Excerpt from the Proceedings

of the
Twentieth Annual
Acquisition Research Symposium

**Acquisition Research:
Creating Synergy for Informed Change**

May 10–11, 2023

Published: April 30, 2023

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
NAVAL POSTGRADUATE SCHOOL

The Innovation Paradox—Merging Process with Disruptive Thinking to Accelerate Capability Transition to the War Fighter Through the Educational Innovation Capstone Process

COL Raymond Jones, (USA Ret)—retired as a Colonel from the U.S. Army in 2012 and is a Professor of Practice within the Graduate School of Defense Management at the U.S. Naval Postgraduate School in Monterey, CA. He also serves as a Guest Lecturer for the IDARM Program within the Institute for Security Governance (ISG), Defense Security Cooperation Agency (DSCA). His last assignment in the Army was as the Deputy Program Executive Officer for the Joint Tactical Radio System (JTRS). Additionally, he served as the Military Deputy for the Director of Acquisition Resources and Analysis in the Office of the Under Secretary of Defense for Acquisition Technology and Logistics (USD(AT&L)), managed three Major Defense programs for the DoD in addition to his many operational and research and development assignments. He graduated from the U.S. Naval Test Pilot School in 1995 and is 1983 graduate of the United States Military Academy. He has a Bachelor of Science degree in Aerospace Engineering, a Master of Science Degree in Aeronautical Engineering from the Naval Postgraduate School, a Master's in Business Administration from Regis University, a Master's Degree in National Resource Strategy from the Industrial College of the Armed Forces and is currently a PhD candidate with the Graduate School of Information Sciences at the Naval Postgraduate School in Monterey California. [rdjone1@nps.edu]

Abstract

Innovation is the process of creating something new or improving an existing product, service, or process. In the national security environment, it is critical to ensuring operational and strategic overmatch against one's' adversaries. Without innovation in ideas and capabilities, nations lose their ability to outmaneuver their competitors and begin their ultimate decline into irrelevance on the world's stage. Innovation can take many forms. It can be the development of a new product or service intended to meet the needs of the end user or customer and It can also be the implementation of a new process that improves efficiency and productivity in an organization. Innovation can be incremental, such as small improvements to existing capabilities or services, or they can be disruptive, completely transforming an organization. Disruptive innovation tends to change the nature of warfare and are marked by paradigm shifts known as revolutions in military affairs.

Innovation is not without its challenges. It can be difficult to come up with new ideas, and even harder to turn those ideas into a successful product or service. It can also be challenging to manage the risks associated with innovation, such as the cost of research and development and the potential for failure. True innovation requires a strategy to transition the innovative idea into a usable capability that has a measurable impact of intended purpose. Therein lies the paradox of innovation. To realize true innovation, the curse of bureaucracy is necessary to allow the innovative thought and concept to move from an idea to an actionable capability. In effect, to transition an idea from concept across the "valley of death," a deliberate and sometimes slow and structured process is necessary to align all the competing interests that might otherwise crush the new idea, much like the immune system attacks a foreign object in one's body. Despite these challenges, innovation remains a critical element of progress and growth in society, business, and the military. It is the driving force behind many of the world's most successful institutions and has been responsible for some of the most significant technological advancements in human history.

This paper will address the fundamental problem that most new ideas have regarding transitioning from a "good idea" to becoming a viable capability in the hands of the user. The problem most militaries have is that the process of capabilities development tends to take too long, is too costly, and lacks the agility to allow for innovative and disruptive ideas to gain a

fold hold, once the acquisition process has started for specific needs of the warfighter. Additionally, many of the critical and disruptive ideas born in the "foxhole" tend to die in place for lack of a clear pathway out of the foxhole. I will seek to define these challenges and present a new pathway to successfully cross the valley of death, beyond the traditional six pathways defined in the Department of Defense 5000 instruction. While these pathways appear to provide a well-defined and deliberate approach to technology maturation and innovation, they lack the opportunity to tap into disruptive innovation rapidly and in a way that supports both government and industry. In essence the current methods of transitioning innovative ideas is simply not robust enough for the rapidly changing dynamics of the future national security environment and it is time to change the paradigm and embrace the innovation paradox.

The Valley of Death

Defense acquisition is the process through which the United States Department of Defense (DoD) acquires goods and services, including weapons, equipment, and technology, to support the nation's security and military operations. However, the defense acquisition process is often fraught with challenges that can impede its effectiveness and efficiency. A significant challenge facing defense acquisition is the sheer complexity of the process. The defense acquisition process involves a vast number of stakeholders, including the DoD, industry partners, Congress, and the public.
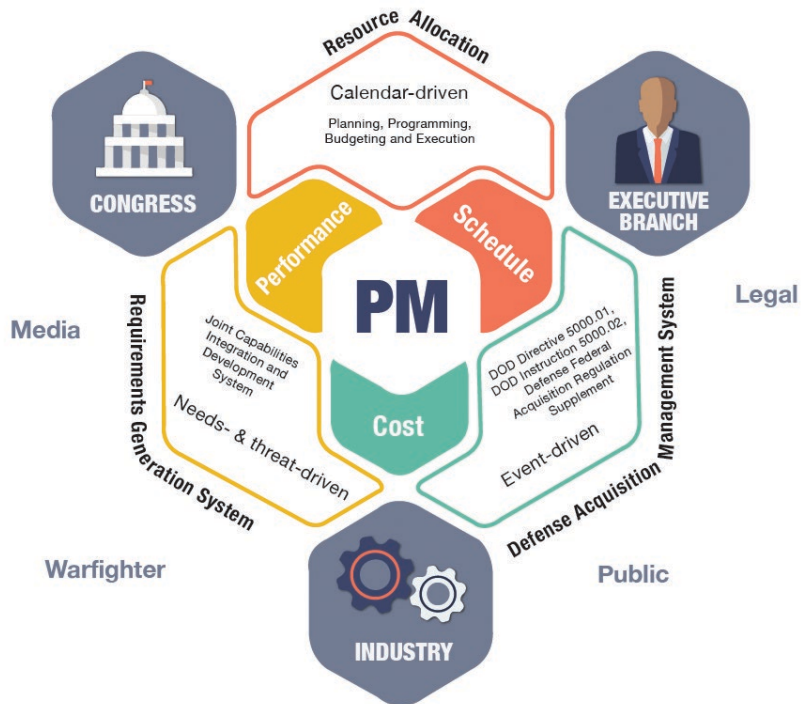

Figure 1. Defense Acquisition Stakeholder Environment

Army ALT Magazine (https://asc.army.mil/web/news-big-a-acquisition-a-primer/)

Each of these stakeholders has their own set of priorities, interests, and requirements, making it difficult to align everyone's goals and objectives. Furthermore, the defense acquisition process involves numerous regulations, procedures, and documentation requirements that can be time-consuming and burdensome.

The valley of death is the gap between the development of new technologies and their successful delivery to the end user or customer. This gap is often referred to as the "valley" because it represents a challenging period of uncertainty and risk for technology developers and investors. New ideas can enter the high-risk zone, as depicted in Figure 2, and quickly spiral below the point of no return and fall into the "valley of death." There needs to be an organized effort and well-defined path for the new technology or concept to stay above the point of no return and be able to transition into production and resource investment. The valley of death is particularly relevant in technology development initiatives where the pace of innovation is rapid and the time it takes for new ideas to gain traction can be slow. The gap between the initial development of a new technology and its successful operationalization can be vast, with many new technologies failing to make it through this difficult phase.
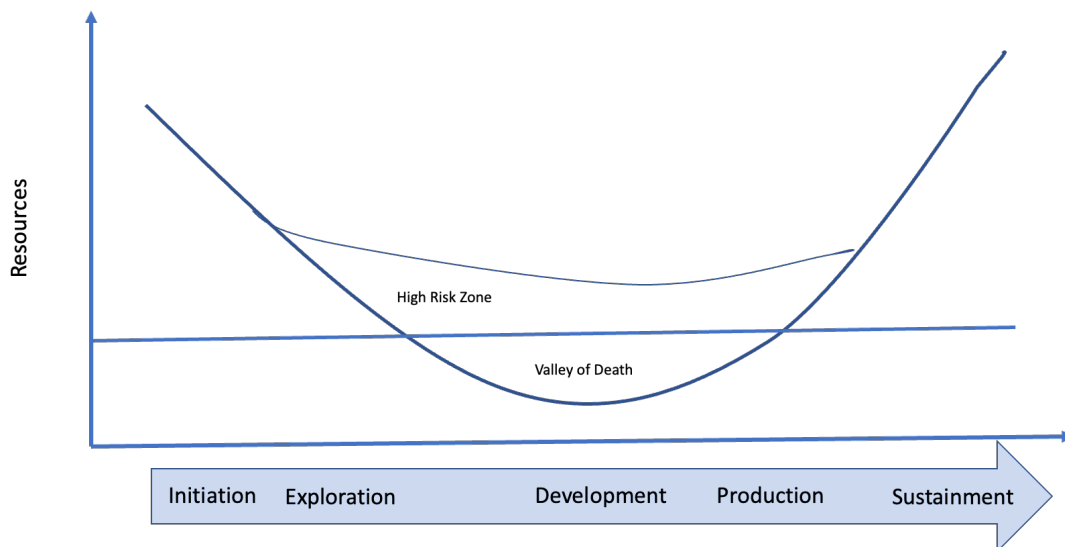

Figure 2. Technology Transition and the "Valley of Death"

There are several reasons why technology transitions fail to cross the Valley of Death. One reason is that new technologies are often untested, with limited data available to demonstrate their effectiveness or safety. This lack of data can make it difficult to make informed decisions about whether to continue to invest in a new technology. From a defense acquisition perspective, the failure to invest often reflects the lack of willingness of programs of record to recognize the value of emerging technologies as they relate to specified requirements. In essence program managers suffer from requirements myopia by failing to see how new innovative ideas align to existing requirements within their portfolios. Without a resource sponsor or investor, the technology idea falls into the infamous valley of death and fails to realize the full potential of innovation.

Current defense acquisition pathways do little to encourage innovation once a program is established and contracts are awarded. In fact, innovation is discouraged if is strays from the well-defined acquisition strategy and contract agreements established with industry. Deviation from the "plan" is seen as a distraction that violates a prescribed

performance baseline, particularly if the deviation comes from outside of the agreed upon contract relationships between the government and industry provider. In effect, once a strategy is approved, the baseline is agreed upon, and contracts are awarded, innovation stops. The plan is executed as prescribed with little introspective assessment of new ideas. New ideas bring risk and drive baseline variance with is a sure path to program failure. Therein lies the paradox. While innovation is born in an unconstrained environment of risk and experimentation, for new ideas to mature and evolve into real capability able to cross the valley of death, the same complex process of rules is the process that is necessary to facilitate the successful transition of innovative ideas that ultimately lead to innovation.

Change at the Margins

The defense acquisition process is often fraught with inefficiencies, delays, and cost overruns, which can impact the readiness and effectiveness of the military. Typically, the defense department seeks new ways to improve the process, and while the department has a significant success record in developing new and capable systems, many more potential opportunities are lost due to the arduousness of the process. Typical approaches that are used to improve a perceived process problem include:

1. **Streamline the procurement process**. The procurement process is often complicated and bureaucratic, leading to delays and increased costs. Streamlining the process can reduce the time and resources required to procure equipment and services, resulting in cost savings and improved readiness. This can be achieved by simplifying the procurement requirements, consolidating procurement efforts, and reducing paperwork and administrative burdens.

2. **Increase competition.** Competition is essential in any procurement process, and the defense acquisition process is no exception. Increased competition can lead to lower costs, improved quality, and better innovation. To increase competition, the government can promote the participation of small businesses and minority-owned businesses and encourage collaboration between industry and academia to foster innovation.

3. **Foster collaboration and communication.** Collaboration and communication between government and industry are crucial to the success of the acquisition process. By working together, they can identify potential risks, mitigate them early on, and find innovative solutions to procurement challenges. Regular communication and collaboration between government and industry can also help identify best practices, reduce redundancies, and streamline the procurement process.

4. **Invest in technology and data analytics.** Technology and data analytics can improve the acquisition process by providing real-time data and insights that can inform decision-making. This can help identify cost savings, reduce inefficiencies, and improve the quality of equipment and services procured. By investing in technology and data analytics, the government can also increase transparency and accountability in the procurement process.

5. **Implement performance-based contracting.** Performance-based contracting is a procurement approach that focuses on the outcome rather than the process. It allows the government to specify the desired results and leaves it up to the contractor to determine how best to achieve those results. This approach can incentivize contractors to find innovative solutions and reduce costs, resulting in improved quality and efficiency.

While these are excellent process improvement techniques, none of this address the root issue of how to enhance innovation. These typical solutions, address the symptoms and not the root cause that new and disruptive ideas simply have a difficult time of entering the process and finding a "sponsor" that can accelerate disruptive ideas and technologies. The DoD has attempted to address the overall process by redefining the acquisition process. A new approach to describing the fundamental process of meeting a "customer's" needs was drafted and marketed as a different way to speed up technology transition. This process, referred to as the Adaptive Acquisition Framework (AAF) provides clear pathways to a system that has always allowed for agility and tailoring as appropriate to meet the needs of the user.

Adaptive Acquisition

The defense acquisition process requires an adaptive approach that is agile and responsive enough to change with the evolving threat and speed of technology. Over the years, the DoD has been criticized for being slow, bureaucratic, and inefficient. In response to these criticisms, the DoD has implemented a number of reforms, including the Adaptive Acquisition Framework (AAF), which is designed to make the acquisition process more efficient and effective. The AAF is a set of guidelines and procedures that are designed to make the DoD's acquisition process more agile and responsive to changing requirements. The AAF was introduced in 2018, and it is based on the principles of the DoD's Better Buying Power initiative. The AAF is intended to be a flexible framework that can be adapted to different acquisition programs and situations.

The AAF is divided into three phases and six pathways: the Explore and Engage phase, the Assess and Approve phase, and the Execute and Deliver phase. Each of these phases includes a number of steps and activities that are designed to ensure that the acquisition process is efficient, effective, and responsive to changing requirements. The Explore and Engage phase is focused on identifying the user's needs and requirements, as well as identifying potential solutions and vendors. This phase includes activities such as market research, engagement with industry partners, and development of the acquisition strategy. The Assess and Approve phase is focused on evaluating potential solutions and vendors and selecting the best option. This phase includes activities such as requirements development, solicitation of proposals, and source selection. The Execute and Deliver phase is focused on implementing and delivering the chosen solution. This phase includes activities such as contract management, testing and evaluation, and delivery and sustainment.

There are six distinct pathways (Figure 3) in the AAF that are designed to align to a potential system of processes maturity level. These pathways represent derivatives of the Major Defense Acquisition process and are designed to mitigate potential inertia program managers could encounter. Each pathway addresses the maturity and type of capability being developed or procured. A common misconception of the AAF, is that choosing an alternative to the Major Capability Acquisition process, allows programs to avoid some regulatory and statutory requirements. While the pathways help to structure a program acquisition strategy relative to its maturity, all specified regulations and statutes are still required to be met or justified. The AAF is a convenient way to show the relationship between system maturity, urgency of need, and time.
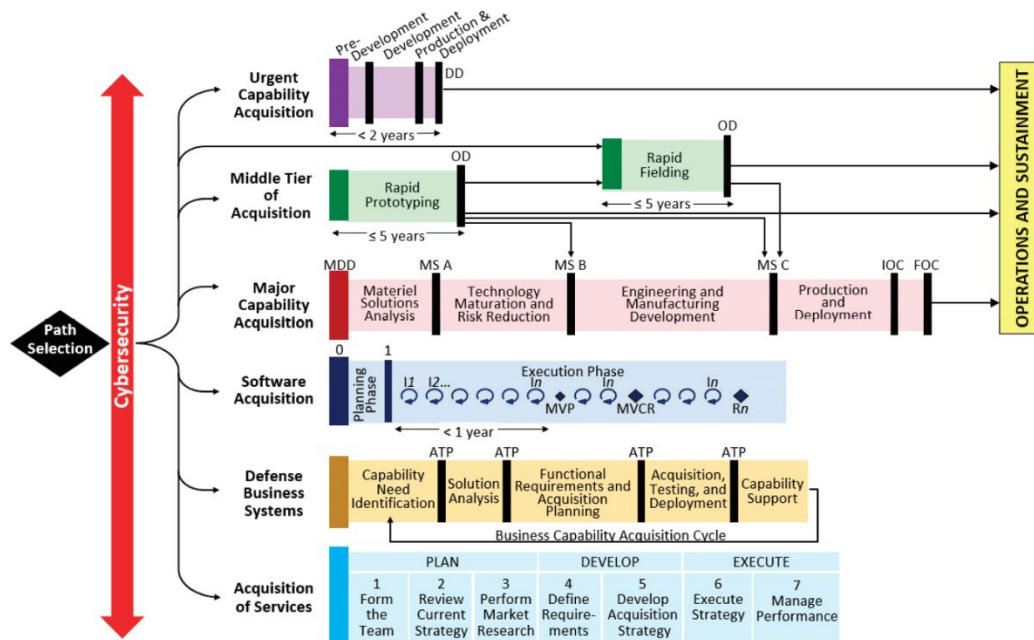
Figure 3. Adaptive Acquisition Framework (AAF) Pathways

One of the benefits of the AAF is that it provides a more flexible and agile acquisition process, allowing the DoD to be more responsive to changing requirements and to adapt to new technologies and threats. While this is accurate, the ability to do this has always been available to acquisition professionals and leaders. The AAF helps the acquisition leader align their technologies to a prescribed strategy, but it does not allow any more agility to rapidly introduce new innovative technologies into existing programs of record. Additionally, the AAF does not address the most critical challenge of how to leverage small innovative companies that have limited resources to compete in an environment that is not suited to speed of thought and innovation. The AAF simply provides more fidelity and definition to the status quo.

Providing more definition to the process seems like a good idea, but has ultimately created a more risk adverse environment focused on compliance centered leaders that are focused on the management of programs at the expense of adaptive and creative leadership of programs. One simply needs to dissect the many program failures to see that part of the root cause of failure lies in program teams managing through compliance rather than making the case for talking calculated and informed risk. Data suggests that the leading cause affecting PM decision-making is the restrictions imposed through processes and oversight within the acquisition environment. While years of acquisition reform, such as AAF, have aided in process maturity within the DoD, these reform efforts to improve oversight, reduce risk, and aid cost control may drive negative, unintended consequences (Neterer & Petrone, 2018).

Compliance centered leadership is preventing critical technologies from crossing the "valley of death" because of inflexible and misinterpretation of the fundamental purpose to the technology mature nation phase of the product development. Requirements are too quickly tied to specific technologies under contract leaving little room for new ideas for fear of violating a "rule" that funds can only be spent of specific, well defined, requirements. As a result, once a contractor with their specific solution is selected innovation in new ideas stops. Project managers are now bound by statutory baselines that are tied to specific

technologies. Additionally, smaller companies are not able to compete in this system that is bias towards compliance and risk aversion rather than innovation, agility, and adoption.

The Adaptive Acquisition Framework is an important initiative that is designed to improve the efficiency and effectiveness of the DoD's acquisition process, it still falls short on providing effective opportunities for innovative disruptive ideas and technologies to make their way into programs that are already under way or that do not fit into one of the prescriptive pathways of AAF. Innovation requires disruptive ideas and solutions to be able to gain a foot hold into more structured developmental efforts to optimize capability at the right time and place. DoD developmental programs are inherently designed to seek stability and are even punished for varying from the "approved" performance and technical baseline. The AAF represents a refinement of the status quo and simply helps the acquisition process categorize technologies and processes based upon their maturity levels. It does not allow for the rapid insertion of change once a program is established, leaving small business innovative thinkers left to struggle with finding a "transition" agent to help them move their ideas into more mature and producible capabilities.

The Innovation Paradox

When organizations and individuals recognize the need for innovation yet struggle to implement change and progress effectively, they are often experiencing the tension between the rigidity of the process and unstructured critical thinking. Paradoxically, to innovate both are necessary. The deliberate and often slow linear thinking of process is necessary to ensure disruptive ideas are shaped in ways that are not threats to the system. To be effective in the business of warfighting, disruptive thinking that moves inside the OODA loop of the adversary requires a deep understanding of the complexity of the business battlespace. Failure to navigate this space leads to missed steps and opportunities in the quest for resources and advocacy across the instruments of national power.

When individuals or organizations try something new, there is always a chance that it will not work out as planned, which can lead to wasted time, money, and effort. Risk aversion can make it difficult to take the necessary steps to innovate and can cause organizations to give up and fail to deliver critical capability.
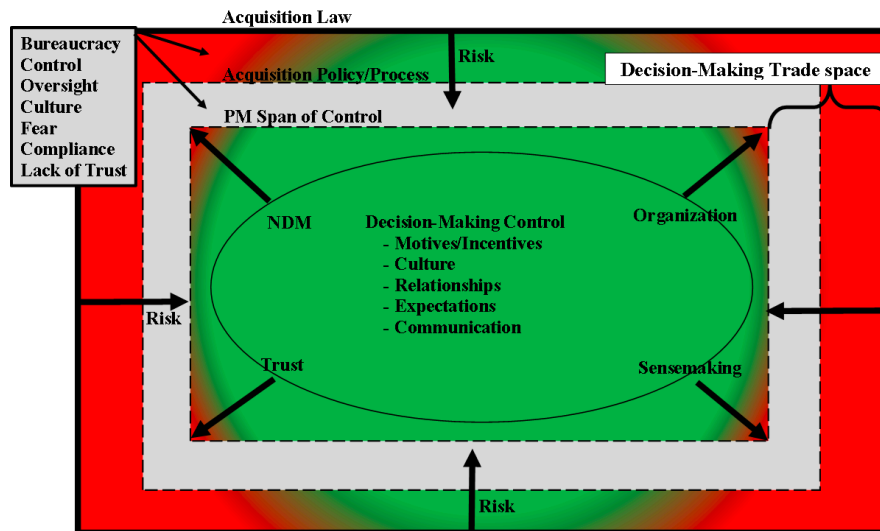

Figure 4. Risk Relationship to Decision Making in the Defense Acquisition Environment. (Neterer & Petrone, 2018).

Risk aversion is often linked to a lack of understanding or confidence in one's knowledge of the process. Those with insight of the technical vision, often lack the insight and clarity in the business process necessary to navigate through the vast sea of bureaucrats that are necessary to move an idea from inception to realization. The process is an essential part of the innovation process the allows the innovator to succeed. Figure 4 shows the relationship between culture, bias, insight and awareness, and risk suggesting that the more perceived risk the more likely a program team will become more process myopic and less innovative. In essence, the system is not structured to introduce new ideas that are not in the technology roadmap, limiting the significant opportunity and technology transition of new ideas.

Another reason why the innovation paradox exists is that innovation requires a certain degree of creativity and outside-the-box thinking. Unfortunately, many individuals and organizations are not naturally inclined towards these qualities and may struggle to come up with truly innovative ideas. Additionally, innovation often requires a willingness to challenge the status quo, which can be difficult for individuals and organizations that have become comfortable with their current methods and practices. Systemic in this the basic lack of detailed knowledge of the process. All too often the process is blamed as the reason for program failures and the lack of visionary thinking that leads to effective innovation. A detailed and integrative understanding of the process is required to be able to think "out of the box" within a very structured process. The tendency is to allow the "system" to take over.

Bold leadership and innovative process adaptation is necessary to drive new concepts into a very deliberate and structured environment. The procurement process will adapt to new ideas for those that are able to take advantage of the inherent mechanisms within the process. In order to successfully do this however, requires in depth and critical understanding of the process and a leadership culture that encourages informed risk rather than a compliance management mindset. Managers keep the trains on time and leaders keep them going in the right direction. The process is a necessary component of innovation and leaders with an intense understanding of the tools are needed to keep the creativity alive throughout the process. To effectively navigate the innovation paradox, it is important to strike a balance between the need for creativity and the need for structure and stability. Ultimately, the innovation paradox is a complex and multi-faceted issue, but one that must be addressed if individuals and organizations hope to remain competitive and relevant in the modern world. By recognizing the challenges associated with innovation and taking steps to overcome them, it is possible to harness the power of innovation and drive meaningful progress and growth.

Educational Innovation Pathway

The first step in creating a successful innovation strategy is to identify and understand the strategic and operational needs of the customer. In the defense environment, a market analysis is considered the requirements analysis, which seeks to identify gaps in capability needed to meet national security objectives. This involves conducting research and analyzing operational user or customer feedback to identify areas where improvements can be made or where new capability or services are needed. By understanding the strategic and operational needs, organizations can create capabilities and services that are not only relevant but also meet the needs of their target audience.

Once an organization has identified the market and customer needs, the next step is to create a culture of innovation within the organization. This involves encouraging the sharing of ideas and providing them with the necessary resources and support to pursue those ideas. Fostering an environment of innovation involves creating an environment that

fosters creativity and innovation, such as encouraging cross-functional collaboration. Cross functional collaboration should be integrated into the entire life cycle process for as to encourage disruptive thinking and potential for novel insight. A successful innovation strategy also involves a willingness to take risks and experiment with new ideas anywhere is the life cycle of a system under development. This means accepting that not all ideas will succeed and being willing to learn from failures and pivot when necessary. It also means being open to feedback and continually iterating and improving upon ideas.

The Innovation Capstone Project (ICP) established by the Department of Defense Management (DDM) at the Naval Postgraduate School (NPS) seeks to integrate the principles of innovation into an educational pathway that merges student/faculty teams with industry and relevant DoD Program Executive Offices (PEOs) to rapidly shape potential solutions for critical operational requirements. Bringing these three institutional entities together early seeks to develop a capability strategy early with an eye toward integration into approved programs of record. A key enabler in this ICP process is the early creation and development of an acquisition strategy for technologies that are very early in their technology readiness levels. By thinking about how a system will transition into a production and sustainment phase, thought must be given to how the process will be influenced relative to the technology to gain adoption. Stakeholders from each phase of the life cycle must be considered and integrated into the plan early and often, not when the new technology is "ready to go."

The process begins with a requirement from the operational forces or PEO. As requirements are vetted by the DDM ICP Program Manager, student cross functional teams (CFT) are formed and assigned to faculty mentors that will help guide them through the process. As the CFTs iterate the problem they create a proposed recommendation and acquisition strategy that defines the total life cycle strategy and impact of their recommendation. At that point the CFT plan and strategy is presented to a board of subject matter experts who assess the viability of the plan and strategy with the intent to proceed into the concept development phase of the ICP. CFTs that successfully meet the standards of the knowledge point review are then married up with relevant industry partners through agreement such as Partnership Intermediary Agreements (PIA) or Cooperative Research and Development Agreements (CRADA) and a PEO with the portfolio requirements appropriate to the technology being considered. The integration of industry and PEO at the first knowledge point is critical in that the industry partners provide the focused technical expertise, and the PEO provides the transition engine for the technology being developed. The CRT acquisition strategy provides the PEO with the specified business plan by which they can adopt the new technology, provided it can be shown to achieve a relevant technology readiness level. Figure 5 summarizes the Educational Innovation Pathway.
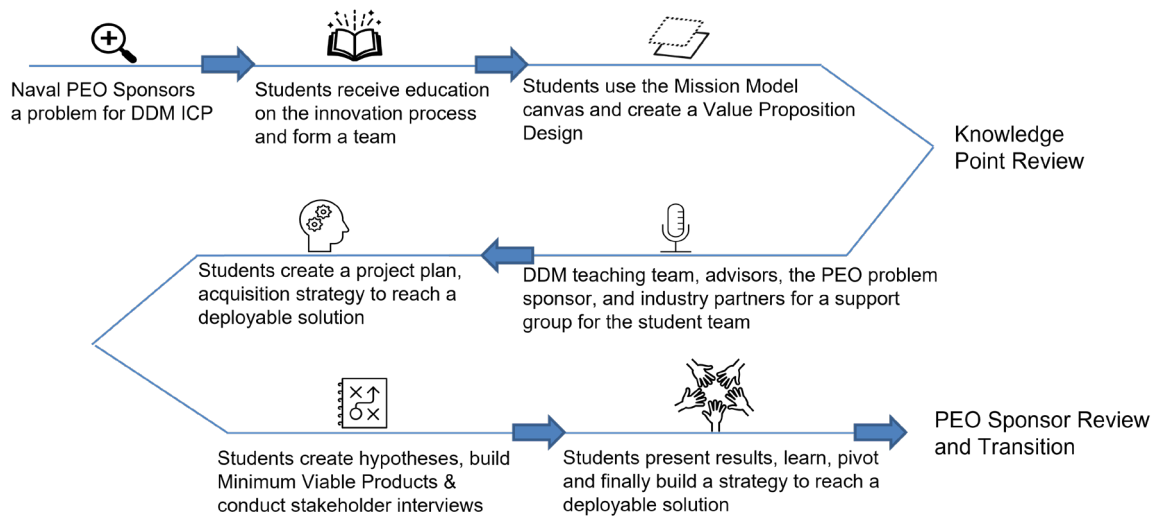
Figure 5. Innovation Capstone Program Pathway

The value proposition for this Educational Pathway is the early development of the acquisition strategy and integration of industry and PEO in the process during the process of exploration. This allows small innovative companies to gain traction with government title 10 program offices early and it allows the PEOs to begin to shape the business strategy for adoption into existing programs of record. From an educational perspective, students at the Naval Postgraduate School begin to work with organizations that are responsible for developing and delivering technology and start to build the scaffolding of creative thought that will follow them into operational positions as they progress through their careers.

Leveraging the educational process for both learning and technology evolution is foundational to experiential learning and provides valuable insight to the institutions responsible for ensuring that the national security posture of the United States stays far ahead of any current and future adversary. The tangible products are the technologies that transition. The less obvious products are the students that learn to think more creatively and deeply about complex problems as well as the relationships that are developed between the DoD and small competent companies that find dealing with the DoD challenging at best.

Developing successful innovation strategies is critical for organizations looking to stay competitive and relevant in today's marketplace. This requires identifying and understanding market and customer needs, creating a culture of innovation, using technology and data analytics, taking risks and experimenting with new ideas, and having a strong leadership team committed to innovation. By incorporating these key components into their innovation strategy, organizations can achieve their goals and create products and services that meet the needs of their target audience.

References

DoDI 5000.02. (2020). *Operation of the adaptive acquisition framework.*

Neterer J., & Petrone, M. (2018). *Why DO programs fail? An Analysis of defense program manager decision making in complex and chaotic environments*. Naval Postgraduate School.