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CULTIVATING NAVAL INNOVATION: ESSENTIAL ELEMENTS OF A BOTTOM-UP APPROACH

June 2023

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**CULTIVATING NAVAL INNOVATION: ESSENTIAL ELEMENTS OF A
BOTTOM-UP APPROACH**

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ABSTRACT

The Department of Defense (DOD) faces a unique challenge in understanding and implementing the innovation process within a military context, distinct from the open market dynamics. This study aims to bridge this gap by exploring the concept of bottom-up innovation in the DOD through a qualitative examination of its interaction with culture, management systems, and motivators of innovators. Additionally, the study examines the implementation approaches employed by the DOD, specifically focusing on the Federal Acquisition Regulations, the requirements determination process, and the Planning, Programming, Budgeting, and Execution process, as well as organizational culture. Findings highlight that bottom-up innovation within the DOD is best suited for O-5 level commands, paving the way for the proposed theoretical framework of bottom-up innovation sub-models. This research serves as a valuable resource for operational-level leaders and entrepreneurs invested in driving innovation for national defense, offering the framework for a structured approach to implement a bottom-up innovation model within the DOD.

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
ARPA-E	Advanced Research Projects Agency-Energy
CEO	Chief Executive Officer
CIO	Chief Information Officer
CTO	Chief Technology Officer
CVF	Competing Values Framework
DARPA	Defense Advanced Research Projects Agency
DIU	Defense Innovation Unit
DOD	Department of Defense
FAR	Federal Acquisition Regulation
FIND	Financial Industry Network Data
FY	Fiscal Year
JCIDS	Joint Capabilities Integration and Development System
JOpsC	Joint Operations Concepts
NATO	North Atlantic Treaty Organization
NDAA	National Defense Authorization Act
OSD	Office of the Secretary of Defense
OT	Other Transactional
OUSDA(A&S)	Under Secretary of Defense for Acquisition and Sustainment
PPBE	Planning Programming, Budgeting, and Execution process
R&D	Research and Development
S&T	Science and Technology
SBA	Small Business Administration
SBIR	Small Business Innovation Research
SMEs	Small and Medium-Sized Enterprises
STTR	Small Business Technology Transfer
USAF	United States Air Force
USN	United States Navy
USSOCOM	United States Special Operations Command

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I. INTRODUCTION

During WWII and the Cold War, the United States leveraged its technological advantages to dominate the global landscape during the industrial and nuclear eras. However, there is reason to question if the U.S. military can win again in the information era, where emerging technology can quickly displace previous advantages. As the world's knowledge advances and becomes readily available, it allows for a significant change or interruption in traditional military operations. As competition with technologically advanced nations intensifies, the Department of Defense's (DOD) ability to develop and field technology will remain a strategic focal point (Hagel, 2014, para. 8). To maintain a military advantage over U.S. adversaries; the DOD must implement effective innovation processes to accelerate warfighter capabilities. Secretary of Defense Chuck Hagel emphasized the importance of promoting innovation across the defense enterprise in his 2014 publication:

We are entering an era where American dominance in key warfighting domains is eroding, and we must find new and creative ways to sustain, and in some areas expand, our advantages even as we deal with more limited resources. This will require a focus on new capabilities and becoming more efficient in their development and fielding...the demand for innovation must be Department-wide...We must take the initiative to ensure that we do not lose the military-technological superiority that we have long taken for granted... America's continued strategic dominance will rely on innovation and adaptability across the defense enterprise. (Hagel, 2014, para. 1–2)

The DOD currently employs the Adaptive Acquisition Framework, a top-down incremental approach to innovation. This system is suitable for large complex projects requiring high oversight levels from regulatory organizations. However, for specialized ventures that require rapid innovation, a bottom-up approach where those closest to the problem are the driver of innovation provides greater flexibility (Blank, 2020). The DOD has no shortage of personnel with good ideas, and we must test these ideas at a high rate to scale innovation (Schmidt, 2018). Recognizing the pivotal role of innovators within the DOD is essential for compiling, evaluating, and experimenting with the myriad of innovative concepts generated by those personnel, as they provide a critical avenue for

large-scale testing of ideas. Savoia (2011) notes that the ability to fail early and cheaply is a crucial aspect of successful experimentation. By engaging a more comprehensive range of experimenters, the DOD can increase the rate of innovation to a degree that would be challenging for competitors to match. Therefore, implementing a bottom-up approach in experimentation wherever possible provides the DOD with even more compelling reasons to embrace the role of organic innovators in the rapid innovation process.

A. PROBLEM STATEMENT

There is a growing recognition that the DOD needs to foster innovation and attract innovators to maintain military superiority in an increasingly complex and dynamic global environment. Despite the DOD's practical top-down incremental innovation model, there remains a significant gap in rapid innovation models within the DOD. Small and medium-sized enterprises, similar in size and structure to O-5 level naval commands, have demonstrated the ability to innovate rapidly by leveraging their agility and emerging technologies (Bennett et al., 2015). However, a lack of clear guidance and a cultural aversion to the risk of failure prevents individuals in O-5 level commands from participating in innovation (Bennett et al., 2015). Talented individuals with the technical expertise needed to drive rapid innovation may not be aware of the opportunities available within the DOD or may find it challenging to navigate the bureaucracy and culture of the organization (Schmidt, 2018). These challenges have led to a need for innovators who are organic to the DOD and capable of filling the void between the rate of innovation in the commercial industry and that of the DOD. Such innovators would develop new technologies and solutions that cater to the distinct requirements of the military. As noted in a 2019 report published by the RAND Corporation, "The organic development of innovative leaders and personnel has become a critical component for maintaining the United States' technological and military edge" (Stasz et al., (2019, p. 9). Addressing this need will require a concerted effort by the DOD to foster a culture of innovation and to create more opportunities for learning and participation within the defense community (Hagel, 2014).

Adversaries such as China have chosen innovation strategies emphasizing adopting existing technology faster than those who developed it (de La Bruyère, 2020). By adopting this strategy, they can minimize their development costs and schedules while gaining an asymmetric advantage over the U.S. and its allies (de La Bruyère, 2020).

To better address China's pace of adaptation, the DOD must consider revisions to its traditional top-down incremental approach to innovation. Therefore, it is essential to identify the key factors of small and medium-sized enterprises that enable their rapid pace of innovation.

B. PURPOSE OF RESEARCH

This research aims to identify the key factors needed to develop a bottom-up innovation model within the DOD. A model can integrate these factors to guide O-5 level naval commands in actively adopting a structured approach to develop or acquire custom solutions, enabling them to match the pace of innovation these enterprises demonstrate.

This study will aim to achieve the primary objective by examining traditional and emerging elements that contribute to innovation in the DOD and commercial sectors. This analysis will also consider the key advantages of their respective ecosystems and identify the critical factors that will serve as building blocks for a refined bottom-up approach to experimentation and innovation at the O-5 command level.

C. RESEARCH QUESTION

The primary research question we seek to answer is: What key factors from small and medium-sized enterprises could be integrated into an organizational model to enable bottom-up innovation among naval O-5 level commands?

D. ORGANIZATION OF STUDY

The remainder of this report will proceed as follows:

- Chapter II summarizes the literature reviewed in support of this study. It highlights pertinent regulations, essays, books, studies, and articles that

provide insight into the nature of innovation in a DOD and commercial setting.

- Chapter III explains the research approach.
- Chapter IV summarizes the findings and best practices.
- Chapter V provides conclusions and recommendations for further research and policy changes.

E. CHAPTER I SUMMARY

This chapter discusses the importance of innovation in the DOD to maintain military superiority in the information era. The current top-down approach to innovation may not be sufficient for specialized projects that require rapid innovation. A bottom-up approach may be more effective, where those closest to the problem drive innovation. There is a need for organic innovators within the DOD who can help bridge the gap in rapid innovation. China's strategy of adopting existing technology faster than those who developed it has enabled them to gain an advantage over the U.S. and its allies. The primary focus of this study is to identify key factors used by small and medium-sized enterprises to innovate rapidly. From our findings, we will develop a list of key factors needed to create a supplementary organizational model that incorporates the essential innovation factors of small and medium-sized enterprises.

II. LITERATURE REVIEW

This literature review aims to analyze the literature on innovation and its relevance within the DOD acquisitions system. The goal is to identify key factors enabling bottom-up innovation and develop an organizational model incorporating these factors. The section discusses the relevance of rapid innovation in the DOD to national security. It also explores how various factors, such as the speed of the acquisition system, congressional oversight, lack of competition in the defense industrial base, and near-peer competition, have hindered rapid innovation in the DOD. The second part of the review examines the literature on innovation theory to gain insights into foundational thinking that can influence organized approaches to innovation management. Finally, literature on the approach taken by the DOD towards innovation is analyzed to reveal bureaucratic challenges and missed opportunities.

A. RELEVANCE TO NATIONAL SECURITY

In a 2019 interview, Dr. William Roper emphasizes that when competing with near-peer adversaries, the speed at which the DOD can develop and deploy new technology significantly impacts national defense.

Competing means we have to speed up acquisition. It's far too slow in this century. The model from the Cold War brought into this century is too slow. If you look at the pace of technology change, we should be fearful of having a slow acquisition system. Who knows what the next technology that's going to change national security is going to be? (Lofgren, 2019, 03:05).

Dr. Roper suggests that the acquisition system of the DOD cannot effectively tackle the current and future challenges faced by the organization citing that the system is “far too slow” to compete in this century (Lofgren, 2019, 3:11). Eric Schmidt agreed with this idea in his 2018 testimony.

In his 2018 testimony before the House Armed Services Committee, Defense Innovation Board Chairman Eric Schmidt warns that the DOD risks losing its competitive technological advantage. Schmidt reports multiple accounts of leaders who, fearing congressional condemnation, opt for a risk-averse approach. In this way, they default to

process rather than taking a calculated risk (Schmidt, 2018). Central to this issue is Congressional oversight, that when too cumbersome, can hinder the entrepreneurial culture necessary to remain competitive in future battlefields. Schmidt points out the need for Congressional oversight to adapt to the new security risks to enable a DOD environment of experimentation and calculated risk-taking. However, a DOD culture of innovation that matches the dynamics of the current technological competition can only succeed with the support of Congress.

A report released by the Under Secretary of Defense for Acquisition and Sustainment in February 2022 points to declining competition in the defense industry as a current security risk for national security. The report shown in Figure 1 notes that the lack of competition reduces the pressure for competitors to innovate and cites reductions in prime contractors through mergers from 51 to 5 since the 1990s and declines in suppliers for tactical missiles, fixed-wing aircraft, and satellites as areas of concern. The report makes five recommendations for strategic planning, including increasing new entrants and opportunities for small businesses and implementing sector-specific supply chain resiliency plans. The report highlights the importance of leveraging Other Transactional (OT) authorities and Commercial Solution Openings to incentivize contractors who conduct prototyping to transition to production and provide opportunities for swift acquisitions (OUSD[A&S], 2022).

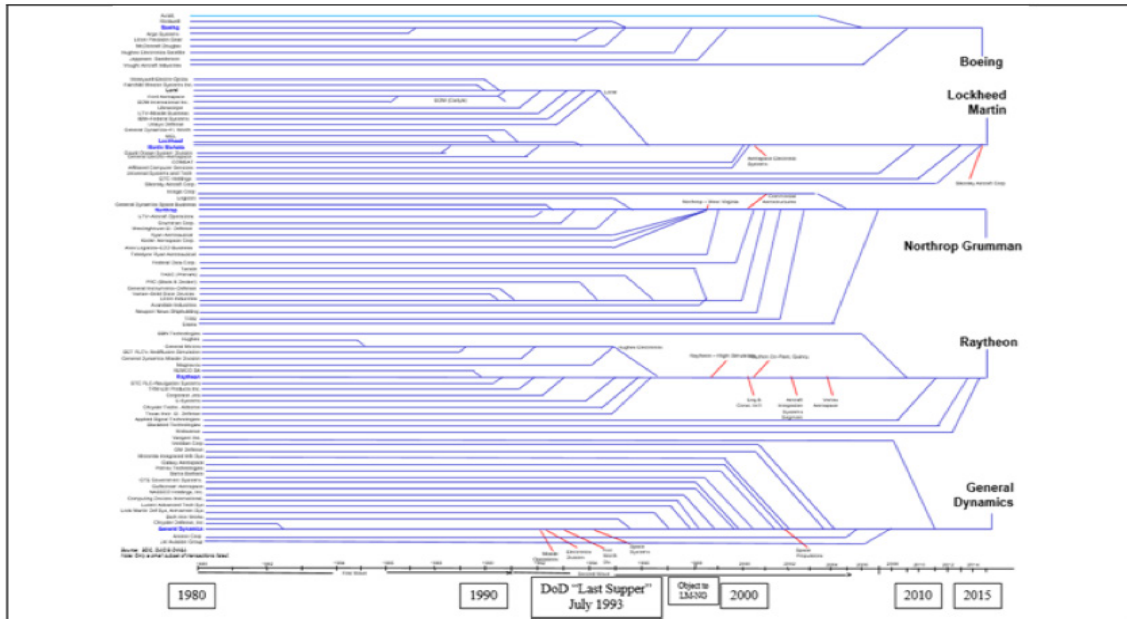


Figure 1. Defense Sector Consolidation. Source: FIND (2022).

A report published by the Acquisition Research Program in 2020 frames China’s innovation strategy as a great power contest. The report asserts that China aims to dominate networks, standards, and platforms to emerge victorious in the competition (de La Bruyère et al. (2020)). The report cautions that Beijing takes advantage of the fragmentation of Western societies to extract intellectual property and expertise (de La Bruyère et al., 2020).

The statements made by Dr. William Roper and Eric Schmidt highlight the urgent need for the DOD to expedite the development and deployment of new technology to maintain national security (Lofgren, E. (2019), (Schmidt, E. (2018)). Dr. Roper and Mr. Schmidt both express concern that the current acquisition system of the DOD is too slow to compete with near-peer adversaries and risk-averse approaches to innovation could hinder the DOD’s competitive technological advantage. Their accounts note Congressional oversight as a potential hindrance to the DOD’s necessary culture of innovation and experimentation. The lack of competition in the defense industry is identified as a national security risk, as it reduces the pressure for competitors to innovate. The OUSD(A&S) report recommends increasing new entrants and opportunities for small businesses, implementing sector-specific supply chain resiliency plans, and leveraging Other

Transactional authorities and Commercial Solution Openings to incentivize contractors to transition to production. The report published by the Acquisition Research Program emphasizes the importance of competition with China in innovation and warns of the risks associated with China's innovation strategy. These statements and reports underscore the crucial role of innovation and the need for an agile and efficient acquisition system in maintaining national security in the face of near-peer competition.

B. INNOVATION THEORY

1. Schumpeterian Entrepreneurship Theory

There exists an abundance of literature published regarding innovation, and each author defines innovation with a unique touch. The definition given by Dr. Upadhyay and Dr. Rawal in their 2018 study of innovation provides a reasonable frame of reference for this study. The authors define innovation as the application of better solutions that meet new requirements or existing market needs through more effective products, processes, services, technologies, or business models (Upadhyay et al., 2018, p. 1682).

Proposed by Joseph Schumpeter in 1932, the innovation theory of entrepreneurship was seen as contrary to the prevailing view of entrepreneurship at the time (Upadhyay et al., 2018, p. 1681). The Schumpeterian entrepreneurship theory identifies entrepreneurs as the primary driver of innovation within small and medium-sized enterprises (SMEs), as shown in Figure 2.

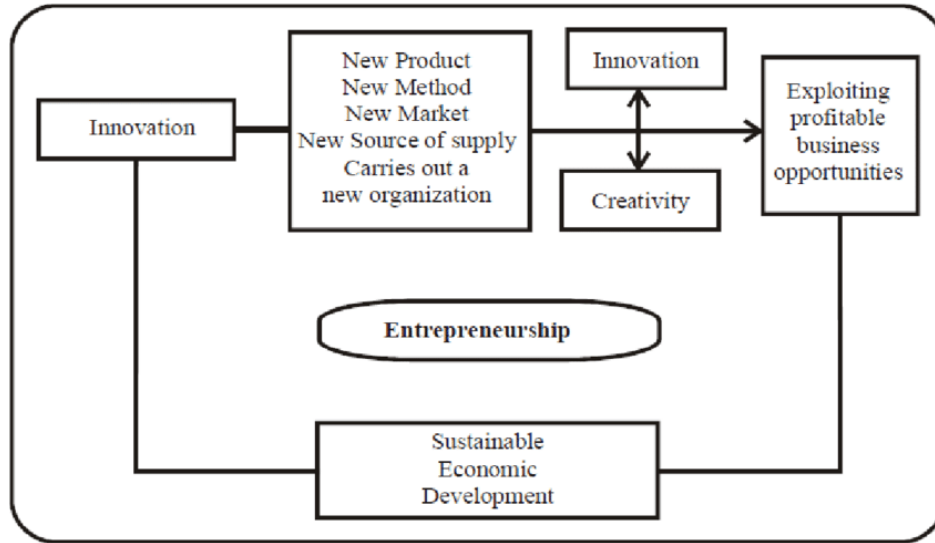


Figure 2. Schumpeter's Innovation Theory of Entrepreneurship. Source: Upadhyay et al. (2018).

Schumpeter's work suggests innovation is best driven by those closest to the problem who, by virtue, have the best insight into a challenge and its potential solutions. According to Schumpeter, a person who seeks new ways to employ the factors of production to bring new products or services to market is known as an entrepreneur (Upadhyay et al., 2018, p. 1682).

Schumpeter makes a distinction between innovators and inventors. According to him, an inventor uncovers or generates a new product or procedure, while an innovator employs those discoveries or creations (Upadhyay et al., 2018, p. 1683). Where the inventor is more concerned with the technical specifications, the innovator is more concerned with the application. Schumpeter acknowledges that occasionally the two mindsets will overlap.

Schumpeter identified several key drivers of innovation, including new technological breakthroughs, changes in consumer demand, and the pursuit of profit by entrepreneurs (Schumpeter, 1942). Schumpeter argued that the main driver of innovation is the entrepreneur, who is willing to take risks and invest in new ideas (Schumpeter, 1934).

Schumpeter also acknowledged systemic barriers to innovation, such as regulatory hurdles, resistance to change by established firms, and difficulty obtaining financing for

new ventures (Schumpeter, 1942). To overcome these barriers, Schumpeter believed that the state should foster innovation through policies encouraging competition through entrepreneurship and funding research and development (Schumpeter, 1934).

Schumpeter gives us a different way of viewing entrepreneurs in terms of innovation. In most cases, entrepreneurs inside large organizations are simply managers of innovative changes pushed down by higher-level decision-makers (Upadhyay et al., 2018). Large bureaucratic organizations, such as the DOD, operate in that fashion. Schumpeter explains that those at the point of need should provide the entrepreneurial drive that identifies problems and implements solutions. Schumpeter refers to these entrepreneurs as creative destructors (Schumpeter, 1942).

Joseph Schumpeter believed that entrepreneurship and the entry of new firms into the market were critical factors that enabled rapid bottom-up innovation in organizations (Schumpeter, 1934). Schumpeter argued that competition from new entrants could disrupt existing markets, forcing established firms to innovate to remain competitive. In this way, Schumpeter saw the process of creative destruction as a necessary element of a dynamic economy that allows for continuous innovation and growth (Schumpeter, 1942).

Joseph Schumpeter's innovation theory of entrepreneurship provides a valuable perspective on innovation and the role of entrepreneurs in driving it. Schumpeter suggests that entrepreneurs drive innovation within SMEs. Schumpeter explains entrepreneurs have the best perspective to identify problems and implement solutions. Schumpeter also highlights the importance of competition in fostering innovation and growth within an economy. Although Joseph Schumpeter proposed his theory almost a century ago, it remains relevant today and shapes our understanding of innovation and entrepreneurship. We must keep Schumpeter's ideas in mind as we progress and create policies encouraging and supporting entrepreneurship and innovation.

2. Customer-Centric Approach to Innovation in Organizations

Steve Blank, a start-up entrepreneur and university professor who created the Hacking for Defense class later adopted by the DOD, provides an intellectual framework that aids in understanding how innovation works. Blank makes distinctions between the

nature of start-ups and established businesses that, in principle, can be translated into government applications. Blank explains how the start-up organization is better positioned to innovate than its larger, more established, bureaucratic counterparts. His observations have influenced the way military practitioners organize to enable innovation. According to Blank, innovation requires a thorough understanding of the customer's needs and a willingness to pivot or change direction based on feedback (Blank, 2020). Unlike a large bureaucracy, a light and flexible organization can quickly change course with far fewer implications until it finds the best path (Blank, 2020). Blank emphasizes the importance of customer discovery, which involves gathering information about customer needs and preferences to guide product development. Blank also stresses the value of experimentation and iteration in the innovation process, encouraging entrepreneurs to develop a minimum viable product and refine it based on customer feedback (Blank, 2020). Overall, Blank's perspective on innovation centers on a customer-centric approach that emphasizes experimentation and iteration.

Steve Blank defines innovation as “a formalized process for taking a new idea and turning it into a product or service that creates value for customers” (Blank, 2020). For Blank, innovation is about generating ideas and rigorously testing and validating them through customer discovery, iteration, and feedback. Blank emphasizes the importance of getting out of the building, engaging directly with customers to understand their needs and pain points, and using this feedback to refine and improve the product or service. Blank also stresses the importance of a lean and agile approach to innovation, where small teams work quickly and collaboratively to iterate and pivot based on customer feedback (Blank, 2020).

Steve Blank identifies several main drivers of innovation in organizations, including the need to solve customer problems or pain points, the opportunity to exploit new technologies, the desire to gain a competitive advantage, and the need to respond to changes in the market or industry (Blank, 2020). Blank emphasizes the importance of deeply understanding customer needs and preferences and using this knowledge to create products or services that better meet those needs. Blank also stresses the importance of experimentation and iteration in the innovation process and maintaining a flexible, agile

approach that can adapt to changing circumstances and feedback from customers and stakeholders.

According to Steve Blank, some common barriers to innovation in organizations include resistance to change, lack of leadership support, inadequate funding, and a culture that discourages risk-taking (Blank, 2020). According to Blank, an organization can overcome these barriers by fostering a culture of innovation (Blank, 2020). Organizations can develop such cultures by encouraging experimentation and failure as part of the learning process, providing resources and support for innovation initiatives, and empowering employees at all levels to contribute ideas and take ownership of innovation efforts (Blank, 2020). Blank also advocates using lean start-up methodology, which involves testing ideas quickly and cheaply to validate assumptions and reduce risk, to overcome some of the barriers to innovation in traditional organizations (Blank, 2020).

Steve Blank (2020) emphasizes that to enable rapid bottom-up innovation, an organization must foster a culture of experimentation, risk-taking, and continuous learning. Blank argues that organizations need to encourage their employees to test and experiment with new ideas and that they should not be afraid to fail. Blank also stresses the importance of having a flat organizational structure that enables open communication and collaboration across all levels of the organization. Furthermore, Blank suggests that organizations should provide employees with the necessary resources, such as time, funding, and mentorship, to support their innovative endeavors.

3. Entrepreneurial Activity within Large Bureaucratic Organizations

In his 1983 article, Robert Burgelman, a Stanford University professor, makes the case that entrepreneurial activity within large complex organizations is necessary for those firms to develop diversity in their strategies and is a crucial component to the organization's continued survival. Burgelman uses the term corporate entrepreneurship to describe these activities, noting that these activities result in diversification through internal development (Burgelman, 1983, p. 1349). His research shows that the new resource combinations resulting from these innovative internal activities provide the means for extending the frontiers of corporate capabilities and the development of additional

synergies. This continued development of new capabilities is critical to mitigating increasing competitive pressures to enter or leave areas of competence.

In his article, Burgelman cites documentation provided by Peterson and Berger that suggests corporate entrepreneurship is an effective means of coping with competitive threats (Burgelman, 1983, p. 1355). Burgelman warns firms that fail to strategically integrate corporate entrepreneurship into their competitive strategy risk disruption of their core competency areas and eventually obsolescence.

Burgelman further explains that to maintain a strategic advantage in their areas of competency, firms must have the ability to cultivate both order and diversity in their operational strategy (Burgelman, 1938, p. 1349). Large, diversified organizations must have a plan and structure that efficiently and effectively allocates the firm's resources (Burgelman, 1938, p. 1350). The firm must also have a means by which those within the firm may participate in the process of experimentation and selection that results in new combinations of the firm's resources or the identification of new strategic opportunities (Burgelman, 1938, p. 1350). According to the article, corporate entrepreneurship is how a firm establishes diversity in its operational strategy (Burgelman, 1938, p. 1349). These entrepreneurial activities are how firms identify new resource combinations, develop new technology, and discover new synergies that allow the firm to expand its capabilities and mitigate external competitive pressure. To accomplish this, Burgelman emphasizes that the firm's management activities must include corporate entrepreneurship in its strategic formulation and implementation (Burgelman, 1938, p. 1349). An idea that is especially true in large bureaucratic organizations, where managers at different levels must closely coordinate their actions.

The article separates the key players of corporate entrepreneurship into three categories entrepreneurial actors, middle-level-managers, and top management. The role of entrepreneurial actors within the organization is to provide the experimentation and selection required to diversify the firm's strategy (Burgelman, 1938, p. 1349). Middle-level managers select and support "bona fide" entrepreneurial actors and their projects activities and guard the firm against "misguided self-centered opportunism" (Burgelman, 1938, p. 1361). The role of top management is not to specify the content or direction of

entrepreneurial activity within the organization; instead, it is to establish the optimal level of entrepreneurial activity within the organization (Burgelman, 1938, p. 1356). Once established, Burgelman says top management must “make a firm commitment” to supporting entrepreneurial activity at the specified level to ensure it does not become “ancillary” or “sporadic” (Burgelman, 1938, p. 1361). Burgelman explains rather than directly participating in or “encouraging” entrepreneurial initiatives, top management should only focus on not “suppressing” it (Burgelman, 1938, p. 1361).

The article states that large organizations may be systematically biased against corporate entrepreneurship. Top leadership may view these activities as more of a hedge against peripheral disruptions rather than a necessary function of the firm (Burgelman, 1938, p. 1355). Furthermore, top management can intervene and act as a “diversity reduction tool” by eliminating “errors” or activities outside the firm’s current strategy (Burgelman, 1938, p. 1355). Innovation involves experimentation, and experimentation has inherent failure involved. Burgelman explains that companies build an administrative system to keep operational-level leaders aligned with the company’s strategic vision. When these “errors” in strategic behavior are eliminated by structure, the system continues to operate consistent with its current strategy, and corporate entrepreneurship is unlikely to occur (Burgelman, 1983, p. 1359). Although innovative behavior falls outside the present strategy concept, it is useful for coping with competitive threats. It requires both the operational level’s capabilities and corporate management’s buy-in. If entrepreneurial initiatives emerge without the support of top management, “orphan” or “misfit” projects can be created (Burgelman, 1938, p. 1356).

Burgelman presents evidence that suggests many successful companies have “strong cultures supporting clear strategic goals concerning entrepreneurial activity” (Burgelman, 1983, p. 1359). Burgelman explains that organizational learning and open-source collaboration are the building blocks of these cultures. Firms that systematize the process of sharing innovation throughout the organization generate entrepreneurial activity continuously (Burgelman, 1983, p. 1359). However, Burgelman warns that appropriate management of such systems is necessary as an over-reliance on them can lead to a reduction of diversity in behavior. Burgelman also presents evidence that suggests

organizations must foster a culture where individual entrepreneurs remain the primary drivers of entrepreneurship-generating functions. Burgelman argues that the organization's culture must limit top management's role in experimentation and selection. Organizations must divide corporate entrepreneurship roles over multiple operational managers in the firm and can only reflect top management's "ex-post" vision (Burgelman, 1998, p. 1360). The new resource combinations that these managers propose are "relatively small and ... relatively difficult to understand and evaluate for top management (Burgelman, 1998)" Therefore, the organization's culture must allow entrepreneurial actors to experiment with new resource combinations without making proposals to top management.

Finally, the article explains that entrepreneurial actors must be insured against failures and rewarded for risk due to the high probability of failure. The article states that top management must develop "reasonably foolproof" safety nets and a system that rewards those actors for taking risks.

Burgelman gives the following as keys to successful innovative activities within organizations:

1. Convert the process of planning and budgeting to seek opportunities instead of rationing.
2. Redesign control and motivation systems to support entrepreneurial goals.
3. Allow entrepreneurial teams to engage in "skunk work" outside formal procedural structures (p. 1359)
4. Recruit entrepreneurial talent (p. 1359)
5. Organizations must learn to be content with "winning a few" the one-in-twenty rule (p. 1359)
6. Top management does not need to encourage entrepreneurship. It only needs to make sure it does not suppress it (p. 1361)
7. Base corporate support on faith rather than experience (p. 1361)
8. Reinforcing the crucial role of cognizant middle-level managers in selecting bona fide entrepreneurial actors and their projects (p. 1361)

Robert Burgelman's 1983 article on corporate entrepreneurship emphasizes the importance of diversifying a large complex organization's strategies through internal development. Burgelman argues that these activities are critical to the continued survival of the organization and the development of additional synergies. Burgelman highlights the need for a balance between order and diversity in the operational strategy and the establishment of a plan and structure that efficiently and effectively allocates the firm's resources. The article identifies the key players of corporate entrepreneurship as entrepreneurial actors, middle-level managers, and top management. Burgelman suggests that organizations must foster a culture where individual entrepreneurs remain the primary drivers of entrepreneurship-generating functions. Overall, Burgelman's research indicates that a strong culture supporting clear strategic goals concerning entrepreneurial activity and appropriate management of the system can generate entrepreneurial activity continuously, which is essential to cope with competitive threats and mitigate external competitive pressure.

4. Organizational Capabilities for Successful Innovation

In "Struggling to Innovate (2015)," Nathan Bennett argues that companies that struggle to innovate often do so because they lack the organizational capabilities necessary to support innovation. Bennett identifies four key capabilities that companies need to innovate successfully: (1) strategic focus, (2) disciplined experimentation, (3) customer insight, and (4) a collaborative culture.

According to Bennett, companies must have a clear strategic focus to innovate effectively. Organizations seeking to innovate must identify a specific area or areas where the company wants to innovate and commit resources to those areas (Bennett, 2015). Bennett notes that companies often struggle with innovation because they spread their resources too thin, trying to innovate in too many areas simultaneously (Bennett, 2015).

Bennett argues that companies need to be able to experiment in a disciplined way. Disciplined experimentation means setting clear goals for innovation projects, defining success criteria, and using data to evaluate outcomes (Bennett, 2015). Bennett notes that

many companies struggle with innovation because they are too risk-averse or lack the discipline to assess innovation projects rigorously (Bennett, 2015).

Bennett asserts that companies must deeply understand customers' needs and preferences (Bennett, 2015). They must engage with customers meaningfully and use feedback to guide innovation efforts. Bennett notes that many companies struggle with innovation because they are too focused on internal capabilities or lack a deep understanding of customer needs (Bennett, 2015).

Finally, Bennett argues that companies must have a collaborative culture supporting innovation. Organizations seeking to innovate must foster a culture of experimentation, encourage cross-functional collaboration, and provide resources and support for innovation initiatives (Bennett, 2015). Bennett notes that many companies struggle with innovation because they have a hierarchical culture that stifles creativity and collaboration (Bennett, 2015).

Bennett's article is a valuable resource for managers and executives seeking to foster a culture of innovation within their organizations. It offers a comprehensive analysis of the challenges that companies face in their efforts to innovate successfully. Bennett argues that innovation is not just a matter of having good ideas; it requires the right organizational capabilities and culture to support it. By identifying the four key capabilities companies need to innovate successfully and examining the organizational structure, systems, and culture supporting them, Bennett provides a roadmap for companies looking to improve their innovation capabilities.

5. Organizational Learning

In an article published in 1990, Cohen and Levinthal argue that a firm's capacity to innovate closely correlates with its ability to recognize the value of new information and assimilate and exploit it. The authors refer to this as the firm's "absorptive capacity." The research shows that an organization's absorptive capacity depends on the collective capabilities of the individuals within the firm (Cohen et al., 1990, p. 131). The concepts expressed in the article show that absorptive capacity is closely related to other commonly

used frameworks and terms. As such, we will interchangeably use the terms R&D, innovative capacity, organizational learning, and absorptive capacity.

A firm's absorptive capacity dictates how well the organization responds to new developments in the market (Cohen et al., 1990). High levels of absorptive capacity can allow a firm to remain viable in highly dynamic areas of competence. Such firms can identify new developments, quickly understand how they will affect the market, and develop or adapt the new processes or technology into the firm's current strategy. Organizations with a modest absorptive capacity may develop "blind spots" that lead to the loss of technical advantages and the risk of disruptions in their competence areas (Cohen et al., 1990, p. 137). The article explains that these organizations tend to be more reactive, only searching for an alternative in response to failing to meet key performance indicators (Cohen et al., 1990, p. 137).

Individuals within an organization have varying levels of absorptive capacity in varying disciplines and can contribute to innovative processes. The collection of competencies within the organization contributes to the organizational absorptive capacity (Cohen et al., 1990, p. 131). The article explains that firms can utilize several mechanisms to generate or improve their organic innovative abilities. The research indicates that a firm indirectly improves its innovative abilities through internal manufacturing operations or by conducting its own R&D (Cohen et al., 1990, p. 140). Conversely, the article explains that firms may invest in absorptive capacity directly by providing specialized training for personnel within the organization (Cohen et al., 1990, p. 137).

A firm's innovative ability is a function of how well the firm manages open-source learning and development. In other words, how well does the firm acquire, assimilate, and exploit information (Cohen et al., 1990)? The article states this System may involve "less structured" communication patterns and the use of "specialized actors" to complete these tasks. The article refers to these actors as gatekeepers (Cohen et al., 1990, p. 132).

Gatekeepers are the link between firms and their external environments and subunits within the firm. Gatekeepers actively monitor the environment, aiming to "develop a broad and active network of internal and external relationships" that the

organization can leverage to strengthen its innovative capacity (Cohen et al., 1990, p. 132). Once the gatekeeper identifies critical information external to the firm, they translate the information into a form understandable to the innovative actors within the firm (Cohen et al., p. 132). If the information is internal to the organization, the gatekeeper is the conduit to facilitate communication between the relevant subunits (Cohen et al., p. 132).

The role of the innovative actor is to develop innovative solutions to exploit the information available to them. The article explains innovative activity is best carried out by the operators with the most knowledge of the issue (Cohen et al., 1990, p. 135).

The team illustrates their point using a quote from Vyssotsky in his 1977 argument to establish Bell Labs:

For research and development to yield effective results for Bell System, it has to be done by ... creative people who understand as much as they possibly can about the technical state of the art, and about Bell System and what System's problems are. The R&D people must be free to think up new approaches, and they must also be closely coupled to the problems and challenges where innovation is needed. (Cohen et al., 1990, p. 135)

The article states: “[t]he ability to assimilate information is a function of the richness of the pre-existing knowledge structure ... learning is cumulative, and learning performance is greatest when the object of learning is related to what is already known” (Cohen et al., 1990, p. 131). Supporting the idea that innovative activity is best carried out by those closest to the “point-of-need” or the operators that have the most knowledge of the issue.

Cohen and Levinthal's article on absorptive capacity provides a valuable framework for understanding how firms can remain innovative in dynamic markets. The report emphasizes the importance of individual and organizational capabilities in assimilating and exploiting new information. Gatekeepers are crucial in monitoring the external and internal environment and translating critical information into understandable forms for innovative actors within the firm. The innovative actor's role is to develop creative solutions to exploit the available information. The article highlights the importance of cumulative learning and the richness of pre-existing knowledge structures in driving

innovative activity. Ultimately, a firm's ability to manage open-source learning and development and respond effectively to new developments in the market is critical to maintaining its competitive advantage.

C. INNOVATION WITHIN THE DOD

The need for innovative ideas within the U.S. DOD has increased significantly due to resource constraints and growing adversarial competition (Hagel, 2014, pp 2). The National Defense Authorization Act (NDAA) for fiscal years 2018 and 2019 highlights the changing nature of the security landscape. It emphasizes the need for more significant investment in emerging technologies, including artificial intelligence, cyber security, and unmanned systems. In this context, the budget for national security in 2019 was \$716 billion, representing a \$74 billion increase from the previous year (National Defense Authorization Act for Fiscal Year 2019, 2018). This significant budget increase indicates the urgency of addressing the DOD's challenges. It underscores the importance of innovation to maintain U.S. national security in a rapidly evolving global landscape.

The Defense Innovation Unit's (DIU) website provides ample information on the mission of DIU. The agency is a notable addition to the changing DOD ecosystem and is crucial in addressing emerging technological threats. Established in 2018, DIU has the distinct purpose of closing the innovation gap between the DOD and the commercial innovation hubs of the country. "DIU is the only DOD organization focused exclusively on fielding and scaling commercial technology across the U.S. military at commercial speeds" (DIU, n.d). DIU's mission includes "accelerating the adoption of commercial technology, transforming military capacity and capability, and strengthening the national security innovation base" (DIU, n.d). DIU specializes in six segments where commercial technology is at the cutting edge (energy, artificial intelligence, cyber, space, human systems, and autonomy) to ensure an accelerated entry into the DOD. In the traditional process, awarding a contract to create a prototype can take 18 months. DIU strives to accomplish this within 90 days using a non-traditional approach. Mike Brown, director of the Defense Innovation Unit (DIU) from 2018–2022, has provided ample comments emphasizing the elements the DOD must advance to enable innovation at a larger scale.

His remarks revolve around the various systems restricting the DOD's ability to adapt commercial innovations quickly. The systems that Director Brown discusses include the requirements determination process, the planning programming budgeting, and execution (PPBE) process, and the Federal Acquisition Regulation (Center for a New American Security, 2022).

Innovation is crucial for the U.S. DOD to address emerging technological threats and maintain national security in a rapidly evolving global landscape. The increasing budget for national security and the changing nature of the security landscape underscores the importance of innovation. The Defense Innovation Unit (DIU) is a notable addition to the changing DOD ecosystem, focusing on fielding and scaling commercial technology across the U.S. military at commercial speeds. DIU's non-traditional approach enables an accelerated entry of cutting-edge commercial technology into the DOD. However, bureaucratic challenges such as the requirements determination process, the planning programming budgeting, and execution (PPBE) process, and the Federal Acquisition Regulation still restrict the DOD's ability to adapt commercial innovations quickly. Addressing these challenges will enable innovation at a larger scale and enhance the DOD's ability to maintain national security in a rapidly changing global landscape.

1. Planning, Programming, Budgeting, and Execution

This section will analyze each stage of the Planning, Programming, Budgeting, and Execution (PPBE) process, including the historically troublesome budget enactment portion, to extract considerations transferable to a bottom-up innovation process. This analysis will provide sufficient reason for a bottom-up innovation model to work within the compounds of approved budgets. Although this places financial limits on projects, a bottom-up innovation model needs to be agile and relatively inexpensive if it is to be a complement to the top-down system.

Philip Candreva explores the particulars of defense budgeting in his book, where Mr. Candreva presents public budgeting as an instrument of public policy and an important tool to assert the role of Congress in a representative democracy. Candreva explains the nation's process when budgeting for defense. His explanation includes the overarching

federal and defense-specific budgeting processes, the PPBE. The PPBE is nested within the overarching congressional budgeting process. Because of this, the PPBE would be best dubbed PPBEE, where the additional “E” represents the political legitimization process and enactment by Congress before execution (Candрева, 2017). The PPBE serves as a DOD decision support system with an emphasis on resource allocation to achieve strategic defense goals within fiscal constraints. The four stages in the system have a linear and sequential nature. However, they behave much like a cycle with overlapping influences on each other. Only programming and budgeting have start and finish points while planning and execution are continuously revised (Candрева, 2017).

a. Planning

The planning stage aims to create financially unconstrained programming objectives by identifying deficiencies between strategy and the capabilities necessary to achieve it. This stage strongly emphasizes strategy in a way that intercepts operational concepts and the forces’ capabilities and limitations (Candрева, 2017). Key planning documents express the approach to be analyzed. These documents include the National Security Strategy developed by the National Security Council. The National Defense Strategy published by the DOD. The National Military Strategy, published by the Joint Chiefs of Staff and the Family of Joint Operations Concepts (JOpsC), describes the nature of joint operations into the future. A conceptual framework describing futuristic joint military operations in the medium to long term (approximately 8–20 years) is found in JOpsC (Candрева, 2017). These concepts provide a basis for experimentation and development of future military capabilities that feed into the requirements determination and acquisition processes (Candрева, 2017). Strategy is developed with a vision of the future and is subject to miscalculation and surprise. Therefore, strategy analysis can impact the effectiveness of capabilities that take years to develop, produce, and field. In this stage, strategy analysis has a similar context to mission analysis at the operational and tactical levels.

b. Programming

The goal of the programming stage is resource allocation through a mid-range timeline guided by the Fiscal Year Defense Plan (FYDP) across five years to achieve the various goals and objectives created in the planning stage. Programming provisionally allocates resources through an iterative evaluation process that sends early budget signals subject to further fiscal constraint in the follow-on budget stage. The decisions in this stage comprise the gist of the DOD's resource allocation effort, which is influenced by the Secretary of Defense's programming guidance and further constrained by the financial guidance provided by the Office of Management and Budget. The goals identified in the programming guidance are generally broader than the limits provided in the fiscal budget guidance. This stage differs from the previous in that planning is resource-informed programming resource-constrained (Candrea, 2017). Programming is to the strategic level what course of action (COA) development, COA Analysis, and COA selection are to the operational and tactical levels; both serve as a decision-making process for resource allocation.

c. Budgeting

The goal of the budgeting stage is to justify the programming decisions made in the previous stage. The major command formulates and submits its budget request to its corresponding service staff through a formulation and review format to justify the budget. This submission starts the review process to ensure the formulation is proper, accurate, and executable. Budget reviews evaluate program plan factors, including price, schedule, executability, appropriation, and consistency. In financial terms, the budget expresses the DOD's plan to accomplish its objectives (Candrea, 2017). As the Fiscal Year Defense Plan progresses from the programming stage to the budgeting stage, it is more common for the availability of money to reduce. Therefore, financial constraints increase during the budgeting stage resulting in requirements that exceed resources (Candrea, 2017). These circumstances force programmers to seek more resources, reduce requirements, increase efficiency, or simply accept the risk that underfunding a program presents. Budgeting at the strategic level is significantly more bureaucratic due to the multiple reviews that occur

at various levels until it reaches Congress. It is important to note that the DOD merely requests a budget. Congress has authority over the nation's purse and provides the final budget. Budgeting is a request for authority to obligate the government financially. Enactment of the budget grants the authority, and execution of the budget is exercising that authority (Candrea, 2017). Compared to the strategic level, the operational and tactical level has a notable advantage when budgeting for an objective. It can reallocate funds supported by limited reprogramming without returning to the congressional budget process.

d. Budget Enactment

The key to developing an agile bottom-up DOD innovation system is avoiding or minimizing the bureaucratic characteristics found in the top-down approach. For insight into one of the most bureaucratic characteristics of the top-down DOD system, one must step out of the PPBE process and into the congressional budget process. As previously mentioned, the budgeting stage crosses paths with the overall congressional budget process. As depicted in Figure 3, this intersection is the silent E in the PPB(E)E, as observed by Phil Candrea. This subsection will analyze some of the political difficulties surrounding the enactment of a budget.

The congressional budget process used by the Federal government today is unfit for expediency in its current form. It is also one of the reasons for recurring late authorizations and appropriations bills during recent decades. The process fails to account for political gridlock and relies more on political will than a systematic budget formulation and appropriation approach.

What the process attempts to do in one year can be considered too much when the competing interests of each congressional representative become inflexible. When political will fails, the process lacks the framework to act as a backstop before defaulting to continuing resolutions and government shutdowns. Eventually, the government receives funding, thanks to the prevailing continuing resolution acts that serve as a funding bridge until Congress can pass appropriations bills. The Congressional process is deemed a failure by this approach.

Funding the government through Continuing Resolutions Acts is far from ideal and inserts much uncertainty into the government's execution of funds. This funding method disrupts programs, and initiatives are placed on hold or become limited while their funding is piecemealed. Continuing Resolutions Acts have a downside in that they rely on the priorities of the previous fiscal year, making it challenging to plan for the long term and hampering responsiveness to the dynamic defense demands.

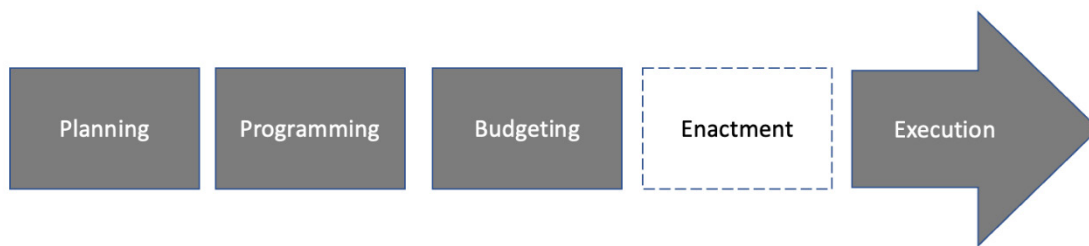


Figure 3. PPBE Process with Notional Enactment Stage

e. Execution

The goal of the execution stage is to administer the programs presented in the previous stage as approved or modified by Congress. It is at this stage that funds become available for programmatic execution. Execution of the plan (the budget) is closely related to the concept of execution of funds. Spending data is tracked and collected to inform future planning, programming, and budgeting iterations. The execution is supervised closely for compliance and transparency with the public. Execution data also feed metrics used to determine the accuracy of the budget. A significant milestone during the year of execution is the mid-year review that provides an opportunity for a degree reprogramming and shuffling of funds. As some programs under-execute, senior leaders within the DOD and the Office of the Secretary of Defense (OSD) make resource reallocation decisions. Reallocating under-executed funds offers opportunities to fund emergent requirements developed from the bottom up.

The PPBE process is crucial for the DOD to achieve its goals and objectives. The process involves four stages: planning, programming, budgeting, and Execution. The DOD

ensures that resources are allocated efficiently and effectively at each step to achieve its strategic objectives. The planning stage focuses on creating financially unconstrained programming objectives by identifying deficiencies between strategy and the capabilities necessary to achieve it. The programming stage is resource allocation through a mid-range timeline guided by the Fiscal Year Defense Plan (FYDP). The goal of the budgeting stage is to justify the programming decisions made in the previous stage. The budget execution stage is to administer the programs approved by Congress. However, the execution stage has a hidden step: navigating the political challenges of passing a budget. Understanding the PPBE process is essential for the DOD to develop an agile bottom-up innovation system that avoids or minimizes bureaucratic characteristics found in the top-down approach.

2. Bureaucracy in DOD Innovation

a. Contracting

This section will analyze the nature of DOD contracting and identify the implications we must consider. In an effective bottom-up model. This analysis will consider contracting as an essential function of innovation management, the advantages and disadvantages of outsourcing, the mission of DOD Contracting, for-profit and duty motives, competition, and other risk challenges.

Steve Cohen and Will Eimicke provide a practical and ethical view of government contracting. The authors present the best contracting management practices to ensure private contractors serve as an extension of the government for the public interest while preserving their core business functions. Contracts are an instrument for managing the DOD's activities in civilian hands and allowing it to extend its capability beyond the limits of its organic resources (Cohen et al. 2008). The book provides a simplified view of the complex contract management function that is vital as an enabler of innovation. Contracting is a specialty function, and it may appear as an obstacle to outsiders of the profession. However, many contracting challenges are unknown to those who are customers of the function. As many users desire a faster and less bureaucratic contracting process, they must carefully consider what changes they demand. Not all bureaucracy is harmful, especially when it concerns protection for the taxpayer.

(1) Importance of Contracting

Contracting is the last leg of the acquisition process and a significant force multiplier for commands effectively deploying this function. It is a critical part of any top-down or bottom-up innovation model that intends to leverage the resources of the industry. A bottom-up innovation model must have many sourcing options, which cannot occur without effective contracting. The model must facilitate the contracting function and procedurally integrate the requirements of the pre-award, award, and post-award phases to minimize the bottlenecks that tend to discourage contracting. To understand what effective contracting is, we must first understand the implications of contracting. Otherwise, expectation management can become complex and frustrate any contracting process. Arguably, contracting will be the most critical enabler of a bottom-up innovation model; this function can be an equalizer against the more centralized and resourceful top-down process if used correctly. The government reaches out to the industry for expertise and capacity it lacks through the contracting function. For this reason, it is a national priority that the industry is strong, diverse, and amenable to transacting with the DOD (White House, 2022).

(2) Outsourcing

Contracting to tap into the resources of private organizations is a modern requirement and an organizational tool (Cohen et al. 2008). The growing importance of contracting as an organizational tool is due to a new trend toward outsourcing. This trend is part of a new era that is unlikely to reverse due to the increased technical, economic, and social complexities that characterize it (Cohen et al., 2008). Simply put, the public expects more from the government than ever. Elected officials take on many responsibilities that demand expertise and focused attention beyond their capabilities. Bureaucracies are an essential part of mitigating the deficiencies of elected officials. These governance demands presented by a complex and industrialized society have allowed bureaucracies to gain greater significance. The scope of government tasks has grown and become more complex and technical. The growth in complexity has occurred to a degree where professional managers are needed to lead narrowly focused bureaucracies (e.g., Secretary of Defense)

to remain responsive to the people's expectations in this complex environment (Cohen et al. 2008).

The increasing complexity of government has led to elected officials depending more on bureaucracies, which, in turn, have grown more reliant on private contractors to access the expertise needed to meet the public's expectations. However, this also creates opportunities for private contractors to exert undue influence over government decisions, a risk contract managers must consider when outsourcing (Cohen et al. 2008).

The decision to outsource, also known as the "make or buy decision" in the contracting profession, considers the potential risk to the government (Cohen et al. 2008). Within the pre-award phase of the contracting process, scrutiny by the contracting staff occurs. To avoid frustration, innovation managers must understand that contracting personnel will pay extra attention to three types of functions:

1. Critical Functions
2. Inherently Governmental Functions
3. Closely Related to Inherently Governmental Functions

Although elaborating on these functions is not the focus of this analysis, it is useful for innovation managers to understand if their contracting request falls into any of these three categories. This greater view of risk to the public's interest will provide realistic contracting expectations. Understanding the public's interest will be instrumental during experimentation phases where ethics such as tests involving humans may fall in line with inherently governmental functions.

Outsourcing will likely continue its growth trend, considering the quickly advancing technology in the commercial sector. Innovation managers need to increase the proficiency by which they engage in contracting. Otherwise, contracting will become a hurdle in the innovation process rather than an enabler.

(3) The Mission of DOD Contracting

Innovation managers who understand the nature of the contracting mission will be better planners and users of the service. In addition to employing the resources of private

industry, contracting agencies must align with the mission of the bureaucracy they serve. Government bureaucracies are accountable to elected officials who are ultimately responsible to the public. Therefore, the collective welfare and benefit of the tax-paying citizens or considerations for the public's best interest are at the core of the contracting mission. Maintaining the public's best interest as a core mission of contracting includes the preservation of representative democracy, transparency, impartiality, value, accountability, ethics, morality, and performance, among others. Officials and lawmakers integrate these concepts into law, federal acquisition regulations, and bodies of ethics. Adherence to the public interest has historically caused government contracting to be bureaucratic, sensitive, and sometimes a bottleneck in the acquisition process. If not careful, a command can accomplish its mission to the detriment of the public interest. The infamous Fat Leonard scandal with the Navy and the Air Force case of Darleen Druyun, who inflated contracts to benefit Boeing, her future employer, are examples of accomplishing the mission at the cost of public interest. The enforcement of proper contracting practices is a guard against intentional and accidental corruption caused by incompetence. Corruption is one of the risks of outsourcing, significantly when the pace or complexity of outsourcing exceeds the contracting workforce's training, education, and capacity. The discrepancy between the speed or complexity of outsourcing and the ability of the contracting workforce causes vulnerabilities in the contracting process that contractors can exploit at the expense of the public's interest. The acquisition system has high expectations for contracting managers. Contracting managers must possess a heightened awareness and increased sensitivity to unethical behavior (Cohen et al., 2008).

Common examples of unethical behavior that occurs in contracting transactions are:

- Use of public position for private gain.
- Contract advisors with conflicts of interest participate in the bidding process.
- Bribes and gifts.

- Awarding contracts to family and friends.
- Awarding contracts to political donors.
- Competitors collude to fix competition.
- Awarding contracts in exchange for personal favors (Cohen et al. 2008).

(4) Duty vs. Profit

Those comparing government and private practice insinuate that government must follow the commercial approach to achieve equivalent efficiency. However, those comparisons are often misinformed and are not an “apples-to-apples” comparison. Contracting for government purposes significantly differs from commercial purposes, as the *government and industry have* different motivations. Private businesses are interested in profit maximization, and government organizations are mission and duty-driven. The two cultures have different perceptions of wealth. For-profit organizations have a favorable view of wealth, while government organizations view it suspiciously. The differing opinions of wealth combined with the missions of each can cause a clash of cultures as each side pursues different interests.

Furthermore, each side measures success differently, leading to incentives and measures of success that can be in opposition. Without sufficient contracting competency, the interest of profit can take priority over the government’s mission. Strong contract management ensures the public’s best interest is a priority, as each side with its own culture can cause misunderstandings and unclear expectations (Cohen et al. 2008).

(5) Competition

As a buyer, the government benefits from seller competition to obtain the best value for the taxpayer. When outsourcing, the government encourages competition and demands it, with some exceptions. However, there are some challenges in ensuring competition. Fair and open competition requirements in government contracting can be cumbersome compared to commercial practice options. Small businesses with fewer resources may find engaging in the contracting process challenging due to the bureaucracy involved in fair and

open competition, which can discourage potential sellers from participating in defense contracting (Schilling, 2017).

Furthermore, maintaining a robust commercial base can be difficult if the government contracting experience is negative. A negative experience results from perceptions of fairness, difficulty navigating the process, or repeated failure to earn a contract (Schilling, 2017). Unlike government contracting, no law requires a commercial buyer to base the organization's sourcing selection on an equitable process. A commercial buyer is not required to justify a source selection to the public and can decide based on anything, including relationships. In commercial practice, sellers look to gain a competitive edge to differentiate from competitors (Blank, 2013). Developing favorable relationships between buyers and sellers is a legal way to attain an edge over competitors. Enhancing commercial relationships through social interaction includes entangling friendships, joint extracurricular activities, exchanging gifts, trading favors, and much more. However, the law does not permit a government administrator to advance a relationship with contractors by such impartial conduct. The higher moral standards placed on government administrators are another example of how government contracting is culturally different from the best practices of a commercial environment.

(6) Other Risk Challenges

Exercising Government Control Over Contractor Networks: Among the advantages that contracting provides a command is the ability to develop a capable network of outside providers. However, capturing this advantage presents the challenge of exercising government control over organizations outside the chain of command. Private contractors are not subordinates and are subject to the UCMJ only to a limited extent. Despite this, government administrators must manage private contractors. When commands outsource regularly, they transition from the internal management of personnel to the external administration of organizations in a network. Networks are different structurally and culturally from government bureaucracies. The differences in structure and culture require contract managers to be flexible and versatile enough to operate in two environments: Internal and external to the government (Cohen et al. 2008).

Pricing for Commercial Items: The DOD has expanded the definition of a commercial item. The broader definition often makes it difficult to obtain cost and pricing data or certified cost and pricing data for commercial items. Even if a “commercial item” is no longer justifiably classified as such, the system will still regard items that were purchased commercially in the past as “commercial items.” The problem is that some items are not commercial enough for a contracting officer to determine a fair and reasonable price when negotiating the contract (R. Rendon, class notes, November 14, 2022).

Other Transactional Authority (OT): Many contracting professionals view OT as the solution to many bureaucratic burdens in government contracting. The problem with OT is that it is not based on the Federal Acquisition Regulation and has fewer internal controls. OT is not structured enough and can cause avoidable risk exposure. Contracting staff must understand how to navigate the FAR in a way that leverages the broad flexibility that it provides. No data shows OT offers a better path than FAR-based contracting (R. Rendon, class notes, November 14, 2022). Figure 4 depicts the majority of the various contracting paths with FAR-based options.

Effective contracting is a critical enabler of innovation and a vital function for any bottom-up innovation model that intends to leverage the resources of the industry. Outsourcing has become a modern requirement and an organizational tool that allows the government to tap into the expertise of private organizations. However, it also creates opportunities for private contractors to exert undue influence over government decisions, posing a risk that contract managers must consider. The mission of DOD contracting must align with the collective welfare and benefit of the tax-paying citizens and the public’s best interest. Innovation managers must understand the contracting process and the implications of outsourcing to effectively engage in contracting and ensure that contracting is an enabler rather than a hurdle in the innovation process. Ultimately, contracting is a specialty function essential to the success of the DOD and the government’s ability to access the expertise and capacity it lacks through the contracting function.

b. Federal Acquisitions Regulations

Figure 4 shows that the Federal Acquisition Regulation (FAR) and the Other Transaction (OT) Guide provide the legal framework to govern DOD contracting transactions. The FAR provides a framework for contracts to comply with federal policy in various circumstances, including cost accounting standards for contracts above \$15 million found in FAR part 30 (Federal Acquisition Regulation (2023)). Other Transaction (OT) agreements offer more straightforward and faster contracting procedures than traditional methods, reducing some bureaucratic hurdles faced under the Federal Acquisition Regulation (FAR). However, OT agreements also limit the contractors' rights to protest under FAR part 33 (Federal Acquisition Regulation (2023)). The FAR also contains points of interest to federal policy, such as requirements for full and open competition, sole sourcing, and social agendas. Historically, the complexity of the FAR has acted as a barrier to entry for less sophisticated entities, particularly small businesses essential to national security (Schilling, 2017). Start-ups and small businesses are essential sources of innovation for the economy and the DOD (Blank, 2020). Although contracts awarded to small businesses increased from 2014 to 2020 (SBA, 2020), questions remain about the continued barriers to the innovation base (Schilling et al. 2017). DOD contracts are subject to public and congressional scrutiny.

Effective government contracting is critical to the innovation process regarding force multiplication. To ensure success, we must integrate the pre-award, award, and post-award phases and involve subject matter experts to ensure contractor accountability. Managers have no authority to treat contractors as subordinates but must manage them effectively. It is essential to consider all options, including FAR-based and OT options, and to avoid bias towards OT. Finally, it is crucial to circumvent contracting hurdles only when the public interest can be protected.

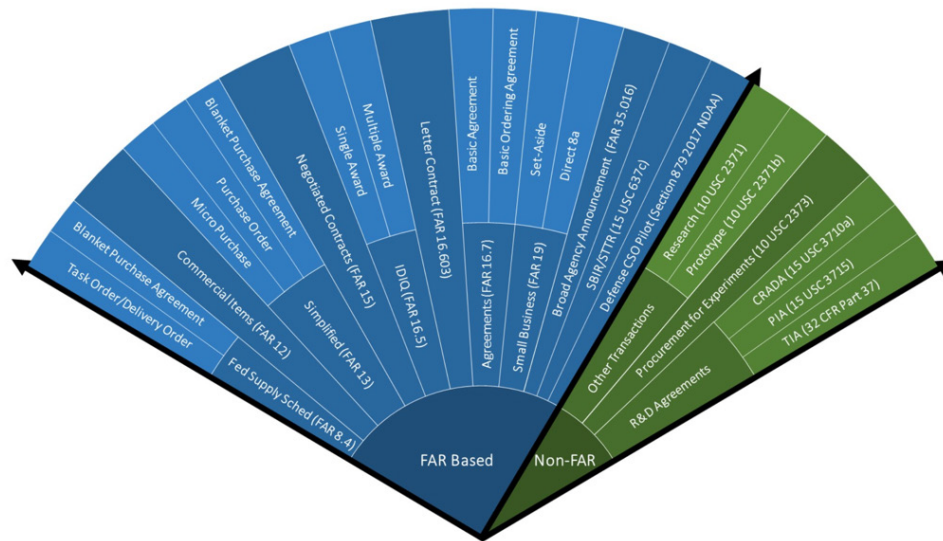


Figure 4. Contracting Cone. Source: Adaptive Acquisition Framework (n.d.).

c. *Management of Defense Acquisition Projects*

Rene Rendon and Keith Snider provide an overview of the functions critical to managing defense acquisition. The authors bring forth a wholesome view of organizational considerations, including dealings with the defense industrial base. The book targets an audience of students and practitioners who must perform within the complex multidisciplinary activities that permeate defense acquisitions. The book is written with a broad sense of the principles and considers the potential for policy change. The lessons discussed in the book will maintain relevancy even during policy change. This long-term guide is useful for navigating the various disciplines practitioners must integrate.

Figure 5 represents the overlaps of three major systems and processes, the Joint Capabilities Integration and Development System (JCIDS), the Planning Programming, Budgeting, and Execution (PPBE) Process, and the Defense Acquisition System. Together, they comprise the DOD resource management model used to allocate resources. Note that this model expresses a strategic context with at least a four-year outlook. Critics who accuse the process of being overly bureaucratic overlook the strengths of this model. These strengths include the following:

- A systematic allocation of over \$700 billion annually (FY 2022) while limiting duplication of effort across the various DOD.
- Supports long-term strategic requirements planning.
- It enables congressional representatives' control over the nation's purse and supports transparency on public spending.
- Separating the planning, budgeting, and execution functions prevents a concentration of power that can foster fraud, waste, and abuse.

These aspects, although bureaucratic, are critical to representative democracy and to upholding the public's trust in government. The nature of this model is peculiar to the highest levels of bureaucracy. It does not bring the same utility when conducting projects at the level with timeframes under two years. The year of execution will generally enable projects of such short duration, which is only a subset of what is in this model. Although short-term, bottom-up innovation projects will need to integrate a separation of power in the requirements generation, financial obligation, and financial execution, it is possible to accomplish this in a less cumbersome way.



Figure 5. Resource Management Triad. Source: AcqNotes (2022).

The process in Figure 6 depicts the procedural controls used to reduce risk in major acquisitions. Without these controls, the amount of waste can be significant. The process follows a series of reviews and decision points within 5 phases and three major milestones. The assessments become more complex and require higher-ranking approval to advance past the gatekeeping milestones as the cost of the acquisition project increases. Although this process is inherently bureaucratic when used in high-dollar projects, high levels of bureaucracy in low-dollar projects may be unnecessary. It is possible, in principle, to replicate the controls of this process in low-dollar, low-risk projects where the level of bureaucracy used is appropriate to the size of the dollar amount. The opportunities to abandon the project that the milestones provide are equally valuable for a major acquisition than a minor one. When used in a significant capability context, the disadvantage of this process is the time it takes to engage every decision-maker. Conversely, expediting this process is possible in a minor acquisition, where all decision-makers can meet within a one-day notice. The major capability acquisition process has a practical framework that allows the DOD to conduct innovative acquisitions in lower echelons of command.

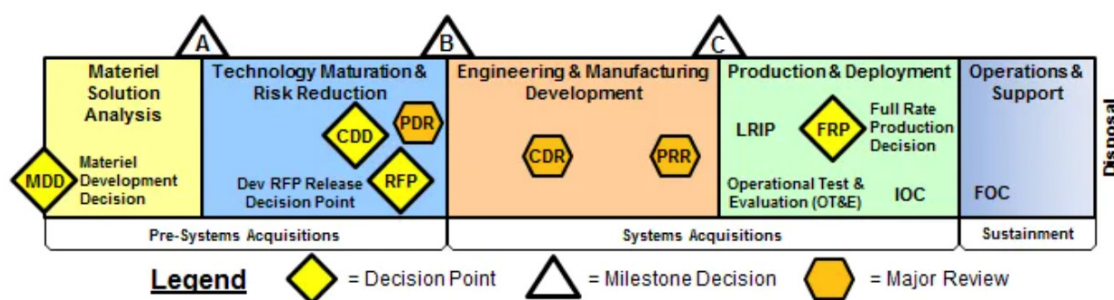


Figure 6. Acquisition Process Milestones. Source: AcqNotes (2022).

Rene Rendon and Keith Snider's book provides valuable insights into the critical functions of managing defense acquisition. The authors' focus on organizational considerations and the defense industrial base offers a comprehensive overview for students and practitioners navigating the complex multidisciplinary activities involved in defense acquisitions. The book's broad sense of principles and potential for policy change ensure that the lessons discussed remain relevant. Moreover, although bureaucratic, the

DOD's resource management model and acquisition process milestones are essential to uphold transparency, prevent fraud, and support representative democracy. These processes provide a practical framework for conducting innovative acquisitions at various levels of command. Thus, the book is a valuable resource for practitioners seeking to integrate multiple disciplines and navigate the intricacies of defense acquisition effectively.

D. CHAPTER II SUMMARY

This chapter provides an overview of the importance of innovation for maintaining national security in the face of near-peer competition. Dr. William Roper, Eric Schmidt, and the OUSD(A&S) emphasize the need for an agile and efficient acquisition system to expedite the development and deployment of new technology. Joseph Schumpeter's innovation theory of entrepreneurship, Steve Blank's emphasis on a culture of experimentation and continuous learning, Robert Burgelman's article on corporate entrepreneurship, Bennett's analysis of the challenges that companies face in their efforts to innovate successfully, and Cohen and Levinthal's article on absorptive capacity provide valuable perspectives on innovation and the role of entrepreneurs in driving it. The chapter also highlights the challenges faced by the DOD, including bureaucratic hurdles and contracting risks, in adapting commercial innovations quickly. The study identifies effective contracting as a critical enabler of innovation and a vital function for any bottom-up innovation model.

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III. METHODOLOGY

A. INTRODUCTION

The methodology for this thesis aimed to answer the question, “What key factors from small and medium-sized enterprises could be integrated into an organizational model to enable bottom-up innovation among naval O-5 level commands?” We conducted our research in three parts, each with a distinct objective.

Firstly, we conducted a meta-narrative analysis of the literature on innovation in large bureaucratic organizations. Secondly, we analyzed the bureaucratic challenges to rapid innovation in the DOD. Finally, in the third part of our research, we synthesized the information from the previous two steps to develop three synthesis charts incorporating the key factors that enable rapid innovation in large bureaucratic organizations.

Although the core theme of this study was innovation, it was essential to consider peripheral factors that influence innovation in a national defense context, such as budget constraints and resource allocation, political climate and government policies, organizational culture and resistance to change, technological advancements and obsolescence, human capital development and training, intellectual property rights and regulations, risk aversion and fear of failure, contracting and procurement practices, inter-agency collaboration and coordination, public perception and accountability. We researched each factor individually to understand the core topic holistically. Our analysis revealed that an agile and flexible structure is essential for rapid innovation, where small teams of stakeholders can work quickly and pivot easily. We found that small and medium-sized enterprises, similar in size and structure to O-5 level naval commands, exhibit these qualities in the commercial sector. By synthesizing our research, we conceptualized the similarities and differences that justify a change model tailor-fitted for the O-5 level commands.

Although we describe each part of our research method individually, it was an iterative process that involved several returns to each step. This approach allowed us to

refine our research objectives and methodologies as we progressed, ensuring our research was comprehensive.

B. META-NARRATIVE APPROACH TO LITERATURE REVIEW

Our exploration of innovation in large bureaucratic organizations involved a meta-narrative analysis that began with creating a conceptual map of the current innovation paths within the DOD acquisition system. This process involved identifying the “storylines” or “narratives” that emerged from the literature and the underlying concepts and theories that linked them. Through this approach, we gained insight into the interdependencies and challenges of the DOD innovation ecosystem and how they influence each other. This map guided our systematic search of academic databases, including EBSCO HOST, JSTOR, the Dudley Knox Library catalog, and Google Scholar, using a range of search terms related to innovation in large organizations and the peripheral factors outlined above, as per the steps outlined in Greenhalgh et al. (2005, p. 427). Our search identified 216 articles we analyzed to develop a theoretical understanding of innovation in large bureaucratic organizations. We then expanded our search to include organizations within the DOD networks dedicated to developing new technology and innovative programs and systems. We reviewed the innovation process of commercial enterprises, starting with Steve Blank’s ideas on innovation, and included examples of small businesses that developed products to solve a need for the DOD.

To further explore the topic, we conducted a semi-systematic literature review to investigate the DOD innovation ecosystem, specifically the three general areas of the acquisition system: 1) The requirements determination process, 2) The PPBE, and 3) The acquisition regulations. We searched academic databases, including EBSCO HOST, JSTOR, the Dudley Knox Library catalog, and Google Scholar, using various search terms related to those topics, resulting in the identification of 154 documents.

C. SYNTHESIS

We created a table with sources in the rows and themes or ideas in the columns to synthesize the information from our meta-narrative analysis. We entered relevant text from each source into the corresponding cell. We searched for patterns and connections between

sources and themes, grouped related themes, and merged similar or overlapping ones. Ultimately, we compiled a summary table listing the key themes and supporting evidence from sources.

In our search for foundational elements for a bottom-up innovation model, we identified 45 key considerations, some with overlapping values, and narrowed the list down to 22. Our analysis included portions of the literature relevant to the top-down innovation process, which contrasted with the bottom-up approach. This approach complemented or drew from the top-down process to avoid leaving our model ill-informed and shortsighted.

We grouped the key considerations into three categories crucial to innovation: systems, structure, and culture, following Bennett and Parks' recommendations found in their research published in 2015. From that data, we generated three tables with a list of references supporting each concept.

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IV. FINDINGS

Innovation is critical to organizational success in today's rapidly evolving business landscape. Organizations must incorporate key systematic, structural, and cultural attributes into their bottom-up innovation model to foster innovation. This section explores the essential elements a DOD bottom-up innovation model must possess to enable successful innovation. These key considerations, identified from various experts and references, encompass agility, flexibility, autonomy, involvement of subject matter experts, utilization of the existing innovation ecosystem, and more. By integrating these elements, the DOD can establish a structured approach that matches the pace of innovation that small and medium-sized enterprises demonstrate and promotes innovation at the O-5 level naval commands. The following subsections delve into each of these considerations, highlighting their significance and the supporting evidence from experts in the field. By implementing these structural attributes, the DOD can cultivate a culture of innovation and empower its personnel to drive meaningful and impactful change.

A. SYSTEMS

- (1) Incorporate analysis of potential threats and challenges, enabling the identification of gaps in the organization's capabilities and the discovery of opportunities to innovate and improve.

To ensure successful innovation, an organization's innovation model must incorporate a thorough analysis of potential threats and challenges, enabling the identification of gaps in the organization's capabilities and the discovery of opportunities to innovate and improve. This analysis should also include access to seek and identify early adopter opportunities and maintain market awareness for smart follower opportunities (Anthony et al., 2006). Additionally, the organization needs access to venues and platforms showcasing undiscovered innovations (Bluestein, 2013). Geroski (2003) emphasizes the importance of staying vigilant and watching for changes in the market and technology landscape to remain competitive and innovative. By integrating these elements, an organization can create an innovation model that addresses potential challenges and takes advantage of opportunities to stay at the forefront of innovation.

- (2) Establish a framework for managing and testing ideas that allow for the collection, evaluation, and prioritization of ideas.

Organizations seeking to innovate must create a framework for managing and testing ideas to increase their chances of discovering new opportunities for growth and success (Bluestein, 2013). This involves establishing a system that allows for the collection, evaluation, and prioritization of ideas and allocating resources for their development, with input from all stakeholders (Bluestein, 2013). Burgelman's (1983) concept of internal corporate venturing (ICV) suggests that organizations should continuously experiment with new strategies and resource combinations to adapt to changing market conditions (Burgelman, 1983).

- (3) Simplify the decision-making process.

The decision-making processes around innovative projects must be simple and efficient. Burgelman (1983) states that complex decision-making processes can stifle innovation, reducing creativity and slower product development. Therefore, simplifying the decision-making process can facilitate innovation, increasing the speed of product development and reducing the time to market. Gourville (2006) supports this notion, highlighting that complexity in decision-making processes can increase resistance to change, causing innovation to falter. Bluestein (2013) further emphasizes the importance of simplification by discussing the need for clear communication in decision-making processes. Effective communication facilitates understanding and buy-in, leading to a more streamlined decision-making process. Blank (2011) also acknowledges the significance of a simplified decision-making process by noting that the involvement of too many stakeholders can lead to a slow and inefficient process. To successfully implement an innovation model, Gagnon and Van Remmen (2018) suggest simplifying the decision-making process to promote participation and encourage stakeholder engagement. Therefore, incorporating a simple decision-making process is crucial to creating an innovative culture, leading to increased efficiency, creativity, and success.

- (4) Establish an efficient communication channel that enables all stakeholders to communicate effectively.

An effective innovation model should incorporate an efficient communication channel to facilitate effective communication among stakeholders, including contractors, who should not be viewed as subordinates, but instead, they must be well-managed (Adner, 2006). Proper management of contractors is crucial to ensure a successful innovation model. The innovation model must also provide an environment that enables communication and encourages collaboration to generate innovative ideas (Bennett & Parks, 2015). Effective communication channels foster collaboration among stakeholders, helping to improve the flow of information and feedback between different departments. As highlighted by Cohen and Eimicke (2008), communication is essential to maintain momentum in the innovation process, which is critical for success. Therefore, organizations must establish effective communication channels encouraging active participation and idea-sharing to ensure a successful innovation model. Finally, as noted by Gholz and Sapolsky (2021), a successful innovation model requires leaders who can effectively communicate the innovation vision and foster a culture of innovation.

- (5) Allocate research and development resources toward generating incremental innovations that deliver value for customers and stakeholders.

To achieve sustainable innovation, organizations must allocate a percentage of their research and development resources toward generating incremental innovations that deliver value to customers and stakeholders. Adner (2006) highlights that this should be considered a requirement for any innovation model. To ensure successful innovation, it is also crucial to provide separate resources for non-standardized work (Bennett & Parks, 2015) and strategically support innovative internal activities (Blank, 2020). This approach enables organizations to create a portfolio of innovations that yield long-term benefits. As Cohen and Levinthal (1990) note, strategic investment in R&D activities leads to competitive advantage. Therefore, a well-defined innovation model that allocates resources effectively is essential for an organization's success (Gagnon & Van Remmen, 2018). According to Bluestein (2013), allocating around 70 percent of resources to incremental innovation that focuses on delivering value to customers and stakeholders while dedicating

30 percent to radical innovation that could create new markets or disrupt existing ones is a healthy split for innovation activity.

- (6) Incorporate existing models and utilize familiar organizational language to create a new framework for achieving rapid innovation.

To achieve rapid innovation, an innovation model must incorporate existing models and utilize familiar organizational language to create a new framework. According to Rendon and Snider (2019), using a structured approach and clear language helps ensure the innovation process is efficient and effective. Additionally, Bennett and Parks (2015) argue that incorporating existing models helps to build on past successes and avoid reinventing the wheel. Cohen et al. (2008) suggest that utilizing existing knowledge and resources can lead to faster and more effective innovation.

Similarly, Geerges (2022) notes that utilizing established practices and processes can help streamline innovation. Gagnon et al. also highlight the importance of using established procedures, language, and effective communication to create a successful innovation model. Incorporating existing models and utilizing familiar organizational language can help to create a new framework for achieving rapid innovation.

- (7) Reduce bureaucracy to achieve a bottom-up innovation model using the lean methodology to test ideas as efficiently as possible.

Organizations looking to develop a successful bottom-up innovation model must reduce bureaucracy and create an efficient process for testing ideas using the lean methodology Candreva, (2017). Leveraging other transaction authority (OTA) can incentivize contractors conducting prototyping to transition to production while ensuring compliance with 809 Panel recommendations to reduce risk aversion (OUSD[A&S], 2022). It is essential to procedurally integrate the requirements of the pre-award, award, and post-award phases and employ non-traditional contracting paths only when suitable (Bennett & Parks, 2015). However, avoiding a biased approach toward OTA is essential, as the organization should consider FAR-based and OTA options (Cohen & Eimicke, 2008). Organizations must ensure that the innovation model complies with regulations and guidelines while encouraging a culture of experimentation and risk-taking. By

incorporating these elements into the innovation model, organizations can create a framework that fosters bottom-up innovation while maintaining necessary compliance standards (Blank, 2020; Bluestein, 2013; Gagnon & Van Remmen, 2018; Rendon & Snider, 2019).

(8) Incorporate cost-saving concepts to minimize innovation costs.

Incorporating cost-saving concepts is essential to minimize innovation costs and maximize organizational value (Blank, 2011). An innovation model that integrates cost-saving measures enables organizations to allocate resources more efficiently while fostering a culture of innovation (Cohen & Eimicke, 2008). By implementing a cost-saving strategy, the organization can prioritize projects and investments that align with its goals and objectives, allowing for a more streamlined innovation process that maximizes the return on investment (Gholz & Sapolsky, 2021). Additionally, focusing on cost-saving concepts can help create a sustainable innovation model that can withstand economic downturns and market fluctuations (Hagel, 2014). To achieve this, organizations must be proactive in seeking innovative solutions that are both cost-effective and scalable (Hamre, 2016).

(9) Establish a system for managing risks.

Risk management is a critical aspect of the innovation process, as highlighted by various scholars. Adner (2006) argues that a comprehensive innovation strategy should account for the risks and uncertainties in the ecosystem where innovation occurs. Blank (2011) advocates for a lean startup approach that involves rigorous testing of assumptions to reduce risk. Anthony et al. (2006) also suggest that managing risk should be a key element of an innovation strategy. Bennett and Parks (2015) recommend examining organizational structures, systems, and culture to identify areas where innovation risks may arise. In addition, Cohen and Eimicke (2008) stress the importance of responsible contract management in mitigating risks associated with innovation, while Cohen and Levinthal (1990) propose the concept of “absorptive capacity” as a way to manage risk by building an organization’s capacity to absorb and apply new knowledge. De La Bruyère and Picarsic (2020) suggest using threat-informed acquisition to manage risk in innovation, while

Geroski (2003) examines how firms can enter new markets successfully by managing the risks involved. Finally, Gholz and Sapolsky (2021) emphasize balancing risk-taking with risk management to ensure successful innovation.

- (10) Establish a system for evaluating the success of innovative activities.

The references suggest that an innovation model must incorporate a system for evaluating the success of innovative activities. According to Adner (2006), organizations should match their innovation strategy to the innovation ecosystem and conduct evaluations to determine the effectiveness of the strategy. Anthony, Eyring, and Gibson (2006) argue that mapping the innovation strategy requires evaluation to track progress and identify areas for improvement. Bennett and Parks (2015) emphasize that when struggling to innovate, organizations should examine structure, systems, and culture, and the authors recommend conducting evaluations to identify potential barriers. Similarly, Burgelman (1983) suggests that evaluation should be performed at every stage of the innovation process to identify and overcome obstacles. Blank (2011) stresses the importance of continuous innovation and testing to identify successful products. Blank (2020) notes that the startup owner's manual should include a process for evaluating the product or service's success. These references suggest that evaluation is a critical component of any innovation model and is necessary to identify and correct deficiencies in the innovation process and achieve successful outcomes.

Table 1 presents the primary systemic factors to be considered.

Table 1. Key Systematic Considerations

Theme	Key Consideration	Supporting References
Idea Management	Establish a framework for managing and testing ideas that allow for the collection, evaluation, and prioritization of ideas.	Anthony et al. (2006) Blank (2011) Bluestein, (2013) Burgelman (1983) Cohen & Levinthal (1990) Gourville (2006) Rendon & Snider (2019)
	Simplify the decision-making process.	Blank (2011) Bluestein (2013, September) Burgelman (1983) Gagnon & Van Remmen (2018) Gourville (2006)
	Incorporate existing models and utilize familiar organizational language to create a new framework for achieving rapid innovation.	Bennett & Parks (2015) Cohen & Eimicke (2008) DIU (2022) Gagnon & Van Remmen (2018) Geerges (2022) Rendon & Snider (2019)
	Reduce bureaucracy to achieve a bottom-up innovation model that can use lean methodology to test ideas as efficiently as possible.	Bennett & Parks (2015) Blank (2020) Bluestein (2013) Candrea (2017) Cohen & Eimicke (2008) DIU (2022). Gagnon & Van Remmen (2018) OUSD(A&S) (2022) Rendon & Snider (2019)
	Establish an efficient communication channel should be established to enable all stakeholders to communicate with each other effectively.	Adner (2006) Bennett & Parks (2015) Blank (2011) Cohen & Eimicke (2008) Cohen & Levinthal (1990) Gholz & Sapolsky (2021)
Resource Allocation and Management	Allocate research and development resources towards generating incremental innovations that deliver value for customers and stakeholders as a mandatory requirement for the innovation model.	Adner (2006) Bennett & Parks (2015) Blank (2020) Bluestein (2013) Cohen & Levinthal (1990) Gagnon & Van Remmen (2018)
	Incorporate cost-saving concepts to minimize innovation costs.	Blank (2011) Cohen & Eimicke (2008) Gholz & Sapolsky (2021) Hagel, C. (2014)

Theme	Key Consideration	Supporting References
		Hamre (2016)
Threat Assessment and Risk Management	Incorporate analysis of potential threats and challenges, enabling the identification of gaps in the organization's capabilities and the discovery of opportunities to innovate and improve.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2011) Bluestein (2013) Cohen & Levinthal (1990) Geroski, Paul. (2003) Gholz & Sapolsky (2021)
	Establish a system for managing risks.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2011) Cohen and Levinthal (1990) Cohen & Eimicke (2008) de La Bruyère and Picarsic (2020) Geroski (2003) Gholz & Sapolsky (2021)
	Establish a system for evaluating the success of innovative activities.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2011) Blank (2020) Burgelman (1983)

B. STRUCTURE

- (1) Innovation teams must be structured in a manner that provides them with the agility and flexibility to swiftly change course until they discover the optimal path.

Organizations must possess the agility, flexibility, and ability to swiftly change course without significant repercussions until they discover the optimal path to be innovative. Several experts in the field support this argument. Blank (2020) asserts that startups must remain agile and flexible to pivot and adjust their strategies until they find the best path to success. Adner (2006) explains that companies must be willing to adapt their innovation strategies to changing market conditions. Similarly, Bennett and Parks (2015) argue that organizations must foster a culture of flexibility and agility to stay competitive. Gourville (2006) emphasizes the importance of flexibility in the face of

consumer preferences and changing market dynamics. Finally, Hamre (2016) highlights the need for organizations to embrace change and take calculated risks to drive innovation. The ability to adapt and change course swiftly is essential for organizational innovation, and it requires a flexible culture, agile processes, and a willingness to take risks.

- (2) Innovators should be given a temporary break from the routine bureaucracy and provided with dedicated resources for non-standardized work.

Bureaucracy can often hinder innovation by creating rigid structures and processes that do not allow flexibility or risk-taking. According to Bennett and Parks (2015), organizational structure, systems, and culture are key factors that influence an organization's ability to innovate. Bluestein (2013) also argues that the belief that bureaucracy and innovation can coexist is a myth. Blank (2021) takes it further and suggests that relying on "Innovation Heroes" to bypass bureaucracy signifies a dysfunctional organization. Burgelman (1983) notes that corporate entrepreneurship requires a different approach than traditional management, emphasizing flexibility and risk-taking. Hamre (2016) highlights how the decapitation of Pentagon innovation stifled creativity and led to bureaucratic inertia. Therefore, organizations must provide innovators with flexibility within the bureaucracy and the necessary resources to succeed. This includes creating a culture of innovation that encourages experimentation, providing funding and other resources to support innovative projects, and giving innovators the autonomy to explore new ideas without fear of failure. (Bennett & Parks, 2015; Blank, 2021; Bluestein, 2013; Burgelman, 1983; Hamre, 2016).

- (3) Innovation teams must involve subject matter experts.

Innovation teams must involve subject matter experts to succeed. Cohen and Eimicke (2008) argued that to implement innovation successfully, organizations must include experts who are well-versed in the technological and scientific aspects of the problem. Similarly, Adner (2006) emphasized that innovation teams should consist of individuals with diverse expertise to foster creativity and provide a broad range of perspectives. Anthony, Eyring, and Gibson (2006) stated that an innovation team should consist of individuals with various skills, including subject matter experts, to successfully

develop and implement new ideas. Additionally, Bennett and Parks (2015) emphasized the importance of having a team with diverse skills and backgrounds, including subject matter experts, to promote innovation. Blank and Dorf (2020) also pointed out that subject matter experts are crucial for identifying and understanding the problems that must be solved. In summary, the involvement of subject matter experts in innovation teams is essential for understanding and solving complex problems and promoting successful innovation.

- (4) The system must use those closest to the problem as the primary drivers of innovation.

Schumpeter (1934) highlighted entrepreneurship's importance as the innovation engine. Adner (2006) emphasized involving users and stakeholders in the innovation process to ensure the solution meets their needs. Bennett and Parks (2015) argued that involving frontline employees can lead to a more inclusive and democratic innovation process. Blank (2011) highlighted the importance of customer feedback in driving innovation. Cohen and Levinthal (1990) noted that innovation requires a firm to develop and maintain knowledge of the industry and its technological capabilities, often best achieved by those close to the problem. Finally, Gourville (2006) emphasized the importance of understanding the psychology of consumer behavior and focusing on customers' needs and wants to drive innovation. These references highlight the importance of involving those closest to the problem in driving innovation.

- (5) Middle level managers must be the selection mechanism for entrepreneurial actors and their projects.

Large bureaucratic organizations face challenges when attempting to foster innovation due to the rigid structures and systems that can stifle creativity and risk-taking. Middle-level managers can be crucial in such organizations as gatekeepers or selection mechanisms for innovative projects and entrepreneurial actors. These managers have the necessary experience and knowledge of the organization's culture and processes to identify and support promising projects while minimizing potential disruptions to the organization's operations. Research by Burgelman (1983), Adner (2006), Bennett and Parks (2015), Blank (2011), Blank and Dorf (2020), Cohen and Levinthal (1990), Gagnon

and Van Remmen (2018), Gholz and Sapolsky (2021), and Gourville (2006) all highlight the importance of middle-level managers in fostering innovation in large bureaucratic organizations. By empowering these managers to be the gatekeepers of innovative projects, organizations can create a culture that encourages experimentation and risk-taking while maintaining the necessary structure and order to operate effectively.

- (6) Connect to, integrate with, and effectively utilize the existing innovation ecosystem.

For an innovation model to be successful, it must be connected, integrated, and effectively utilize the existing innovation ecosystem, with innovation arms within the Military Services serving as potential IPT members and junction points (Wieser, 2020). By leveraging the existing ecosystem, the model can more effectively identify and pursue opportunities for innovation and improvement. Stakeholders must collaborate and communicate effectively to ensure the sharing of knowledge and expertise and the efficient utilization of resources. This approach also allows the model to build on the existing infrastructure and capabilities of the organization and avoid duplication of efforts. Additionally, it enables the model to identify potential partnerships and collaborations with external entities, such as academia and industry, to enhance innovation efforts further (Adner, 2006; Anthony et al., 2006; Bennett & Parks, 2015; Blank, 2020; Cohen & Levinthal, 1990; Gagnon & Van Remmen, 2018; Hamre, 2016).

- (7) Ensure fair and open competition where possible and of best interest to the public.

The DOD innovation model should prioritize fair and open competition whenever possible and in the public's best interest. Cohen and Eimicke (2008) highlight the role of responsible contract management in managing risks associated with innovation, emphasizing the importance of fair and open competition. Similarly, de La Bruyère and Picarsic (2020) discuss how threat-informed acquisition can manage risk in innovation by promoting fair and open competition. Gagnon and Van Remmen (2018) argue that the DOD should prioritize competition to drive innovation, as it encourages the best ideas to rise to the top. Hagel (2014) notes that open innovation and collaboration can help the DOD

stay ahead of technological advancements, while Hamre (2016) emphasizes the need for innovation in procurement processes. Finally, the U.S. House Select Committee on the Modernization of Congress (2021) has recommended reforms to the congressional budget and appropriations process to prioritize fair and open competition in government contracts. The DOD innovation model must prioritize fair and open competition to ensure that the best ideas are selected, and the public's interests are protected.

Table 2. presents the primary structural factors to be considered.

Table 2. Key Structural Considerations

Theme	Key Consideration	Supporting References
Leverage Collaboration and Expertise	Ensure fair and open competition where possible and of best interest to the public.	116th Cong. (2019) Cohen & Eimicke (2008) de La Bruyère & Picarsic(2020) Gagnon & Van Remmen (2018) Hagel, C. (2014) Hamre (2016)
	Connect to, integrate with, and effectively utilize the existing innovation ecosystem.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2020) Cohen & Levinthal (1990) Gagnon & Van Remmen (2018) Hamre (2016) Wieser, A. B. (2020)
	Middle level managers must be the selection mechanism for entrepreneurial actors and their projects.	Adner (2006) Bennett & Parks (2015) Blank (2011) Blank & Dorf (2020) Burgelman (1983) Cohen & Levinthal (1990) Gagnon & Van Remmen (2018) Gholz & Sapolsky (2021) Gourville (2006)
	Innovation teams must involve subject matter experts.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2011) Blank & Dorf (2020) Cohen & Eimicke (2008). Cohen & Levinthal (1990) Gallo (2011) Gholz & Sapolsky (2021) Gourville (2006)

Theme	Key Consideration	Supporting References
	Must be structured to use those closest to the problem as the primary drivers of innovation.	Adner (2006) Bennett & Parks (2015) Blank (2011) Cohen & Levinthal (1990) Gallo (2011) Gourville (2006). Schumpeter (1934).
Empower Innovators	Must possess the agility, flexibility, and the ability to swiftly change course without significant repercussions until the optimal path is discovered.	Adner (2006). Bennett & Parks (2015). Blank (2020) Blank & Dorf (2020). Gourville (2006). Hamre (2016)
	Innovators should be given a temporary break from the routine bureaucracy and provided with dedicated resources for non-standardized work.	Bennett & Parks (2015) Blank (2021) Bluestein (2013) Burgelman (1983) Hamre (2016) Jensen, B. (2016)

C. CULTURE

- (1) Organizations that want to foster innovation must create an environment where risk-taking is not only accepted but encouraged.

Organizations that want to foster innovation must create an environment where risk-taking is not only accepted but encouraged. According to Bennett and Parks (2015), to promote innovation, organizations must provide a safe space for their employees to explore new ideas and experiment without fearing failure. Blank (2011) also highlights the importance of an organization's culture in promoting risk-taking behavior. Organizations that do not create such an environment are more likely to stagnate, whereas those that do are more likely to succeed. In addition, the research of Cohen and Levinthal (1990) shows that risk-taking is an essential component of innovation and that organizations must embrace risk-taking if they want to be innovative. Schmidt (2018) also argues that innovative companies understand the importance of taking risks and that taking risks is a necessary part of the innovation process. Therefore, organizations that want to foster innovation must create an environment where risk-taking is accepted and encouraged.

- (2) The model must include an organizational learning model.

Innovation is not a one-time event but a continuous process that requires organizational learning to be successful. To foster an innovative culture, organizations must develop a corporate learning model that promotes knowledge sharing, experimentation, and learning from past experiences. According to Burgelman (1983), an effective innovation strategy involves a continuous cycle of trial and error that allows the organization to learn from its successes and failures. Cohen and Levinthal (1990) also emphasize the importance of organizational learning in innovation, suggesting that firms better at absorbing and utilizing knowledge will have a competitive advantage. Leonard-Barton (1992) highlights the role of knowledge management in innovation, implying that organizations must create processes and structures to facilitate knowledge sharing and learning. Tidd and Bessant (2019) also argue that organizations must develop a culture of experimentation and learning from failures to be successful in innovation. Bennett and Parks (2015) echo these sentiments, stating that innovative organization values learning and experimentation.

- (3) The model must include specialized training for individual involved in innovative activities.

Innovation is a complex process that requires creativity, knowledge of the domain, and the necessary skills to bring ideas to fruition. Therefore, organizations that wish to innovate must develop a model that includes specialized training for individuals involved in innovative activities. Cohen and Levinthal (1990) highlight the importance of training and learning in innovation. In their research, the authors argue the knowledge and skills of the individuals involved heavily influence innovative activities. Gallo (2011) also emphasizes the importance of training, stating that innovative organizations recognize that continuous learning and skill development are critical to maintaining a competitive advantage. Similarly, Gholz and Sapolsky (2021) suggest that specialized training is essential for organizations seeking to foster innovation. In conclusion, organizations wishing to innovate must invest in training and education to ensure their employees have the knowledge and skills to drive innovation.

- (4) Organizational culture must match the innovation strategy.

Organizational culture plays a critical role in determining the success of a company's innovation strategy. Adner (2006) argued that alignment between a company's culture and innovation strategy is essential to ensure that innovative ideas can be effectively generated, developed, and executed. Additionally, Anthony et al. (2006) suggest that a strong innovation culture can help companies to overcome internal resistance to change and establish a more proactive and entrepreneurial mindset. Furthermore, Bennett and Parks (2015) state that organizations prioritizing innovation and creating a culture that fosters creativity and risk-taking are more likely to achieve sustained growth and competitive advantage. In line with these perspectives, Blank (2011) and Blank and Dorf (2020) highlight the importance of establishing an innovation culture that values experimentation, learning, and collaboration to drive successful innovation outcomes. In summary, organizational culture must match the company's innovation strategy to effectively support and facilitate innovation efforts.

- (5) Create an environment that allows innovators to operate with a certain degree of autonomy.

To be successful, organizations must create an environment that fosters innovation, which is essential for their growth. Adner (2006) asserts that the environment in which an organization operates is a crucial determinant of innovation success. In particular, creating an environment that allows innovators to operate with a certain degree of autonomy is essential for innovation success. Anthony et al. (2006) reinforce this point. The authors argue companies must be willing to experiment and take risks to innovate. Bennett and Parks (2015) further suggest that organizational structure, systems, and culture can hinder innovation, highlighting the need for an environment that supports innovation. Blank (2011) contends that innovation requires a startup mentality, necessitating an environment that allows flexibility and autonomy. Burgelman (1983) argues that creating an environment that fosters corporate entrepreneurship and strategic management is essential for innovation success. Gholz and Sapolsky (2021) also suggest an innovative climate requires risk-taking. The writers argue innovators can only achieve this when they have the necessary autonomy and resources to succeed. Therefore, for organizations to be

innovative, those organizations must create an environment that allows innovators to operate independently.

Table 3. presents the primary cultural factors to be considered.

Table 3. Key Cultural Considerations

Key	Key Consideration	Supporting References
Alignment Culture and Strategy	Organizational culture must match the innovation strategy.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2011) Blank & Dorf (2020)
	Organizations that want to foster innovation must create an environment where risk-taking is not only accepted but encouraged.	Bennett & Parks (2015) Blank (2011) Burgelman (1983) Cohen & Levinthal (1990) Gallo (2011) Schmidt (2018)
	Create an environment that allows innovators to operate with a certain degree of autonomy.	Adner (2006) Anthony et al. (2006) Bennett & Parks (2015) Blank (2011) Burgelman (1983). Gholz & Sapolsky (2021) Jensen (2016)
Organizational Learning	The model must include an organizational learning model.	Burgelman (1983) Bennett & Parks (2015) Cohen & Levinthal (1990) Leonard-Barton (1992) Tidd & Bessant (2019)
	The model must include specialized training for individual involved in innovative activities.	Cohen & Levinthal (1990) Cohen & Eimicke (2008) Gallo (2011) Gholz & Sapolsky (2021) Hagel (2014) Hamre (2016)

V. CONCLUSION, RECOMMENDATIONS, AND AREAS FOR FUTURE STUDIES

A. CONCLUSION

Innovation within the DOD can be effectively fostered through a bottom-up approach that empowers individuals and teams to contribute innovative ideas. Several key factors must be considered to ensure the success of a bottom-up innovation model in the DOD.

Creating an environment that encourages risk-taking and experimentation is crucial. The DOD must provide a safe space for employees to explore new ideas without fear of failure. Contemporary researchers recommend embracing failure as a learning opportunity and supporting a culture that values risk-taking (Bennett & Parks, 2015; Blank, 2020; Cohen & Eimicke, 2008; Schmidt, 2018).

Organizational learning plays a vital role in the continuous process of innovation. The DOD should develop models facilitating knowledge sharing, experimentation, and learning from past experiences. Insights from Burgelman, Cohen and Levinthal, Leonard-Barton, Tidd and Bessant, and Bennett and Parks highlight the significance of organizational learning in fostering innovation and maintaining a competitive advantage.

Specialized training is a critical factor for the success of bottom-up innovation. The DOD should invest in training and education to equip individuals involved in innovative activities with the necessary skills and knowledge. Research by Cohen and Levinthal, Gallo, Gholz, and Sapolsky emphasizes the importance of specialized training in driving successful innovation outcomes.

Fourthly, aligning the organizational culture with the innovation strategy is essential. The DOD should cultivate an innovation culture that fosters creativity, risk-taking, and a proactive mindset. The works of Adner, Anthony et al., Bennett and Parks, Blank, and Blank and Dorf emphasize the significance of an innovation-supportive culture for sustained growth and competitive advantage.

Finally, creating an environment that allows innovators to operate with a certain degree of autonomy is critical. The DOD should encourage experimentation and risk-taking and provide resources and freedom to innovators. Insights from Adner, Anthony et al., Bennett and Parks, Blank, Burgelman, Gholz, and Sapolsky stress the importance of autonomy and the ability to take risks in driving successful innovation outcomes.

In summary, a successful bottom-up innovation model in the DOD requires creating an environment that encourages risk-taking, developing models for organizational learning, providing specialized training, aligning organizational culture with the innovation strategy, and allowing innovators to operate autonomously. By embracing these key factors, the DOD can foster a culture of innovation and unlock the full potential of its personnel to drive meaningful advancements in defense capabilities.

B. RECOMMENDATIONS FOR FUTURE STUDIES

This study has explored the essential elements required to establish a model for bottom-up innovation within the DOD. By examining existing research on fostering innovation in organizations, the study has highlighted the importance of encouraging risk-taking and experimentation, promoting organizational learning, providing specialized training, aligning organizational culture with innovation strategy, and allowing autonomy for innovators. These elements provide a foundation for building an effective bottom-up innovation model in the DOD. However, there are still areas that warrant further investigation for future studies. For example, future research could explore the challenges and barriers to implementing a bottom-up innovation model in a hierarchical and complex organization like the DOD. Additionally, exploring the impact of incorporating emerging technologies and methodologies, such as artificial intelligence and agile approaches, on the bottom-up innovation process in the DOD would be valuable. Further studies can contribute to the continuous refinement and improvement of bottom-up innovation models within the DOD, ultimately enhancing the organization's ability to drive innovation and adapt to evolving threats and opportunities.

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