultural adaptation, helped explain organizational variety and change in the face of challenges from the environment (Morgan, 1997). For example, Schein's (2004) work on culture showed how, like a living organism, important functional aspects of an organization adapt to changes and problems in the environment and how leaders have the ability to shape and create different types of cultures (e.g., a service culture or a culture of innovation) based on the shared values and assumptions about how things should work in an organization. Schein (2004) argued that culture is an organizational characteristic that both acts on individuals and is shaped by the individuals of an organization.

Research has shown how interdependencies in organizations create unique values, norms, and ways of working to solve problems, while those same interdependencies shape the culture and mindset of leaders to frame problems in particular ways (Schein, 2004). For instance, many of the U.S. manufacturing firms that created early discoveries in computing and technology were grounded in cultures that valued stability and traditional engineering principles. However, the values and norms that helped them achieve early success in those industries contributed to their downfall as the changing operating environment demanded more flexible and adaptable leaders and organizations (Schein, 2004). This important shift in management thinking occurred as leaders expanded their focus beyond the performance of individual workers and discrete organizational goals to the larger trends, ideas, and systems that influenced the work environment. As a result, it become increasingly clear that, while the leader was still the most influential player in the problem-solving world, that world was expanding rapidly and problem-solving was becoming a dynamic, multi-dimensional activity.

The explosive impact of information technology in the 1960s and 1970s contributed to new waves of thinking on leadership and an equally dramatic shift in the problems that organizational leaders faced. The information age shifted the focus of organizations from building and managing "things" to that of creating and sharing "ideas" (Argyris, 1990; Drucker, 2002; Martin, 2007; Senge, 1990). The

change of focus brought about new forms of organization, communication, and ways of working, but also created unique tensions and unexpected problems for leaders to solve. For example, the knowledge and interconnectivity made possible through technology and the Internet has enabled innovation and new capabilities that have changed the very nature of industries, but the emphasis on information and "big data" has sometimes shifted the focus away from the interactions and relationships that sustain success. As a result, information and data problems increasingly burden leaders, who have less time to focus on organizational needs, like building and supporting interdependency and collaboration between employees, customers, and suppliers. As early as the 1970s, classic research like Mintzberg's (1973) work on managerial effectiveness identified the negative impacts of information overload on organizational leaders.

The leader's responsibilities in the information age have expanded well beyond the confines of formal organizations to include larger interconnecting systems and networks. Along with the change in scope and scale of responsibility, modern approaches to leadership focus less on roles and activities and more on the purpose and character of leadership (Avolio, 2010). Leadership in the information age extends beyond the factory walls to focus not only on problems of complicated processes, but also on the complex interdependencies which are not fully controllable. As the previous section demonstrated, leaders still face predictable, manageable tasks and plans, but they must also respond to a growing number of problems they are incapable of solving with the expertise and knowledge immediately at hand (Argyris, 1990; Drucker, 1999; Kahneman, 2011; Kegan & Laskow Lahey, 2009; Senge, 1990). Just as modern conflict demands new organizational forms and leadership, the complex challenges of the acquisition system demand new thinking and different abilities.

The evolution of leadership thinking, or the general shifts in the theory, frameworks, and models of leadership and problem-solving are summarized in Table 3. While the theories and models have evolved in response to changes in goals and problems, the earlier objectives and challenges have not gone away. Instead, leaders are expected to deliver on multiple goals while solving a wider array of

problems. The stress and strain of these increasing demands is recognized as one of the biggest challenges facing leaders today (Uhl-Bien & Arena, 2017) and is particularly relevant for acquisition leaders, given the stakes associated with an environment described as the “most unpredictable global security environment in over 40 years” (DoD, 2016, p. 6).

Table 3: Evolution of Leadership Thinking

Management Theory	**Dominant Goal/Problem**	**Leadership Model**	**Follower Framework**
Scientific Management	Productivity/Efficiency	Trait	Mechanism
Human Relations	Scale/Quality	Behavioral	Group
Contingency	Scope/Alignment	Interactional	Collective
Systems	Ideas/Learning	Complexity	Team

Consequently, acquisition leaders need new capabilities and new ways of leading in order to leverage ideas and learn rapidly, but they also must possess general leadership abilities to effectively function within the Defense hierarchy. For example, implementation guidance for the BBP 3.0 defense acquisition improvement initiative touches on each of the dominant goals and problems that facing acquisition leaders today:

> Efficiency and productivity are always important, but the military capability that we provide to our Warfighters is paramount. We will continue to work to improve productivity and efficiency, but we must also turn our attention increasingly to our ability to innovate, achieve technical excellence, and field dominant military capabilities. (DoD, 2016, p. 6)

The Acquisition Workforce Strategic Plan goes on to state that while leaders must focus on achieving the broad goals to maintain the “technological edge” over adversaries, they are challenged by a fiscal environment that inserts ambiguous legislative actions like sequestration, uncertain budget cycles, and the volatility of

government shutdown threats (DoD, 2016, p. 7). These are further indications that the acquisition system is increasingly complex and subject to uncertain and unpredictable influences.

The tensions that emerge from the complexity of modern warfare, the disconnections in the acquisition system, and the need for sustained DAWF performance present challenges that may exceed the current capabilities of acquisition leaders, but they may also create opportunities for new forms of organization and different approaches to leadership. Since evidence suggests that the cycle of complexity, challenge, and change is not likely to end, the evolving in thinking about leadership and problem-solving offers insights that may help acquisition leaders "manage organizations for efficiency and results while incorporating new knowledge about how to lead for adaptability" (Uhl-Bien & Arena, 2017, p. 9) and build the capabilities that enable warfighters "to counter a wide range of threats" (DoD, 2016, p. 6). The review of current theory and models about leadership and teams that follows offers a foundation on which to build that understanding and capability.

Complexity and Leadership

To be successful in the VUCA environment of defense acquisition, leaders must start with "a new way of understanding what it takes to lead in a complex world" (Uhl-Bien & Arena, 2017, p. 9). While leaders have always concerned themselves with solving problems and seeking opportunities, it seems that a growing number of them struggle in this increasingly turbulent environment (Drucker, 1999; Heifetz, 1994; Uhl-Bien & Arena, 2017). On one hand, this turbulence might be a product of "wickedly" unsolvable problems, discussed previously, or it may be that a more turbulent world is one where the pace, size, and nature of problems has expanded beyond the leader's current capability to solve (Kegan & Laskow Lahey, 2009). Whatever the reason, the capability gap, also known as "adaptive" or complex challenges, demands more of leaders than traditional approaches to problem-solving can deliver (Heifetz, 1994). And as Kaplan's (2009) quote at the beginning of this chapter suggests, the way we think about leadership may, in fact,

be the “hammer” that limits our ability to successfully close this growing capability gap.

There are two prevailing assumptions about problems and leadership that are particularly relevant for acquisition leaders and that help orient observers to the nature of this adaptive gap. The first assumption is that an increasing number of problems and crises lack simple, straightforward solutions (Heifetz, 1994). Nearly every report and review of the acquisition system suggests that the environment and the problems facing acquisition leaders are growing more complex (DoD, 2016). However, the previous section suggested that leaders must concurrently attend to an array of problems that range from the simple and technical to the chaotic and exceedingly complex. In other words, the scope, scale and form of problems has changed, and leaders must be able to deal with all of the changes, all at once.

The second assumption is that leaders do not automatically recognize that there is a need to shift the way they think about building adaptive capacity to solve this array of problems (Heifetz, 2006). The inability to recognize needed change may partly be a function of the cognitive biases that lead us to ignore things that are outside of our normal frames, but it is also likely due to prevailing cultural narratives about the centrality and importance of organizational leaders (Kegan & Laskow Lahey, 2009). Argyris (1991, p. 100) used the example of “single” and “double-loop” learning to suggest that these biases and cultural blinders impair the ability of organizations and, in particular, highly-skilled leaders, from effectively learning and changing.

These assumptions and associated problems stem from conventional, or formal, thinking about leadership, which argues that the primary purpose of leadership is to set direction, develop plans, and manage activities that are designed to achieve goals (Russ & Uhl-Bien, 2011). The leadership purpose is accomplished primarily by monitoring operations and providing feedback that minimizes error and ensures compliance with plans (Kotter, 2001).[13] The formal leader functions within a

[13] Kotter (2001) made the distinction between management (controlling and directing) for stability and leadership (motivating and inspiring) for complex and changing circumstances. The current project portrays this distinction through “conventional leadership thinking” and “complexity leadership.”

rigid hierarchical structure and maintains strict role responsibilities, stable processes, and predictable decision rules (Lichtenstein et al., 2006). Formal thinking about leadership suggests that complexity and associated change is a temporary state that leaders must manage or sometimes "do" to organizations in order to reestablish the ultimate goal of stability (Uhl-Bien & Arena, 2017, p. 10).

This fixed and formal approach to leadership thinking contributes to a mindset that leaders possess (or can gain) expertise, experience, and training, as well as unique personal qualities and character that set them apart and bestow them with unique responsibility and authority. In a world of complex challenges, this line of thinking seduces organizations into thinking that success is dependent on the perfect plan or structure delivered by the right leader (Heifetz & Laurie, 2001). The result is an increased emphasis on comprehensive human capital strategies, broad competency models, and complicated talent management systems, but evidence is starting to question the efficacy of this level of planning and control (Arena & Uhl-Bien, 2016). In a world that continues to demand more from every member of the organization, the perfect plan or the right leader may actually be the "enemy of adaptability" because it tends to "stifle out the interactive dynamics needed by organizations to respond effectively to complexity" (Uhl-Bien & Arena, 2017, p. 10).

As Ashby (as cited in Russ & Uhl-Bien, 2011, p. 384) famously argued, "It takes complexity to defeat complexity," which stands in stark contrast to the conventional thinking that order and stability are the proper response to complexity (Uhl-Bien & Arena, 2017). However, more recent leadership thinking focuses on the dynamic and adaptive nature of modern organizational life. For instance, a key concept underlying the idea of dynamic complexity is the argument that leadership is not "in" the person of a leader or something that is "done by" a leader, but that "leadership is an emergent event, [or] an outcome of relational interactions among agents" (Lichtenstein et al., 2006, p. 2). Such dynamic interactions produce learning, innovation, and creativity, which foster the adaptive capacity for change within an organization (Lichtenstein et al., 2006).

While early approaches to complexity leadership retained the focus on how the leader controls interactions and establishes the conditions for adaptive change (Heifetz, 1994), later thinking demonstrated a shift from the functional formal leadership role towards leadership as "a dynamic that transcends the capabilities of individuals alone" (Lichtenstein et al., 2006, p. 2). Other perspectives on complexity have described this dynamic as an "influence process that arises through interactions across the organization" (Goldstein, Hazy, & Lichtenstein, 2010, p. 2). The term *generative leadership* is also used to describe the "process of innovation that is not led by any one individual but emerges through an unfolding series of events at every level of the organization" (Goldstein et al., 2010, pp. 2–3).

The classic HBR article by Heifetz and Laurie (2001) argued that "solutions to adaptive challenges reside not in the executive suite, but in the collective intelligence of employees at all levels" (p. 132). However, the authors are not arguing for the abandonment of organizational structure or formal leadership roles, nor are they suggesting that leaders assume a "laissez-faire" or hands-off style of leadership to deal with complexity. Instead, they suggest a shift in thinking about the nature of problems and the role of organizational leadership (Heifetz and Laurie, 2001).

Such a shift is found in Complexity leadership theory (CLT), an emerging school of thought that highlights the different ways in which leadership occurs in complex organizations. CLT is not about creating leaderless organizations or the removal of hierarchy and control, nor is it focused on the behaviors or styles of individual leaders. Rather, CLT provides a framework to understand the different leadership needs within complex adaptive systems and how those needs emerge and facilitate adaptive change through learning, creativity, and innovation (Uhl-Bien & Arena, 2017).

CLT provides a general model that explains how dynamic interactions produce emergent leadership and what positional leaders do to facilitate those processes (Lichtenstein et al., 2006; Uhl-Bien & Arena, 2017). Consequently, CLT offers a way of thinking that acknowledges the diverse needs of modern organizations, such as hierarchical order and bureaucratic control mechanisms,

while setting loose the entrepreneurial energy needed to innovate and adapt to complex challenges in the environment (Arena & Uhl-Bien, 2016; Uhl-Bien & Arena, 2017). The basic structure and operation of the complexity leadership model is depicted in Figure 4 and further described below.

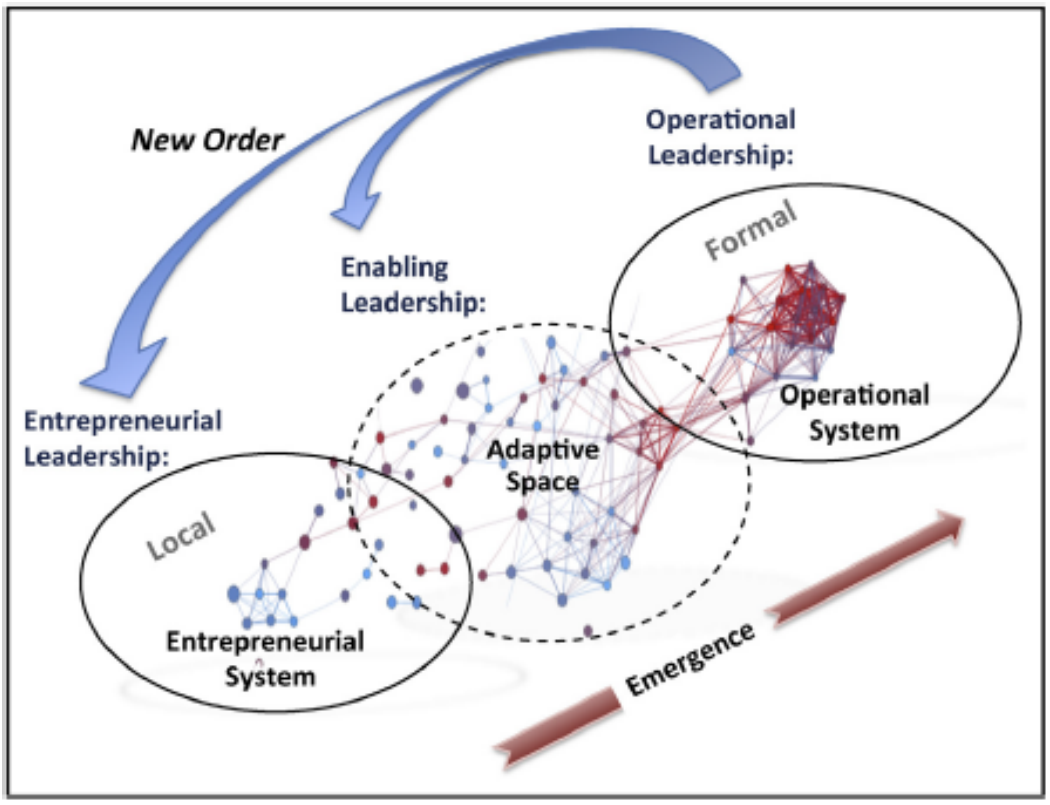

Figure 4: The Complexity Leadership Model. Source: Uhl-Bien & Arena (2017, p. 15).

The complexity leadership model operates on the assumption that organizations consist of two systems, the operational system (administration and execution) and the entrepreneurial system (innovation and creative action), as well as the adaptive space between the systems, where innovation and adaptive work is translated into new concepts, products, and modes of operating (Uhl-Bien & Arena, 2017). These assumptions support an important principle of complexity leadership thinking, that innovation and adaptive work occurs outside of the formal operational system, but tensions between the operational and entrepreneurial systems must exist for adaptive change to improve and transform the operational system (Uhl-Bien

& Arena). Despite the move in many organizations to matrix and flattened structures, the influence of hierarchy and bureaucracy remain powerful organizational forces, and for good reason. The operational goals of productivity, scale, and scope (see Table 3) remain central to the success of most organizations, especially for those involved in defense acquisition. The fact that governmental and non-governmental actors interact to produce complicated weapons systems necessitates some form of formal structure and control. In other words, a new fighter jet is not going to make itself, and the stakes associated with modern warfare are too great to leave weapons system development to informal groups. The formal, operational system of defense acquisition provides efficiency, quality, and alignment and incorporates boundaries, processes, and constraints to ensure the organization goals are achieved and national security interests are met.

At the same time, many large organizations actively discourage or seek to eliminate entrepreneurial activity because of the belief that it is either not a core function of the organization or that entrepreneurial activity runs counter to or actively drains energy and resources from the operational system (Uhl-Bien & Arena, 2017). As a result, most formal, operational systems resist the integration of new ideas and fail to effectively leverage learning and creativity. However, CLT argues that even in organizations that tend to minimize the influence of the entrepreneurial system, innovation and adaptive work is still possible by cultivating the adaptive space between the two systems (Uhl-Bien & Arena, 2017).

CLT posits that unique and different forms of leadership are necessary to support both the operational system and the entrepreneurial system, and to enable the adaptive space that connects the two systems and manages the resulting tensions (Uhl-Bien & Arena, 2017). The three forms of leadership that emerge in the complexity leadership model produce distinctly different effects and help to explain the unique states and needs of each aspect of the complex adaptive organizational system.

- Operational leadership: the formal design and processes to execute ideas and produce outcomes

- Entrepreneurial leadership: the generation of new ideas, innovation, and learning in response to challenges and opportunities
- Enabling leadership: the conditions that support and sustain adaptive space (Uhl-Bien & Arena, 2017, p. 14)

The primary adaptive functions and principles associated with each of the three forms of complexity leadership are listed in Table 4.

Table 4: Complexity Leadership Functions & Principles. Source: Uhl-Bien & Arena (2017, pp. 14–19).

	Entrepreneurial Leadership	**Enabling Leadership**	**Operational Leadership**
Adaptive Function	Generate ideas that stimulate learning and growth	Open adaptive space for innovations that ensure viability and fitness	Transform innovations into new adaptive order
Adaptive Principles	Link with enabling leaders to promote ideas	Seek emergence of ideas and novelties into innovation and learning	Sponsor or pull initiatives into operational system and position for support
	Leverage trust and cohesion to test and socialize ideas	Broker and bridge transfer of innovation and learning	Align initiatives with strategy and mission
	Flexible bias toward action that iterates ideas	Leverage tension and disequilibrium needed for innovation and learning	Resource, implement, and execute new capability

Instead of identifying functional roles or individual behaviors, the three forms of leadership describe those things that emerge from the interactions within in the organization, which is a key distinction in the thinking about complexity leadership. The functions and principles in this model show how the rich interconnections and the systematic engagement moves ideas to innovations and ultimately into new organizational capabilities. From this overview of CLT, it is possible to imagine what those interactions might look like, how and where those interactions might emerge,

and who might engage in those interactions in an organizational context, such as defense acquisition.

CLT suggests that formal leaders adopt a systems mindset that allows them to incorporate and leverage all aspects of the model found in Table 4; however, individual leaders and particular positions are not necessarily associated with any or all of the functions and principles of CLT (Uhl-Bien & Arena, 2017). Instead, CLT argues that complex adaptive organizations seek an array of individuals who interact and contribute to the emergence of entrepreneurial, enabling, and operational leadership (Uhl-Bien & Arena, 2017). CLT states that complex challenges cannot be solved without strong and effective entrepreneurial and operational systems, but it concludes that adaptive space is the key to promoting the rich interconnectivity, which generates innovation and learning (Uhl-Bien & Arena, 2017, p. 19). Consequently, all three aspects of leadership are necessary to engage in adaptive work. However, more research on CLT is needed to understand how the different forms of leadership emerge in organizations and what needs to be done to develop effective entrepreneurial and operational systems and adaptive space.

Defense acquisition serves as a prime example of how difficult it is for large bureaucratic organizations to shift thinking from an operational leadership mindset to the diverse thinking associated with entrepreneurial and enabling leadership. The complexity leadership model, depicted in Figure 4, suggests a balanced and stable relationship between the operational and entrepreneurial systems. However, in many systems, such as Big “A” acquisition, it is more likely that a state of continual tension between the operational and entrepreneurial systems exists, with the negative effects of this imbalance being felt directly in the adaptive space. In well-established organizations, such as defense acquisition, the operational system tends to be larger and more powerful, and so it is not surprising when hierarchy and bureaucracy overwhelm other aspects of the model.

To counter this influence, a key shift in leadership thinking is needed, which acknowledges that “innovation and adaptability are as core to organizational survival as operating results” (Uhl-Bien & Arena, 2017, p. 14). Without this mindset, the

complexity leadership model will never function effectively. Former Under Secretary of Defense Kendall (2017) argued this very point when he said that the key to acquisition success is “the ability to create innovative, even game-changing products that enable innovative operational concepts” (p. 8). The former head of defense acquisition called for a more flexible and adaptable system that can change the game of warfare through technological innovation and superiority.

Despite leadership pronouncements for new thinking and practices to deal with complex challenges, the acquisition system remains largely a hierarchical operational model that depends on expert control, rigid regulations, and formal decision rules to solve problems (Defense Acquisition Performance Assessment Project, 2006). One reason why the system is slow to change might be the influence of strict legislative demands and policies that constrain opportunities for innovation. Another reason for the lack of change may be an overreliance on certainty and predictability in a context where the outcomes of decisions and actions pose daily life-or-death implications (Defense Acquisition Performance Assessment Project, 2006). However, many decisions and actions within the system are also culturally and socially driven, which contributes to outmoded thinking about who leaders are and what leaders do in defense acquisition. Shifts in the thinking about leadership might provide ways to influence the culture of the DAWF.

One such shift in thinking might be towards CLT, which offers a framework and a model that recognizes and addresses the cultural impact of hierarchy and bureaucracy in defense acquisition, but challenges leaders to apply complexity thinking to enable innovation and adaptability. A shift towards CLT suggests that leaders not only provide direction and order to maintain the operational system, they also enable the dynamics that make a complex system adaptive (Uhl-Bien & Arena, 2017). CLT suggests that, unlike the complex adaptive systems found in nature, which are bottom-up phenomena, complex adaptive organizations operate simultaneously as “bottom-up:top-down” models which both stimulate adaptation and sustain order in organizations (Lichtenstein et al., 2006). CLT suggests that enabling leadership is the key to this important capability, by supporting the adaptive space to deliver innovation and helping produce the energy needed to scale and

sustain new operational models to replace existing hierarchical structures and bureaucracy (Uhl-Bien & Arena, 2017, p. 17). Defense acquisition, and the DAWF in particular, might benefit from a shift in thinking toward CLT and enabling leadership.

CLT provides important ideas and practices that have relevance for the challenges facing defense acquisition. However, CLT is a relatively new approach and the application of the theory to practical settings is limited. CLT would benefit from linkages between this emerging theory and established organizational contexts and conditions. The study of teams and teamwork presents one such connecting point by which CLT concepts and practices might shape the thinking about complexity and leadership in defense acquisition. The next section reviews some of the thinking on teams and team leadership that relates to CLT and the complex adaptive challenges facing defense acquisition.

Teams and Complex Adaptive Systems

In the past three decades, the literature on teams and teamwork has grown dramatically, and the field has expanded well beyond its origins in social psychology to other theoretical disciplines and a variety of applied settings (Kozlowski & Bell, 2013). The literature is extensive and varied and demonstrates the rapid growth of knowledge in this field. Research shows how teams do many valuable things for organizations, such as promoting efficient action, building cohesiveness, and coordinating collective effort toward a common goal (Kozlowski & Bell, 2013; Mathieu, Maynard, Rapp, & Gibson, 2008). Likewise, the research on team characteristics and attributes is robust (Kozlowski & Bell, 2013) and the notion of "high performance teamwork" is cited as a key to success for many organizations (Katzenbach & Smith, 2006). In fact, Former Under Secretary of Defense Kendall suggested that a fundamental principle of the BBP initiative is that "Defense Acquisition is a team sport" (Kendall, 2017, p. 13). With so much emphasis and interest on teams and teamwork, it is no surprise that teams appear to be the answer to many of the greatest challenges facing organizations.

However, Kozlowski and colleagues (2009) highlight the lack of research on team leadership, which focuses on "process dynamics" and "building adaptive

capabilities" in organizations (p. 113). While the practical value of teams is well-established, the evidence of processes and actions to implement and lead teams in organizations like, defense acquisition is lacking. As a result, the ubiquitous nature of teams and teamwork does not necessarily mean the concepts are understood fully, or that the practice of team leadership has been perfected. While defense acquisition may be a "team sport," the rules, organization, and goals of the game are unclear. Former Under Secretary of Defense Kendall (2017) offered another perspective on defense acquisition teamwork when he argued that "the complexity of acquiring defense products and services makes simple solutions untenable" (p. 11). Are teams merely "simple solution" or a management fad with minimal impact, or are teams a viable and relevant means to solve the complex challenges facing defense acquisition? The next section reviews the thinking that informs the practice of teams in complex systems, like acquisition.

The rapid growth of teams and teamwork is partly a function of cultural, technological, social, and economic transformations and the associated changes in the organizational environment (Kozlowski & Bell, 2013). These transformations have shaped how people work and relate to one another, prompting the growth of teams in many different settings. The emergence of teams, teamwork, and teaming and other ideas about collaboration have influenced not only the way people work, but also the thinking about work. For example, in the area of human resources and talent development, the emphasis on teams has shifted the conversation from building and "optimizing human capital" to enabling "social capital" through connections, networks, and interdependencies (Arena & Uhl-Bien, 2016). The important finding here is that the emerging ideas about teams and team leadership serve as a conceptual and practical bridge to link CLT to defense acquisition.

CLT highlights the importance of interconnections and the generative nature of the "collective intelligence" that emerges from interdependent and cohesive groups (Uhl-Bien & Arena, 2017, p. 10). DeChurch and Mathieu (2009, pp. 268–269) provide a connection point between the research on complexity and teams through two trends in the evolution of organizations. The first trend is that organizations rely less on individual jobs and general roles to accomplish goals and rely more on

collectives and networks that provide expertise and experience needed for specific challenges (DeChurch & Mathieu, 2009). The growing influence of complexity makes it more difficult for any individual or organization to accomplish highly technical work, let alone solve complex adaptive challenges. Growing efforts in many industries to partner, collaborate, team, merge, and acquire new capabilities are commonplace strategies that leverage the collective intelligence and specialization needed to succeed.

In a similar manner to the collective intelligence of teams, the CLT concepts of interconnections and collective behavior describe how innovative ideas emerge in complex organizations (Russ & Uhl-Bien, 2011; Uhl-Bien & Arena, 2017). These findings are relevant for defense acquisition because of the previously identified tension between the operational and the entrepreneurial system of defense acquisition. The diversity of participants and stakeholders and the variability of interests and values in defense acquisition lead to conflicts within the system but also present the potential space for innovation and adaptation to occur (see Figure 2). The interconnections of CLT and the collective intelligence of teams enables expertise and learning to be leveraged across the acquisition system, which is essential to the goal of "timely and cost-effective development and delivery of warfighting capabilities" (DoD, 2016, p. 2; Kendall, 2017, p. 13).

DeChurch and Mathieu (2009) offered a second trend that describes a shift from strict hierarchical control toward the empowerment of different organizational agents, who take on important responsibilities. In most organizations, teams operate as independent entities that are typically empowered and responsible for local goals and outputs (Mathieu et al., 2008). While there are a number of variables that make the functioning of teams more or less complex, they tend to be inwardly focused, and empowerment typically ends at the team boundary (Kozlowski & Bell, 2013). In most teams, the connections with external players are loose and generally mediated by external leadership. While empowerment exists in teams, the extent of that power is limited by organizational structure.

However, DeChurch and Mathieu (2009) suggested that empowerment is not just an individual property but can be a shared state, which enables collectives to connect and form “tightly coupled systems” (p. 269). Evidence shows that an empowered workforce enables quicker, more direct action, because those closest to the problem or opportunity respond directly to emergent needs (Heifetz, 2006). Research also shows that more organizations are empowering teams to connect across boundaries and “interface directly and interdependently in response to environmental contingencies” (DeChurch & Marks, 2006, p. 311).

This new organizational structure is termed a multiteam system (MTS) and brings together “specialized skills, capabilities and functions aimed at attaining goals too large to be performed by a single team” (DeChurch & Mathieu, 2009, p. 270). However, DeChurch and Mathieu (2009) cautioned that MTSs tend to exhibit a lower level of interdependence between teams in the system, which necessitates a greater need to build “functional interdependence” in the processes used to accomplish a task (p. 272). In contrast to the more formal structures of the MTS, CLT suggests that leaders act as bridges between structures so that boundaries are transformed from “brick walls” into “filters” so that ideas are more likely to gain collective ownership (Uhl-Bien & Arena, 2017, p. 16). An important finding from this review is that boundaries and linkages serve important roles in complex organizations and leaders must apply different thinking to properly leverage this organizational capability.

The organizational trends of collective intelligence and empowerment have led to new organization forms, such as MTS, as well as the complex networks and linkages that promote collaboration, learning, and innovation. Research shows that organizations that manage for efficiency and results, while leading for adaptability, are more successful in complex environments (Uhl-Bien & Arena, 2017). This is especially true in the broader national security environment, as evidenced by the increasing number of case studies highlighting cross-team connections and collaborative networks in combat and the intelligence communities (Hackman, 2011; McChrystal et al., 2015).

Multiteam systems and other cross-team collaboration networks are particularly relevant given the defense acquisition workforce strategy to "empower the acquisition workforce to make the right decisions to buy the right systems to support the Warfighter at the right time" (DoD, 2016, p. i). To better understand the distinctions in leadership thinking across different organizational structures, a comparison of fundamental concepts related to formal, team and complexity leadership is presented in Table 5.

Table 5: Fundamental Concepts of Formal, Team, and Complexity Leadership. Adapted from Kozlowski et al. (2009) and Uhl-Bien & Arena (2017).

Concept	**Formal Leadership**	**Team Leadership**	**Complexity Leadership**
Approach	Structure	Process	Emergence
Level of Analysis	Individual and organization	Individual and team	Networks and systems
Objective	Apply universal behaviors	Regulate process to compile team skill	Enable adaptive space
Dynamics	Fixed in situation; varies across situations	Variable development within situation	Complexity and pressure

There are several findings that result from this review of the fundamental concepts that distinguish formal, team, and complexity leadership, and many of those findings have relevance for defense acquisition. Besides highlighting the differences in thinking about leadership, the comparison in Table 5 provides a way to notice trends and connections among the various forms of leadership and the implications for defense acquisition. The most important finding is that there is a general shift in the approach to leadership from a structural role or position, to an interactive process between people and finally, as a state of mind or a way of thinking, seeing, and acting. Thus, leadership moves from a focus on self, to the relationship with others, and finally to an active observer of a system. Most

hierarchical and bureaucratic systems, such as defense acquisition, rely on formal leadership roles and the application of behavioral competencies as the primary approach to leadership and leader development (Arena & Uhl-Bien, 2016). However, the growth of coaching and other developmental interventions in leadership may actually parallel the shift towards teams and collaborative efforts in organizations that represents an important change in thinking about how leaders are developed (Conger & Ready, 2004).

A second finding highlights the different objectives sought by each form of leadership as the frame shifts from something objective and behavioral to that which is contingent and relational, and finally to the adaptive and experiential. This shift not only reveals what is most important to each model (competence, development, and learning, respectively), but also how one comes to know (the practice and methodology) about leadership (predict and measure, test and correlate, experiment and review, respectively). Most of the recent efforts to "professionalize" the DAWF have relied on building more competent and qualified acquisition leaders through technical education, standardized courses, and positional tenure (DoD, 2016). While efforts to increase personal and professional development of acquisition leaders and promote deep learning through experiences and action has been suggested, such interventions are time- and resource-intensive.

Finally, the model highlights distinctions in the thinking about problems and the role of leadership in solving them. The current study highlighted the different types of problems and how they range from the simple and technical to the chaotic and complex. In the formal leadership model, problems are viewed as technical challenges with predictable solutions. Leaders engage in thorough planning and effective management to ensure the right solution is applied. In other words, there is a correct solution and the leader has it. In the team leadership model, the problems are known but often involve conflicts over the methods or actions a team will take and what a leader can do to help the team perform. In this case, the thinking is that, there is a better solution in a team and the leader must build it. Finally, the complexity leadership model views problems as opportunities for learning, where diverse perspectives come together, and novel ideas and innovation emerges. For

complexity leadership, there are better questions and different ideas and the leader needs to ensure people are presenting them.

The linkages, networks, and collective intelligence made possible through the practice of CLT and MTS has the potential to deliver the energy to adapt and innovate new capabilities needed in the acquisition system. However, it is not enough to merely talk about empowerment and collaboration in defense acquisition. The thinking and practice of leadership must reflect the most rigorous and relevant research and understanding of these theories, frameworks, and models. The present study and application of CLT and MTS to defense acquisition represents an important shift in the thinking about teams, organizations, and leadership in this VUCA context.

Thinking Differently About Defense Acquisition

"There is nothing so practical as a good theory."

—Kurt Lewin (1951)

The quote by noted psychologist Kurt Lewin serves as an appropriate conclusion to a project that set out to assess the thinking that guides leadership in defense acquisition. This project has been about the search for better theory and understanding of leadership in an increasingly complex defense acquisition environment. The project was prompted by a quote from former Under Secretary of Defense Frank Kendall that "Defense Acquisition is a team sport" (DoD, 2016, p. 1). This initial statement led the project to the thinking about teams and team leadership in defense acquisition. However, the project's focus shifted from the thinking that guides teams and team leadership, to a broader study of the gaps in thinking about leadership and complexity in defense acquisition.

The project reviewed the relevant theory, frameworks, and models of leadership and teams in complex and dynamic settings and compared that to the current thinking and context of leadership and teamwork in defense acquisition. From this theoretical review of the literature and a practical review of Acquisition policy and guiding documents, the project addressed two things:

1. The gaps that exist in the thinking (theory, frameworks, and models) about leadership and teams in the DAWF, given the dynamic interactions and complex tensions of the acquisition system
2. The thinking (theory, frameworks, and models) that might inform the practice and development of adaptive and collaborative leaders and teams to address the dynamic interactions and complex tensions of defense acquisition

This review identified a number of gaps (real or apparent) between the theory, frameworks, and models of leadership and the current thinking about leadership and teams in the DAWF. The findings have been presented throughout the paper, but the following is a summary of the key findings:

- The current thinking about leadership may not be sufficiently rigorous or comprehensive enough to address the complexity of defense acquisition.
- The scope, scale, and form of problems has changed, and acquisition leaders must be able to deal with all of the changes, all at once.
- The tensions that emerge from the complexity of modern warfare, the disconnections in the acquisition system, and the need for sustained DAWF performance present challenges that may exceed the current capabilities of acquisition leaders, but they may also create opportunities for new forms of organization and different approaches to leadership.
- The inability to recognize the need for new thinking is not uncommon.
- Acquisition leaders must understand the range and types of problems they face, rather than merely applying existing or accepted solutions.
- Efforts to impose order on complexity will do more harm than good and is an example of outmoded or inaccurate thinking that seeks system maintenance and stability over adaptation and change.
- In a complex system, innovation and adaptability are just important as operating results.
- A "poised" system is central to the notion of agility in modern warfare and has relevant applications to defense acquisition.
- Boundaries and linkages are key areas for the work of acquisition leaders.
- Complexity leadership is not an "either–or" situation, but rather a "both–and" focus on the "bottom-up and top-down" aspects of a system.
- The focus in defense acquisition must shift from "optimizing human capital" to enabling "social capital."
- Teams, team leadership, and complexity thinking provide the connective and theoretical framework for acquisition leaders.

The goal of this project has been to present information to support more flexible and agile approaches to leadership and teams and to suggest opportunities for future research into conceptual frameworks and practices that support the mission and objectives of defense acquisition. The findings and recommendations developed in this study present research opportunities that may inform changes or improvements in structure, processes, and culture within the acquisition system and ultimately bridge existing gaps in the thinking about leadership and teams in defense acquisition.

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