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Facilitating Usage of New Tech in Defense Systems: Issues and a Way Forward

INCUBATOR EXECUTIVE SUMMARY AND REPORT

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ACRONYMS AND ABBREVIATIONS

A&S	Acquisition & Sustainment
AI	Artificial Intelligence
DFAS	Defense Finance and Accounting Service
DHMSM	Defense Healthcare Management System Modernization Initiative
DoD	Department of Defense
MEPS	Military Entrance Processing Stations
MHS	Military Health System
MOS	Military Occupational Specialty
RFP	Request for Proposal
ROI	Return on Investment
SOP	Standard Operating Procedures
USMC	United States Marine Corps

EXECUTIVE SUMMARY

This project contributes to the acquisition and sustainment process for new technology by identifying critical issues in the socialization of new technologies from the end-user perspective. Understanding that the definition of an end user varies greatly by the technology and purpose in question, but there is a fundamental knowledge gap between how to best acquire and test a new technology versus how to domesticate and use the technology within the relevant Department of Defense (DoD) culture, function, and processes.

Previous research points to convenience as a factor. If it is easy to makes sense of it in a person's day-to-day workings, then incorporating a new technology is easier (Sokol, 1994). However, in cases where an individual or group within an organization must make moderate to substantial changes to their daily routine and practices, the pushback is much stronger.

This pushback—and other processes and systems that slow the progress of the implementation of a new technology—is called friction. In our initial research, the following areas of friction were identified as concerns within the DoD:

- Reassignment of critical military personnel.
- User ownership and accountability.
- Poor communication of emerging and ongoing user issues.
- Unintended consequences of neighboring protocols and inter-branch relations.
- Lack of clear, holistic, and consistent metrics for tracking end-user sustainment.

Recent examples, such as the challenges in the Military Health System (MHS) GENESIS electronic health-records system initial roll out,[1] shine a light on the potential issues that can arise when the domestication of a new technology or platform are placed without sufficient consideration or processes that promote end user buy-in.

We note that due to the complexity, scale, and unknown factors within the DoD, establishing clear metrics to track and improve new technology socialization practices or identify areas of friction unique to different project types is a major undertaking.

To that end, we recommend continued research focusing on the complexity barrier to creating cardinal metrics. The best place to begin is by focusing on identifying blind spots in the process of technology socialization within and across organizational branches. The goal is to paint as clear and comprehensive a picture for one specific type of technology and then repeat the study for other technology categories and adjust as necessary.

[1] DOD Healthcare Management System Modernization (DHMSM) – DOT&E)

BACKGROUND

The acquisition of innovative digital technologies is an important initiative within the Department of Defense (DoD). However, the success or failure of these mission critical technologies does not rest solely on the mechanics of the acquisition process. Implementation with relevant personnel, integration within existing systems and processes, and ongoing modernization are vital components of a technology acquisition strategy. The gap between how to best acquire and test a new technology versus how to domesticate and use the technology within the relevant DoD culture, function, and processes is lacking in applied research and cohesive best-practice guidance. This report provides insights into these issues and potential ways forward to address them—with particular attention to new technologies to improve sustainment functions in the DoD.

There is substantial research suggesting that the incorporation of emerging digital technologies, such as artificial intelligence (AI) and automation, can increase efficiency within organizations of various sizes (Mikalef, et al, 2023) However, the success of applying these technologies varies greatly based on integration and socialization with relevant personnel, organizations, and processes (Freeman, et al, 2022). In this context, socialization of a technology refers to the intentional process of connecting the technology use with the practical daily activities of the potential users of that technology—thus encouraging positive and enthusiastic adoption of the technology. By extension, this adoption of the technology then spreads to more employees and eventually persists in the culture of the organization.

Research from the private industry discusses the best methods for technology transfer strategies, intergenerational technology training, managing leadership and employee turnover in the context of technology investments, and socializing modernization “buy in” from the end user for maximum efficiency in new technology (Hanelt, et al, 2020). This research can be leveraged to support technology socialization within the DoD. However, the unique nature of the DoD infrastructure requires additional research and considerations.

In the context of the DoD, one must also consider a multitude of organizational boundaries. This includes, but is not limited to, the different branches, the different departments within branches, civilian and military personnel, and inter-agency collaborative initiatives. For the DoD, the process of implementation follows a path from acquisition to a private-sector contractor implementing the new technology in operational systems. When that acquisition ends and when military leadership and civilian personnel are replaced, the training is often conducted by either the original contractor or (more often) the military or civilian end users. This creates a proverbial ‘game of “telephone”’ situation (Sayyadi, 2019).

As a result, poor Standard Operating Procedures (SOP) proliferate (Yablonski, 2020). Distrust of systems increases (Chivukula, et al., 2018). Misuse of systems increases (Hanelt, et al, 2020). The possibility of security issues, costly system failure, or the need for unexpected repair increases (Whilhelm, et al., 2020). Often, these issues are not factored into the budget for the purchase and sustainment of a new system. Therefore, research leading to the removal or reduction of these challenges could be considered a cost-saving return on investment (ROI).

1. EMERGING TECHNOLOGY AND MILITARY PERSONNEL: HOW FAST CAN WE CHANGE?

In the world of defense operations, a need is identified and the technology to fulfill that need is sought through a system of conceptual design, market research, requests for proposals (RFPs), awards, development, testing, and fielding. Then, the work of deploying the technology arrives. In the case of DoD acquisitions, it is very common for the people who are managing the process of acquiring and choosing the technology not to be the people using the technology. Moreover, there is commonly the additional issue of adjacent departments and personnel impacted by the implementation of that technology.

Previous research points to convenience as a factor. If it is easy to use and makes sense of it in a person's day to day workings, then incorporating a new technology is easier (Sokol, 1994). In cases where an individual or group within an organization must make moderate to substantial changes to their daily routine and practices, the pushback is much stronger.

In the context of the DoD, the solution may seem simple. If one orders subordinates to use the technology exactly in the manner specified, there should be no issue. However, the reality appears to be different. Once the technology implementation reaches the intended end user of a new technology, there is often friction against smooth transitions and use of the systems containing the new technologies.

2. POTENTIAL AREAS OF FRICTION IN TECHNOLOGY IMPLEMENTATION AND SUSTAINMENT

Friction occurs when personnel, processes, and environmental factors work fully or partially in conflict with a new system containing the technology. This friction slows or stops the efficiency of the technology in one or more areas. In the context of the DoD, initial research has identified the following points of friction for new technology socialization and end user buy-in.

2.1 CONTINUITY OF CARE: DISJOINTED COMMUNICATION, PERSONNEL SHIFTS, OWNERSHIP & ACCOUNTABILITY ISSUES

2.1.1 REASSIGNMENT OF CRITICAL MILITARY PERSONNEL

When a new technology is implemented, there are typically key military personnel involved in the process at different levels of leadership, down to local chains of command – depending on the type and purpose of the technology. These personnel typically give orders or direction to end user personnel at the field and company levels. They directly assist in the training of personnel to use the technology and help to ensure that the technology is used in the intended method.

While supported by and in support of civilian DoD personnel, the military counterparts using these technologies and facilitating training (and those being trained to use the technology) will be reassigned to a different position every 2–3 years. In the case of non-commissioned officers, the new position may be completely unrelated to the use of the new technology – so those hours and knowledge transfer efforts are lost. Each individual may come to the position to use the technology with differing levels of experience adapting to new technology.

Moreover, in the case of lower and non-commissioned officers, the entire process must start again. This time, the officers responsible for training on the new technology may also be new to the position. While templated training materials, videos, and the like may assist in this endeavor – if the service members in that office or position are using the technology differently than originally intended (i.e., “duct tape fixes” for departmental needs), the original training may be more confusing than helpful. There is an inherent lack of consistency for new technologies within one branch due to the complexity of inter-branch departments. When considering large scale inter-branch technologies, the complexity grows.

Notably, information regarding the rate of turnover for civilian DoD personnel in these endeavors is not readily available. Therefore, depending on civilian DoD personnel in the oversight of new technology implementation, socialization, and sustainment presents a potential critical gap in readiness. The impact of civilian DoD personnel and military personnel in new technology implementation and sustainment is an opportunity for continued research.

2.1.2 USER OWNERSHIP AND ACCOUNTABILITY

Once the technology has been deployed, a common challenge is determining who is responsible for ensuring and monitoring effective sustainment through end-user training, use, and management. The deployment strategy for software, cloud, and AI technologies seems to assume that all end users will perform the tasks as trained. The reality may be different.

In our initial research, we spoke with representatives from MilTech at Montana State University. According to their research (currently in progress), interviewees noted the need for a documented process that delineates the transfer and transition process, as there are information gaps between initial implementation and when the technology is fully realized in the field. Other interviewees noted the culture surrounding new technology implementation was often a barrier to effective leadership, acquiring the necessary funding, and the overall success of a new technology acquisition. As an example, one interviewee noted that "…an end user can kill a new technology."

The first questions raised when reviewing this issue are 1) who is the end user, and 2) who should be responsible for overseeing operational strategy and mobility as a new technology moves from deployment to sustainment? The answer varies based on the technology in question and the end user.

For example, a new accounting software deployed at the Defense Finance and Accounting Service (DFAS) may have a certain type of end-user dynamic – accounting staff, possibly more civilian personnel working side by side with military personnel. Meanwhile, acquisition of a new drone targeting system may likely have primarily combat-ready military personnel making the day-to-day decisions on how to use the system on a regular basis. Both technologies are necessary for military readiness, but the goals of deployment and sustainment are very different. The end users have different backgrounds and operational goals. Therefore, the approach to sustainment should be different to encourage mobility and adaptability. The oversight of this approach requires different skill sets for each of the two technologies in the example.

Should the ownership of new technology and accountability for technology socialization and sustainment funnel through a single organizational hub with a select few key leaders? Would the goal of technology socialization be better served with a targeted military occupational specialty (MOS) and a more industry common organizational tree dedicated to the task of ensuring maximum efficiency and adaptability? Should the different branches have unique organizational structures to oversee technology socialization and end-user support? These questions are opportunities for further research.

2.1.3 COMMUNICATION OF EMERGING & ONGOING USER ISSUES

Somewhat related to the issue of ownership and accountability is the process for end users to raise and address issues that arise in the implementation of a new technology (as is done in Agile software development) to make the socialization and sustainment phase of the process more efficient. In the interest of adaptability and mobility for the warfighter, waiting until the closing of a project is not always the most effective time to review opportunities to improve. While there are data collection processes in place for many new technology acquisitions, there is not always a plan in place to review, analyze and apply the data effectively (Heeren-Moon, et al, 2023). There is an opportunity to research potential data frameworks to help the different cogs in the DoD technology acquisition and sustainment machine communicate more efficiently and make better, faster decisions. Implementing a robust incident reporting and lesson learning system can capture and document challenges encountered during implementations, providing valuable insights for future projects. By analyzing past incidents, the DoD can identify recurring issues and develop strategies to mitigate them, ultimately leading to more successful and efficient technology deployments.

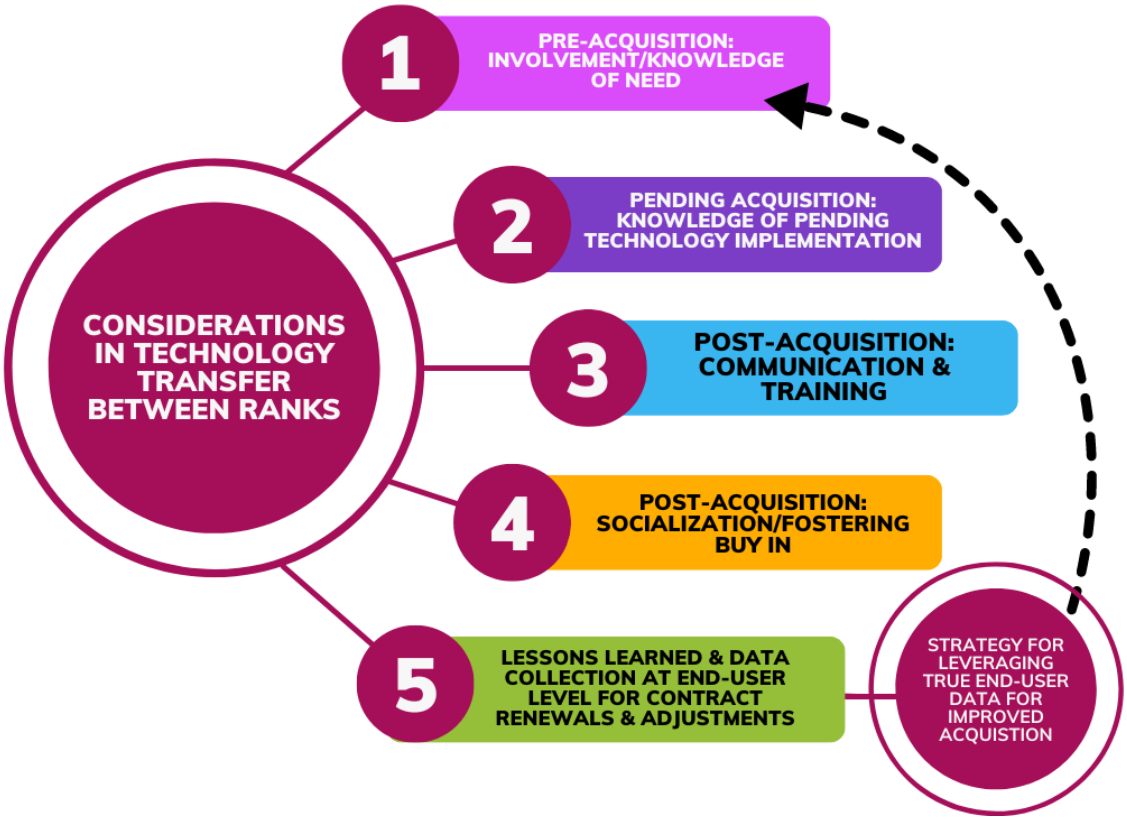

Figure 1 - Data Flow for Improved Communications

2.2 UNINTENDED CONSEQUENCES ON NEIGHBORING PROTOCOLS & INTER-BRANCH RELATIONS

The concept of technology socialization and improving warfighter adaptability is an identified issue. However, there are still many blind spots within the DoD.

One recent example is the impact of the Military Health System (MHS) GENESIS, which is an electronic health record system designed for the DoD by Leidos. The contract was awarded originally in 2015, with next-generation contracts continuing the project. GENESIS was acquired as a solution under the DoD's Healthcare Management System Modernization Initiative (DHMSM). The initial and subsequent contracts with Leidos and subcontractors included the development, delivery, and support of the MHS GENESIS system (Leidos, 2024).

GENESIS is replacing select legacy systems and is truly a cross-branch, agency-wide platform that impacts multiple offices related to military and military family healthcare, personnel management, private sector partnerships, and operational medicine. The medical records of military personnel and certain dependents – prior, during, and after separation from the military – are maintained within the same system to ensure continuity of care and improve efficiency in the movement of troops and dependents (Bustamante, 2022).

In March 2022, GENESIS was deployed at all 67 Military Entrance Processing Stations (MEPS). MEPS is the first in-processing for new and potential recruits. For military recruiters, this changed how they enlist new recruits. Prior to GENESIS, recruiters asked prospective recruits whether they had certain conditions. If the recruit had experienced one of these conditions, the records associated with those conditions had to be sent to MEPS as part of the enlistment packet. Without these records, the recruit would not be able to enlist. Notably, the system operates as it should in catching medical issues that would "red flag" an applicant. It is designed to do so in the military recruiting process, and functionally, seems to do the job properly. However, the technology was not well received amongst the military recruiting community.

Prior to this roll out, the time from enlistment application to enlistment contract was 27 days, according to the DoD. However, recruiting reports suggest that more than half of the applicants would move from application to contract in nine days or fewer. After the implementation of GENESIS, some branches are reporting nearly 60 days as the average time from application to contract (Thayer, 2023).

The military recruiting community was quick to cite issues with the GENESIS system, but other than the extension of time to move from application to contract – most of the concerns involve a frustration with the change in how things are done. Military Times quoted one recruiter as saying, "What it takes to get in the Army is, quite frankly, a lot of fraud and perjury" (Loewenson & Ziezulewicz, 2023). Most common is the failure to provide complete medical histories—those from an applicant's young age or a minor sports injury from the past. The answer to this issue was for recruiters to seek more waivers—or documented exceptions to certain conditions—to get the same sort of applicants across the proverbial finish line (Cohen, 2023).

When GENESIS was rolled out for MEPS, there was a lack of awareness of the reality of recruiter culture, processes, and the dynamic between recruiters and the MEPS personnel which led to delays in recruits being in processed. This led to recruiting numbers being critically low across multiple branches. Notably, the numbers did not drop for all branches, like the United States Marine Corp (USMC). The reason for this caveat is an opportunity for further research.

Table 1 - Active Duty Recruiting Goals and Actual Enlistments by Branch (Office of the Under Secretary of Defense for Personnel & Readiness)

Branch	FY21Goal	FY21 Act	FY22 Goal	FY22 Act	FY23 Goal	FY23 Act
Army	57,500	100.18%	60,000	74.84%	65,500	76.61%
Navy	33,400	100.48%	33,400	100.13%	37,700	80.20%
Air Force	26,641	100.06%	26,196	100%	26,977	89.34%
USMC	30,607	100.03%	28,600	100%	28,900	100.07%
Space Force	NA	NA	521	102.11%	492	109.15%

The GENESIS scenario illuminates a potential obstacle for large-scale new technology adoption within the DoD. Logically, GENESIS cannot be the sole reason for the lower recruiting numbers. However, the issues that arose from the GENESIS roll out demonstrate how a blind spot from leadership can cause cascading issues with the DoD. Had the technology been socialized with existing processes as they existed—not how they had been idealized—the operational efficiency of the system could have improved the recruiting process. However, the recruiting practices did not change, and the system with deployed with the additional friction in place.

This phenomenon suggests a lack of communication between the departments. GENESIS was intended to be a DoD-wide program that facilitates medical record keeping from new recruit to retiree. From a data management standpoint, this platform has many benefits. However, the impact on the recruiting process was not necessarily considered outside of "how things ought to be." The goals are admirable but was the friction preventable? Recent research suggests that the blind spots that caused the issues may have been preventable or can be a lesson learned for future acquisition and sustainment efforts (Woody, 2024).

The GENESIS example presents an interesting case study at a critical point in the platform's implementation within the DoD. By exploring this scenario, lessons learned can potentially be applied to the acquisition and sustainment of other information platforms within the DoD. This could be a promising avenue of future research.

2.3 LACK OF CLEAR, HOLISTIC, CONSISTENT METRICS IN IMPLEMENTATION AND SUSTAINMENT

In Figure 1, we identified a potential information flow to better leverage data to inform adaptability and effective socialization of new technologies by bridging the communication gap between end users and senior leadership. However, this research also requires identification of which metrics are most effective for this goal. Currently, in the area of personnel adaptability to new technology, the task of establishing consistent metrics to make such a data flow workable on a grand scale is daunting at best (Heltberg, 2022). This is an opportunity for new research that is explored in the next section.

3. THE NEED FOR CARDINAL METRICS (AND THE ROADBLOCKS IN THE WAY)

The ideal resolution to the issues identified in this report is a unified vision and approach to new technology socialization and knowledge transfer that can be adapted across departments and branches within DoD. This approach should include insight, initiative adaptability, and harmony between leadership, industry partners, and end users (Boyd, 1986). Boyd states that each of these components are critical to be successful in the "uncertain and ever-changing environment of conflict or war." In the context of technology sustainability, the cost of not maximizing opportunities to enhance adaptability can cascade rapidly.

In the initial exploration of this topic, the prospect of cardinal metrics that can be translated between technology sustainment needs, departmental goals, branches, and differing budget requirements presents a great opportunity to reach the goal of a unified approach. However, a key question is immediately raised: what metrics are best suited toward this goal? Table 2 presents potential metrics inspired by Hubbard (2014) for further exploration in future research. Reviewing existing literature and discussions in our initial review process, the following subsections have identified the following barriers to creating these cardinal metrics.

Table 2 - Suggested Metrics in Technology Socialization

Metric	Description
Training Completion Rates	Percentage of personnel who complete training programs for new technology AND/OR Time taken to complete training modules.
Proficiency Levels	Scores on post-training assessments to gauge understanding and proficiency AND/OR Periodic proficiency evaluations to measure skill retention and improvement over time.
Usage Metrics	Frequency and duration of technology use by personnel AND/OR Number of tasks or processes completed using the new technology.
Feedback and Satisfaction	Surveys and feedback forms to collect user satisfaction and perceived ease of use AND/OR Analysis of common feedback themes to identify recurring issues or areas for improvement.
Performance Improvement	Metrics comparing pre- and post-adoption performance, such as productivity increases, or error rate reductions AND/OR Time saved on tasks or processes due to new technology implementation.
Support and Help Desk Requests	Number and types of support requests related to the new technology AND/OR Time taken to resolve help desk tickets and the nature of common issues.
Adaptation Time	Average time taken for personnel to adapt to and feel comfortable using the new technology AND/OR Milestones achieved during the adaption period.
Collaboration and Communication	Frequency and effectiveness of communication between end users and senior leadership regarding technology use AND/OR Number of collaborative projects or tasks facilitated by the new technology.
Error Rates	Frequency of errors or issues reported when using the new technology AND/OR Comparison of error rates before and after technology implementation.
Retention and Turnover Rates	Retention rates of personnel post-technology adoption AND/OR Analysis of turnover reasons, especially if related to technology adaption challenges.
Innovation and Improvement Suggestions	Number of suggestions or innovations proposed by personnel for improving the technology AND/OR Implementation rate of user-suggested improvements.

3.1 BARRIER: SCALE

The DoD is a massive agency. The sheer size of it, which reaches over two million military personnel (Department of Defense, 2023), creates an environment where successfully implementing unity in operational processes is challenging.

3.2 BARRIER: COMPLEXITY

In addition to the number of personnel involved, the DoD has many different initiatives, goals, budget considerations, and operational protocols based on individual services provided by the agency. A set of metrics that can be applied on a universal basis requires an understanding of as many of these different approaches as possible. Conceptually, overcoming this roadblock will require extensive research.

3.2 BARRIER: UNKNOWN FACTORS

Tied to the issues of scale and complexity is the potential for unknown variables to rise in the course of establishing and applying cardinal metrics. Moreover, as technologies and operational practices progress, these unknown factors may change over time. Therefore, the metrics assisting in a unified approach to adaptability must be adaptable themselves.

CONCLUSIONS

The DoD is unique in that the military personnel and leadership involved with the use and implementation of new technologies (and newly acquired technologies) typically transfer out of the relevant positions every two to three years. They may or may not use that technology in their next duty station. Meanwhile, all branches of the DoD lean heavily on a contracted and non-contracted civilian workforce to provide personnel stability throughout these transitions. As a result, employee retention is critical to the endeavor of creating a technologically innovative force.

The civilian and military personnel using many of these technologies have no say in which technologies are chosen, and how the technologies change how they work. While it is true that orders and mandates exist for this purpose, they do not promote retention through job satisfaction if the employee in question does not fully domesticate the technology in its intended use into their daily activities. There is an information gap between the day-to-day practical actions of the end user and the individuals acquiring the technology. Inconveniences and lack of domestication in changes to daily activities can reduce morale and damage employee retention rates.

There is a large information gap here. We recommend that future research focus on the complexity barrier to creating cardinal metrics, as discussed in this report. We believe the best place to begin is by focusing on identifying blind spots in the process of technology socialization within and across the different branches. While it is virtually impossible to find every blind spot, the goal is to paint as a clear and comprehensive a picture for one specific type of technology, and then repeat the study for other technology categories and adjust as necessary.

If future research is successful, the findings could be built upon to answer the following questions:

1. How is information related to new technology implementation perceived by field-level civilian and military personnel?
2. What is the current likelihood of positive interaction with the technology in the case of these personnel training another civilian or military personnel?
3. In the day-to-day implementation and socialization of a new technology, who leads the narrative of that technology in practice?

These questions could be approached with the following prospective methods: Conduct focus groups and individual interviews with personnel involved in the implementation and training of the new system. Observe training processes and subsequent user interaction. Leverage findings to contribute to questions listed above. Ultimately, identify roadblocks to learning new technology, new technology adoption, and barriers to personnel buy in.

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