TECHNICAL DATA RIGHTS FOR ADVANCED DEVELOPMENT SCIENCE AND TECHNOLOGY PROJECTS

LARRY MUZZELO

May 2013

PUBLISHED BY
THE DEFENSE ACQUISITION UNIVERSITY
PROJECT ADVISER: DR. CRAIG ARNDT
ENGINEERING AND TECHNOLOGY DEPARTMENT,
CAPITAL AND NORTHEAST REGION, DAU
THE SENIOR SERVICE COLLEGE FELLOWSHIP PROGRAM
ABERDEEN PROVING GROUND, MD

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Abstract

The objective of this research was to improve the government staffs' understanding of the relationship between government ownership of TDRs and the transition of technology from the Science and Technology community into Programs of Record (PoRs). Survey questionnaires were used to solicit feedback from Program Executive Offices (PEOs) and Program Managers (PMs) on Advanced Technology Development (ATD) projects to ascertain whether the ATDs transitioned technology products as well as the associated TDRs of transitioned technology. Through an analysis of survey responses, this research indicates that government ownership of TDRs makes a statistical difference in the successful transition of technologies from the Science and Technology community to PMs for use in PoRs. Based on survey findings, this research points to the importance of TDRs that technology developers acquire since those data rights may ultimately effect the transition of their innovative technologies into advanced weapons systems for use by the Department of Defense (DoD).

Chapter 1—Introduction

Background

The DoD utilizes its S&T community to develop innovative technologies that will drive the technological advancements in its weapons systems. Nonetheless, the DoD historically has been challenged to transition these pioneering technologies into the PORs that have the responsibility to engineer, integrate, and deploy the advanced weapons systems. Concurrent with this technology transition challenge, the Department is placing renewed emphasis on government ownership of technical data for use throughout the acquisition lifecycle.

Title 10, United States Code (U.S.C.) Section 2320, Rights in Technical Data, has been in force for many years and is instantiated in both the Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation Supplement (DFARS). These rights depict who owns the technical data and is typically of three types. Unlimited TDRs allow the government the right to use, disclose, reproduce, or prepare derivative works or distribute copies in any manner and for any purpose and to have or permit others to do so. Limited TDRs are for data delivered with marking specifying how the government may use or disclose the data. Conversely, the data may be withheld from delivery or specified via only form, fit, and function information. For example, restricted computer software is developed at a private company’s expense and marked with restricted rights thereby limiting the government’s use of the restricted computer software or the data may be withheld to protect it. The TDRs granted to the government are dependent on the funding source of the item, process, or computer software. The funding source can be the government, a private company, or a mix of both. These rights can take many forms, such as build to print, source code, object code, form, fit, function, maintenance, installation, and training (10 U.S.C., 2012). In some instances, the government may have no TDRs and instead must pay license fees to use the product. A classic example is licensing of computer software developed a private expense.

The Weapon System Acquisition Reform Act (WSARA) of 2009 and the Better Buying Power Initiative 2.0 (Kendall, 2012) have identified the need to increase the use of open architectures, use technology development (TD) for true risk reduction and implement a TDRs strategy over a product's life cycle, to include acquiring the TDRs while competition still exists. It is unclear whether the assertion that government ownership of technical data will have positive effects, especially during the TD phase of the acquisition life cycle when the government is in the best position, from a competitive standpoint, to acquire data rights at a reasonable cost.

Erwin (2012) indicates industry is increasingly concerned over potential government demands for drawings, specifications, and manufacturing methods so future procurements can be made, in some cases, using other sources. She further notes that DoD is requiring industry to turn over data rights, but that some of the technical data being provided to the DoD is developed with industry's own funds and that the DoD's desire for the best and latest technology is potentially irreconcilable with its policies calling for competition in the marketplace.

Problem Statement

Although a strategy in TDRs exists at the Department, Service, and PEO levels, no integrated and overarching strategy and guidance commonly is enforced and executed throughout the DoD. This especially is true in purchasing TDRs during TD projects, which may affect the transitionability of these projects and subsequent incorporation of new technologies into weapon system acquisitions. Without a consistent approach to purchasing TDRs for TD projects, and a potential lack of understanding as the resultant implications, there are wide variations when making a determination on whether to purchase TDRs on these projects.

Purpose of This Study

The purpose of this study is to analyze the impact of government ownership of TDRs on the transition of technology from the S&T community to PEOs and PMs. S&T ATD projects have an end goal of transitioning products into acquisition programs that will provide military utility and satisfy user requirements. Based on survey findings, this research will determine if there is a correlation between government ownership of data rights and a positive effect on technology transition to PoRs. This research provides the government staffs' understanding of this correlation specifically for ATD projects.

Significance of This Research

This research will help develop and promulgate knowledge to improve acquisition management. It will support a research based underpinning for acquisition policies associated with the purchasing of government TDRs for ATD projects thereby helping to improve the business decisions made by the DoD. This research also will provide acquisition professionals with a better understanding of the relationship between purchasing of government data rights (independent variable) and technology transition (dependent variable). If government TDRs are shown to be contributing factor in the transition of technology, this research will provide an initial set of recommendations associated with determining the benefit of government ownership of technical data.

Overview of the Research Methodology

This research utilized the results of questionnaires responded to by PEOs/PMs on the TDRs of S&T projects that had planned to transition technology from the Research, Development, and Engineering Centers (RDECs) of the U.S. Army's Research, Development and Engineering Command (RDECOM). As documented in questionnaire responses, this research examined the past 10-year history of Army ATD projects identified as planning to transition technology to PEOs/PMs. This research analyzed completed questionnaires provided to the Army Materiel Systems Analysis Activity (AMSAA), which is investigating internal technology transitions within the S&T community as well as external transitions to PEOs/PMs. AMSAA is investigating contributions to transition successes from the factors of user requirements, funding, schedule, technology maturity, deliverables, acquisition strategy, testing challenges, and Headquarters, Department of the Army priorities. This research examined the factor of TDRs on technology transition as responded to through questionnaires. By analyzing the completed questionnaires, an assessment of the past 10 years of ATD project transition success, or lack thereof, to PEOs/PMs will indicate if there is an impact of government ownership of technical data on transition success.

Research Question

Using survey findings, is there any correlation between government ownership of TDRs and the transition of technology to the PEO/PM communities for use in acquisition PoRs?

Research Hypothesis

Government ownership of the TDRs makes no difference in transition of technology projects from the S&T community to PoRs. In other words, data rights have no effect on a project's ability to transition to an acquisition program.

Objectives and Outcomes

Based on survey results, the objective of this research is to understand if there is a correlation between government ownership of TDRs and technology transition. The outcome is to offer some recommendations for the purchase of government-owned TDRs on TD projects.

Limitations of the Study

The study focused on the last 10 years of U.S. Army RDECOM ATD projects that transitioned to PoRs. It is assumed that survey data collected is representative of all ATD projects and the data are extensible to other, nonformal projects, resourced with ATD funding to develop and integrate technology for experimentation and test in anticipation of transitioning to the next phase of the acquisition life cycle. The study limitations include data availability and/or access. Eighty-three questionnaires were distributed. Questionnaire responses were received covering 71 different projects for a response rate of 86 percent from the surveyed PEOs/PMs.

Validity of the Research

Possible threats to validity include selection, effects of selection, and unique program features. To account for selection, effects of selection, and unique program features, the research survey covered all funded ATD projects targeted for transition to a PEO/PM over the last 10 years from RDECOM, and not just a sample of the population.

Reliability of the Responses

The survey was consistently communicated to each Army PEO/PM who was the recipient of the technology developed under each individual ATD project. These PEOs/PMs have access to the information needed to accurately, consistently, and correctly responded to all survey questions for the respective technology projects transitioned to them.

Chapter 2—Literature Review

DoD Laboratory Purpose

The DoD depends on its research laboratories to develop and transition new technologies and systems that enhance or improve military operations and ensure technological superiority over adversaries. Dobbins (2004) explained that technology transition is the process by which technology deemed to be of military use is transitioned from a science and technology environment for incorporation into an existing or new start acquisition program. The objective of this transition is to make the technology available to the military as quickly as possible at a best value to the government. Dobbins (2004) also noted that since available technologies suitable for transition usually are not part of the acquisition program's Program Objective Memorandum [POM], this can result in the candidate projects being at risk for successful transition.

The DoD's ability to successfully and routinely take advantage of its significant investment in S&T programs, funded at $12.2 billion in fiscal year (FY) 12, and transition the technologies coming out of its laboratories has been the focus of several Government Accountability Office (GAO) studies and analyses to better understand the challenges and identify possible solutions. The GAO (2005) noted that DoD historically has experienced problems bringing technologies out of the laboratory environment. The report cites several potential causes for these problems. These causes include inadequate demonstration of the technology potential, acquisition programs being unwilling to fund the final stages of a technology's development, and acquisition programs electing to develop technologies themselves instead of depending on DoD laboratories. The report noted that even though acquisition programs receive the greatest share of DoD's research, development, test, and evaluation funding, these programs instead prefer to invest in other areas perceived as being more important rather than maturing technologies from the DoD's laboratories.

The GAO (2006a) compared DoD's technology transition with commercial best practices including an assessment of the extent to which the DoD utilizes these practices. It found that leading companies utilize three fundamental techniques to successfully develop and transition technologies. These techniques are strategic planning at the corporate level to include prioritization of resources and identification of the most desirable technologies; gated management reviews to ensure feasibility of the technology and gaining product line commitment to incorporate the technology once the laboratory has finished maturation process; corroborating tools to document specific cost, schedule, and performance metrics to be met prior to transition occurring; and use of relationship managers to address transition issues within and between laboratories and the product line community. The report's findings are that DoD lacks the breadth and depth of these techniques and that there was no evidence of a defined phase for technology transition (GAO, 2006a).

Technology Transition and Challenges

Flitter (2008) provides a programmatic definition of technology transition as the "successful transfer of responsibility for development, testing and integration of a technology from the S&T community to the Acquisition community" (p. 5). He further enumerates that transition involves the "incorporation of a technology into the design for or production of an acquisition product" (p. 5). At the macro level, transition really is about getting technology to the warfighter and the supporting organizations.

Pezzano and Burke (2004) clearly articulate the need to transition programs from the S&T community into the acquisition system to enable a transforming Army. However, they assert this must be accomplished with maximum flexibility and an approach that reduces risk. They see it as incumbent on the acquisition community to develop innovative solutions at reasonable cost while providing maximum flexibility to a program office. They view the innovation as not being exclusive to product design but also involving effective acquisition and contracting. Pezzano and Burke sum up the conundrum facing the technology base as it strives effectively and efficiently to transition technology to PoRs:

> *Acquisition policy provides the acceptable guidelines and boundaries in which the PM community has to operate. However, creativity is required to meet the unique needs of a program and make the most efficient use of our scarce research and development resources.* (p. 22)

The National Research Council (NRC) (2004) explored the topic of accelerating technology transition to examine methods to expedite the adoption of new materials technologies in defense systems. The Council said it typically takes at least 10 years to move new materials and processing technologies from research to application and the historical precedents for technology transition into defense systems is neither fast nor efficient. These long timeframes are attributed to the complexity involved in invention, development, and transitioning. Among the challenges faced in the technology transition process are the varying and changing internal and external partnerships required for success:

> *[A]cademic, government, and industrial corporate laboratories lead the concept refinement and technology development; industry leads system development, demonstration, and production; and warfighters take the lead in deployment, operations, and support. While each partner has a critical responsibility in the process, team members may all have different goals, time lines, and funding levels. Achieving active collaboration among these partners during all phases of technology transition is a key goal for success.* (p. 1)

The NRC (2004) pointed to industry and research experience in the fields of the history of technology, business, and social sciences as ways in which the "social, cultural and historical factors influence adoption, implementation, and long-term acceptance of new technology" (p. 9). It asserts that scientists and engineers have a tendency to see only the technology solutions as causing a failure of technology transition while overlooking these other factors as well as the problem of communication. Another issue, particular for military systems, is the problem of introducing new technologies into existing systems. The NRC (2004) contends that "it is well known that once technologies become entrenched, change is very difficult to effect since the technologies themselves become locked in through the coevolution of various technological systems" (p. 9). For military systems, this problem is exacerbated by the practices and policies governing requirements and acquisition leading to constrained choices. Nontechnical issues that affect technology transition require an appreciation of social dynamics, including decision-making processes and who is accountable for what. Given the complexity of the defense establishment, individuals are responding to different requirements and drivers. For example, increasing the mobility or survivability of a system may be contrary to a requirement to reduce system cost. Recognition of the social dynamics, a group's size, and organizational characteristics play an important role in enhancing or impeding technology transition. The interactions between organizational subcultures are vital in determining the success or failure of technology transition. Technology transition is critically dependent on individuals who can successfully manage this interaction, while "fostering the communication that is the essence of successful technology transition" (p. 11).

The NRC (2004) identified the risk-reward relationship as a primary barrier for successful transition and insertion of new technologies. There is a belief that the DoD has a practice of punishing those who cause failure—for example, PMs who introduce a technology that fails, even in early testing. "This attitude within the DoD that so heavily penalizes failure and does not provide appropriate rewards for success breeds a culture that is, by nature, averse to transitioning new technology very rapidly, or at all" (p. 24). Figure 1 provides a comparison between the DoD and venture capitalist perspective of the value of success and penalty of failure for a particular technology. Unlike the DoD, the venture capitalist places a high value on success and a relatively low penalty for failure, which creates a strong incentive to succeed while accepting failures as part of the process.

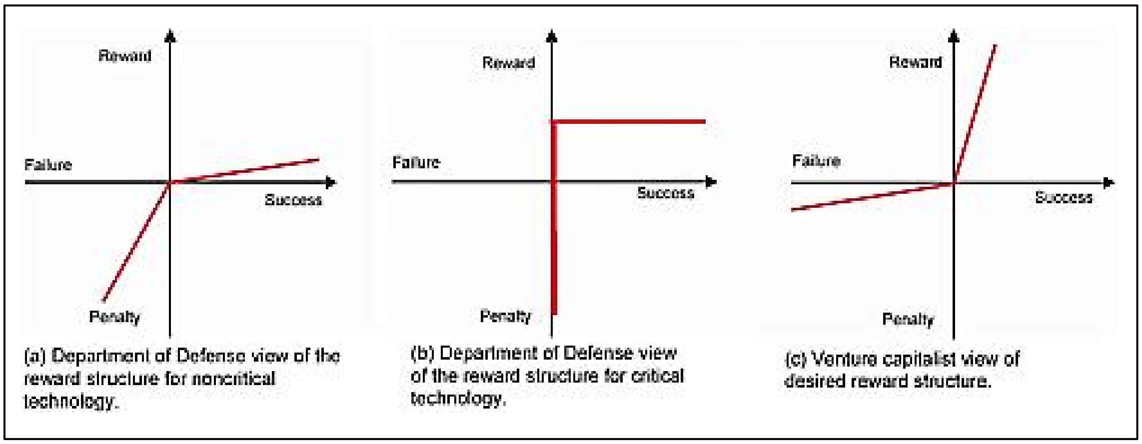

Figure 1. Different Views of the Reward Structure for New Technologies

The NRC (2004) asserted that, for military systems, the fear of failure and accompanying penalties represent a key barrier to moving forward in transitioning new technologies. This is reinforced by the fact that for almost every new technology a conservative fallback solution is available which, although it may have a lower performance level, also lessens the risk of failure. It contends that "the insertion of new technologies into military systems is, therefore, most rapid and effective when existing technology fails: there is a crisis and there is no fallback position" (p. 25).

The NRC (2004) did not identify a single strategy that, if implemented, will accelerate insertion of new technologies into military system. But "it is more likely that the omission of a key element of the many needed will guarantee failure" (p. 2). It determined that a strong organizational culture and structure was a necessary condition for the successful transition of technology. Furthermore, it identified certain common characteristics of successful technology transition efforts, including groups of committed, multidisciplinary teams led by a strong motivating champion; team determination in making the technology work; open and free communication, including communicating problems; and a willingness by the champion to take personal risk resulting in an organization that takes enterprise level risks.

Arcella (2005) argues that, to understand how to overcome the low success rate of technology transition through the so-called "valley of death" in the DoD, one needs to look to technical entrepreneurs and sales people from small start-up companies. An answer is the inherent risks within the system to incorporate new technologies, even at less cost, better performance, and quicker delivery time, as compared to legacy systems. An untried new technology, as compared to continuing with legacy systems, may not work and will divert resources from the customer management team to assess and verify it for deployment. The safe path is to stay with legacy systems, thereby eliminating buyer's risk and precluding any red flags and finger pointing. However, without acting to speed technology acceptance, the United States may lose its technological edge and erode the current advantages of the U.S. defense industrial base.

Albors-Garrigos, Hervas-Oliver, & Hidalgo (2009) analyzed mechanisms that influence the transfer and marketing of advanced technology and proposed a construct to explain how advanced technology is transferred, diffused, and adopted by users in a firm. They used a value mapping methodology adapted to the case of advanced technology and determined that variables such as technology complexity, market barriers, and relationships between researchers, developers, and final users are critical to technology transfer. Data and experience were used from the Grupo Activador de la Microelectronica en España (GAME) program, whereby the Spanish central and regional governments promoted increased usage of microelectronics in industry. By examining the development, outcome, and efficiency of the GAME program, the key factors that proved related to technology transfer are technology complexity, market barriers, a lack of customer focus, relationships with the research center, as well as the firm's feedback related to the added value of the project and technology.

Among the challenges facing technology providers is the vast array of wares from ideas, to patents, to market-ready mew products. These are touted by all kinds of peddlers (hawkers) from idea scouts to business incubators, including internal ones. There is a preponderance of sourcing opportunities and strategies in the marketplace which Nambisan & Sawhney (2007) term the “innovation bazaar” (p. 110). This “innovation bazaar” can be chaotic, daunting, and bewildering; they offer a guide to navigate the bizarre and make wise selections from vendors including the use of intermediaries to help companies navigate the bizarre and improve the effectiveness of their sourcing efforts and selections. The variables to be accounted for when transitioning technology would be the same variables to be considered for externally sourcing innovation and include the reach companies have as the cast about for ideas to assess, the cost of acquiring and developing ideas, the risk in turning them into marketable products, and the speed at which ideas can be brought to market (Nambisan & Sawhney, 2007).

Brown (2002) argues that in times of rapid and unpredictable change, corporate research needs to help companies invent new practices and processes to increase their flexibility rather than solely focusing on the next technology or on product development as the centerpiece of innovation. He offers four suggestions to improve an organization’s innovation aptitude. These include investing in research on new work practices, learning how to use the innovation that exists throughout the entire company, co-producing innovation by partnering with others throughout the organization to transmit the innovation, and understanding that the ultimate innovation partner is the customer. The corporate research function requires communicating the significance of radical innovations to the organization, developing tools and methods to improve customers' capacity for continuous innovation, and customizing technology and work practices to meet customers' current and future needs.

Similarly, Choi (2009) found that for, effective technology transfer, the technology provider needs to help change the adopter's perception of technology and consider the adopters' willingness to accept technology. Among the key factors to this acceptance are relationships and informal communication. The transfer of technology also should be a two-way communication because it is collaborative. In this process, the technology providers must play a key facilitating role and "should try to transfer to its adopters all resources and capabilities needed to use, modify, and generate the technology" (p. 55).

Iansiti and West (1997) surmise that a company's ability to choose technologies wisely has a large impact on the performance of its R&D [research and development] organization in terms of time to market, productivity, and product quality. They identify technology integration as a methodology companies use to identify, refine, and then select technologies for employment in a new product, process, or service. If a company selects technologies that do not work well together, it can end up with a product that is hard to manufacture, late to market, or one that does not fulfill its envisioned purpose. They say an effective technology-integration process must start in the earliest phases of an R&D project and provide a roadmap for all design, engineering, and manufacturing activities. The technology integration process defines the interaction between the research world and the worlds of manufacturing and product application. They say the more effective organizations follow a process characterized by three factors, which include emphasizing technology integration activities, following specific approaches to investigate the impact of novel technologies on product functionality and system performance, and dedicating to the process personnel who had prior experience with technology integration and are knowledgeable about the organization's capabilities.

Flitter (2008) offered the notion that the best transition occurs when there is no perceived transition but a seamless and continuous process from concept, development, test, production, and fielding of the technology.

Technical Data Rights

The statutory and regulatory requirements for the government's TDRs depend on included contract clauses as prescribed by the Federal Acquisition Regulation (FAR) (2013). The clauses are from Subpart 52.2 and include 52.227-14 through 23 as prescribed by Subpart 27.4. In contracting for ATD projects data rights clauses might include one of more of the following:

- FAR 52.227-14: Rights in Data—General
- FAR 52.227-15: Representation of Limited Rights Data and Restricted Computer Software
- FAR 52.227-16: Additional Data Requirements
- FAR 52.227-17: Rights in Data–Special Works
- FAR 52.227-18: Rights in Data–Existing Works
- FAR 52.227-19: Commercial Computer Software License
- FAR 52.227-23: Rights to Proposal Data (Technical)

Clauses 52.227-14, -15, and -16 will be the one most typically utilized and deserve some more detailed discussion. Under FAR 52.227-14, Rights in Data—General, the contractor protects proprietary data by withholding it or delivering it with restrictive markings specified by the FAR (2013). The government receives unlimited rights for all data first produced in performance of the contract, form, fit, and function data, and data delivered under the contract. Unlimited rights include the right to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly, in any manner and for any purpose and to have or permit others to do so. Exceptions are for limited rights data and restricted computer software. The contractor may withhold proprietary data and only has to deliver form, fit, and function information about the withheld data unless either the Limited Rights (Alternate II) or Restricted Computer Software (Alternate III) portions of the FAR clause are incorporated into the contract. Limited rights data embody trade secrets that the contractor protects by withholding from delivery unless Alternate II, limited data rights, of the clause is incorporated into the contract. In this case, the contractor must deliver the limited rights data marked, in specific terms, with how the government may use and share the data. These limited rights may be negotiated between the government and contractor. Restricted computer software is developed at private expense which the contract protects by withholding unless the contract includes unless Alternate III, restricted rights, of the clause is incorporated into the contract. In this case, the contractor has to deliver the restricted computer software with marking specifying the limits of the government's use of the restricted computer software. The restricted rights may be negotiated between the government and contractor. Under FAR 52.227-14 and as prescribed by FAR Subpart 27.4, 27.406-1(c), the government does not normally require a contractor to provide unlimited data rights that otherwise would be limited rights or restricted computer software. FAR 52.227-15, Representation of Limited Rights Data and Restricted Computer Software, requires the contractor to identify data it intends to withhold or deliver with limited rights or restricted computer software. FAR 52.227-16, Additional Data Requirements, requires delivery of data not specified for delivery in the contract.

The GAO (2006b) reported on DoD's failure to obtain sufficient TDRs for seven major weapons systems. It identified that "DoD guidance and policy changes, as part of the department's acquisition reforms and performance-based strategies, have deemphasized the acquisition of technical data rights." (p. 12). There were two major findings in the GAO report. The Army and Air Force's failure to obtain TDRs in procuring certain weapons systems was found to have proven problematic as the Services try to sustain these weapons systems. Second, it was found that DoD's acquisition policies do not require obtaining TDRs when procuring major weapons systems. Furthermore, the report cited the use of performance-based acquisition strategies by DoD as obviating, as perceived by some in DoD, the need for data or data rights. However, the report acknowledged that a number of factors complicate a PMs' decision on acquiring TDRs. Included among the factors that influence whether to procure TDRs are:

> *. . . contractors' interests in protecting their intellectual property rights, the extent the system being acquired incorporates technology that was not developed with government funding, the potential for changes in the technical data over the weapon system's life cycle, the extent to which long-term sustainment strategies may require rights to technical data vs. access to the data, the numerous funding and capability tradeoffs program managers face during the acquisition of a weapon system, the long life cycle of many weapon systems, and changes in DoD policies regarding the acquisition of technical data and the implementation of performance-based logistics* (p. 3) .

In its report, GAO (2006b) asserted DoD should strengthen policies for assessing technical data needs to support weapons systems since a crucial consideration in managing the life cycle of a weapon system is the availability of the item's technical data that are necessary to design and produce, support, operate, or maintain an item. The GAO (2006b) found that technical data decisions during the acquisition process have long-term and far-reaching consequences given the long life of systems in the defense inventory and recommended policy improvements for DoD's acquisition of technical data.

Among GAO's (2006b) recommendations were to "specifically require program managers to assess long-term technical data needs and establish corresponding acquisition strategies that provide for technical data rights needed to sustain weapons systems over their life cycle." (p. 19). It also recommended that the Secretary of Defense require that the GAO's recommendations be included in mandatory acquisition guidance, such as DoD Directive (DoDD) 5000.1 and DoD Instruction (DoDI) 5000.2, when next updated.

In discussing key elements of the September 14, 2010, Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) memorandum, *Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending*, Medlin and Frankston (2011) identify open systems architecture and the related acquisition of TDRs as being integral to the engineering tradeoff analysis that will be completed and presented at a program's Milestone B. The Milestone B is a Milestone Decision Review (MDR) at the end of the TD Phase of a DoD program's acquisition life cycle the purpose of which is to determine whether a program is ready to enter the Engineering and Manufacturing Development (EMD) Phase (see Figure 2).

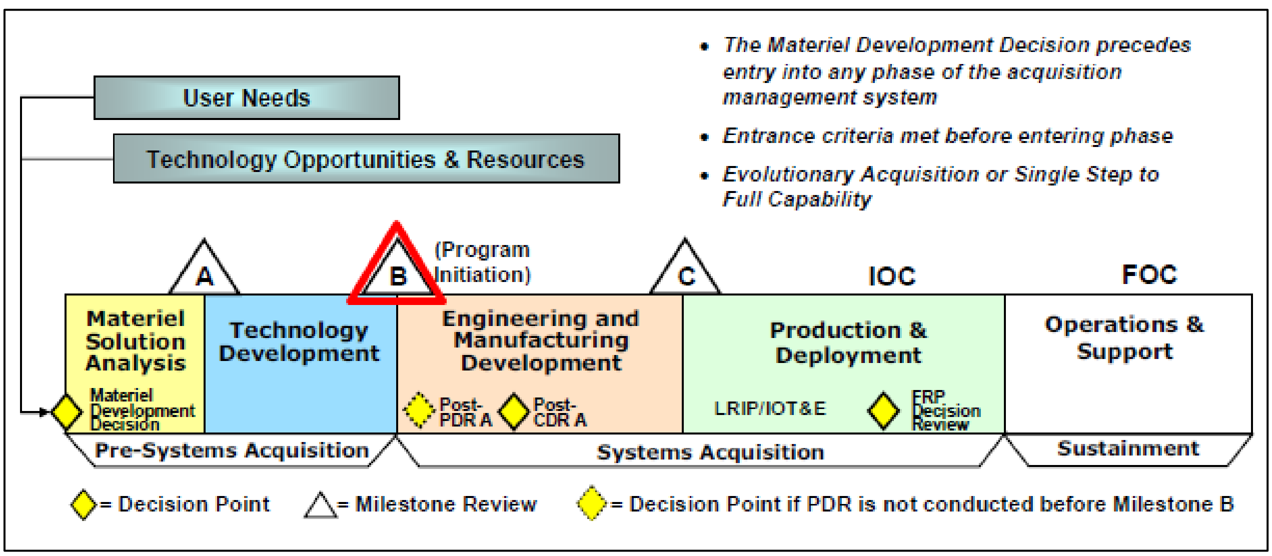

Figure 2. Acquisition Program Life Cycle

Medlin and Frankston (2011) describe the major purpose of an open architecture and the acquisition of TDRs as necessary to “ensure the government has the right information to compete future contracts (i.e., design documentation, interfaces, tools and information that can be shared with others)” (p. 32). The data rights referenced in the USD(AT&L) memorandum are not new. Title 10, Section 2320, Rights in Technical Data, have been in force for many years and is instantiated through both the FAR and DFARS. However, “technical data rights represent a poorly understood area, especially with respect to the sustainment aspects of technical data” (p. 32). They are of importance to ensure sustaining competition in acquiring weapons systems and “data rights decisions made during acquisition do have far-reaching implications over the system’s life cycle” (p. 32).

Conversely, Mazour (2009) argues that government contractors should be allowed to keep as many exclusive rights in technical data as possible and only provide the government with the minimum needed for government procurements. He makes the case for a revised technical data policy protecting the right of government contractors as ultimately in the best interest of both the government and private companies to keep contractors from walking away from government contracting because of a problematic data policy.

Watts-Horton (2009) investigated factors in purchasing technical data, specifically in the context for the long-term sustainment of military systems. Among her findings were: TDRs have been confusing, ambiguous and contradictory, at times leading to misinterpretation; the DFARS (2011) is a complex set of regulations mostly understood by legal personnel, but lacking clarity of understanding in nonlegal terms; lack of readily available data rights training outside of the procurement functional domain; financial pressures to buy either more items or more capability in lieu of TDRs; lack of skills and tools to determine appropriate and necessary TDRs; and the unpredictable in changing scenario requirement magnifies the difficulties in determining the appropriate level of TDRs for its intended purpose. She also identified the need for an understanding of long-term program acquisition strategy as a to determine how much and what kind of technical data is necessary to support the system given potential future upgrades, modifications, obsolescence, and manufacturing resources versus the impacts, if any, of having no technical data.

Chapter 3—Research Methodology

This chapter describes the research methodology including hypothesis, research process, and data collection used to explore the topic of whether government ownership of TDRs correlates to successful technology transition for TD projects.

Research Hypothesis

For this research project, the null hypothesis (H_0) is that government ownership of TDRs makes no difference in technology transition. The alternate hypothesis (H_1) is that there is a correlation between government ownership of TDRs and technology transition.

Research Process

The research process utilized a survey to gather the requisite data. The required survey data for this research was incorporated into a questionnaire that the AMSAA was using to gather information for an S&T technology transition study. The AMSAA study, concluded in February 2013, examined the past 10 years of Army ATD projects to identify factors contributing to the transition, or anticipated transition, of a technology product to a PoRs. AMSAA queried each PEO/PM identified by RDECOM as a ATD technology project customer. The identified customer PEOs included PEO Ammunition, PEO Aviation, PEO Combat Support and Combat Service Support (CS&CSS), PEO Command, Control and Communications—Tactical (C3T), PEO Ground Combat Systems (GCS), PEO Intelligence, Electronic Warfare, and Sensors (IEW&S), PEO Missiles and Space, PEO Soldier, and PEO Simulation, Training and Instrumentation (STRI). This specific research assessed, based on survey findings, whether there is any correlation between government ownership of TDRs and the transition of technology. AMSAA had elected not to consider TDRs in its study. In addition to the data AMSAA was seeking, the survey questionnaire, prior to distribution to the PEOs/PMs, was modified to query each respondent as to the level of government-owned TDRs, including unlimited rights, limited rights, or no rights, as well as any restrictions on computer software, for each S&T technology project. The survey also requested information on whether the project transitioned a product to a PEO/PM for use in a PoRs.

Data Collection

Eighty-three questionnaires were distributed to the identified customer PEOs/PMs on Oct. 23, 2012, requesting responses by Nov. 16, 2012. Responses were received between Nov. 16, 2012, and Jan. 11, 2013. Of the 83 questionnaires distributed, 78 responses were received from the surveyed PEOs/PMs covering 71 different projects for a response rate of 86 percent. The PEOs/PMs could not provide input for 12 of the projects due to personnel losses and/or a lack of knowledge on the project.

Chapter 4—Findings

The objective of this research was to use a survey to assess whether there is a correlation between government ownership of TDRs and technology transition from the S&T community.

Population and Sample Size

Eighty-three projects were included in the analysis when surveying PEOs/PMs via questionnaires. Of the 83 projects, the PEOs/PM provided survey responses on 71 separate projects. Of the 71 projects for which survey data were received, 40 were identified as a transitioning a technology product to a customer's PoRs. An additional 4 projects were identified as transitioning technology directly to the warfighter, either through a Quick Reaction Capability (QRC) or Joint Urgent Operational Need (JUON) executed by the PM, rather than through continued technology maturation and development as would be typical in the standard acquisition life cycle. An additional 27 projects did not transition a product(s) to a PM. These 71 projects form the underlying data set for the research analysis and findings. The survey questionnaire provided to the PEOs/PMs is included in Appendix A.

Collected Data

The surveys requested respondents to identify the TDRs associated with each project and whether these rights were unlimited, limited, or there were no government rights. Of the responses, 9 questionnaires neglected to provide any information on the data rights either by failing to answer the questionnaire or by indicating in the comment section that the type of data rights were unknown by the PEO/PM respondent. An additional 5 surveys were returned with the respondent indicating that the rights were unlimited, but providing a comment to the effect that the survey was answered by only using the individual's best engineering judgment. In both cases, these questionnaires were determined to not be meaningful either because of the lack of a response as to the specific project data rights or, in the second situation, the respondent not actually knowing the specific data rights, and the responses were excluded from the analysis. After excluding the data determined to not be meaningful, 57 projects remained to be included in the analysis. Figure 3 portrays the transition status for the projects included in the analysis and includes 37 projects transitioned to a PoR, three projects directly fielded, and 17 projects not transitioned.

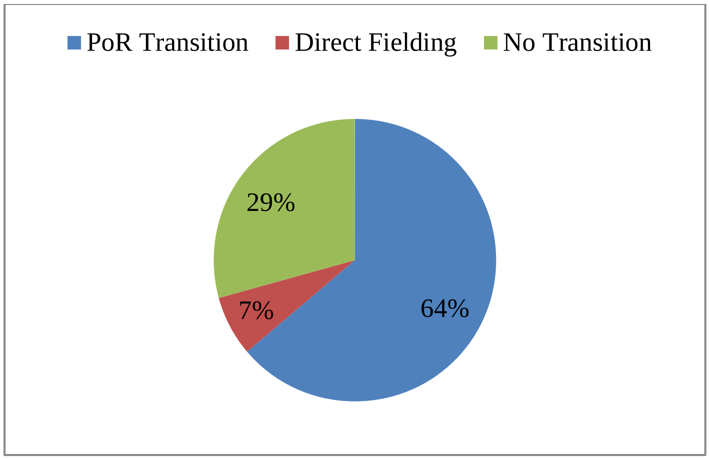

Figure 3. S&T Project Transition Status

A top-level summary of the data rights associated with each project included in the analysis is provided in Table 1.

Table 1. Summary of Technical Data Rights of Surveyed Projects

Transition Scope	Unlimited Rights	Limited Rights	No Rights
Program of Record Transition	12	23	2
Transition via Direct Fielding	3	0	0
No Transition	3	9	5

The S&T products provided to the PEO/PM recipients took various forms. The possible nature of the various products is categorized in

Table 2.

Table 2. Forms of S&T Products

Form	Description
System	A complete, multicomponent system that will be used or produced by the recipient
Hardware End Item	A materiel product that will be used or produced by the recipient
Component	A (sub-)component of the Hardware End Item
Software/Algorithm	
Knowledge Product	The knowledge product can take many sub-forms including: inform requirements (i.e., technology tradeoffs); inform acquisition (inform AoA, specification for RFP); standards, certification or accreditation; data analysis or report (including M&S or assessment reports); Scientist & Engineering support for follow-on development; Training, Leadership, or Education
People	Matrixed personnel or subject matter experts to a non-S&T organization for technical expertise/knowledge

The form or nature of the S&T product that was provided to the recipient is identified in Table 3, which includes products transitioned to a PoR, products directly fielded and those not transitioned.

Table 3. S&T Product Form

Transition Scope	System	Hardware End Item	Component	Software, Algorithm	Knowledge Product
Program of Record	6	7	10	12	2
Direct Fielding	1	0	2	0	0
No Transition	3	1	9	1	3

Table 4 identifies the form of those products that had unlimited rights. Table 5 shows the form of those products that limited data rights. Table 6 identifies the form of the products with no data rights.

Table 4. S&T Product Form for Projects with Unlimited Data Rights

Transition Scope	System	Hardware End Item	Component	Software, Algorithm	Knowledge Product
Program of Record	3	0	2	6	1
Direct Fielding	1	0	2	0	0
No Transition	0	0	3	0	0

Table 5. S&T Product Form for Projects with Limited Data Rights

Transition Scope	System	Hardware End Item	Component	Software, Algorithm	Knowledge Product
Program of Record	2	7	8	6	0
Direct Fielding	0	0	0	0	0
No Transition	1	0	5	0	3

Table 6. S&T Product Form for Projects with No Data Rights

Transition Scope	System	Hardware End Item	Component	Software, Algorithm	Knowledge Product
Program of Record	1	0	0	0	1
Direct Fielding	0	0	0	0	0
No Transition	2	1	1	1	0

Analysis

The collected data were analyzed by performing an analysis of variance (ANOVA) test calculated from the null hypothesis and the three sample groups consisting of unlimited rights, limited rights and no rights. In each of the three groups if a project transitioned it was assigned a value of 1, while a project that failed to transition was assigned a value of 0. The resulting group data are presented in Table 7, Table 8, and

Table 9 for groups with unlimited data rights, limited data rights, and no data rights, respectively.

Table 7. Unlimited Data Rights Group Statistics

Statistic	Value
Group Size	18
Mean	0.833
95% Confidence Interval for Mean	0.6260 thru 1.041
Standard Deviation	0.383
Average Absolute Deviation from Median	0.167

Table 8. Limited Data Rights Group Statistics

Statistic	Value
Group Size	32
Mean	0.719
95% Confidence Interval for Mean	0.563 thru 0.874
Standard Deviation	0.457
Average Absolute Deviation from Median	0.281

Table 9. No Data Rights Group Statistics

Statistic	Value
Group Size	7
Mean	0.286
95% Confidence Interval for Mean	-4.68E-2 thru 0.618
Standard Deviation	0.488
Average Absolute Deviation from Median	0.286

The ANOVA statistical test yielded an F statistic of 3.980 with a probability of the result, assuming the null hypothesis, of 0.024. The probability of the result is less than 0.05. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted implying that government ownership of TDRs makes a difference in technology transition. Other results of the ANOVA test are provided in Table 10.

Table 10. ANOVA Statistical Test Results

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares
between	1.533	2	0.766
error	10.40	54	0.192
total	11.93	56	

Chapter 5—Conclusions and Recommendations

Conclusion

Using findings based on a survey, this research assessed the correlation between government ownership of TDRs and technology transition. From the questionnaire responses of the ATD projects surveyed as part of this research, it was indicated that government ownership of TDRs makes a statistical difference in the successful transition of technologies from the S&T community to PoRs. The government staffs' understanding is that owning TDRs increases the likelihood that technology will transition. Owning the data rights also enables the government to have greater flexibility for incorporating technology products in acquisition programs. Without ownership of TDRs, the ability to transition technology is decreased and the government will be constrained in its use of the technology products by the company owning the data rights.

Recommendations

From survey findings, this research reveals that government ownership of rights makes a difference in the transition of technology. To make effective use of this finding, three recommendations are offered:

1) Increase collaboration between the S&T project offices and the program management office that is the intended recipient of the technology. This will enable a better understanding of the PM's planned use of the technology, how the technology fits within the PM's road map, as well as how the data ownership thereof corresponds to the acquisition program's overall Technical Data Rights Strategy. The S&T community needs to fully understand the impact if there are no technical data, or if is the data are limited in scope, and how this lack of TDRs could impact the PM's willingness to accept the technology and use it within the acquisition program identified as the transition venue.

2) Increase training and ensure S&T project office personnel understand that buying TDRs is a business decision that can ultimately impact technology transition. S&T project offices need to fully train their personnel on the various types of TDRs and what each of those various rights permits the government to legally do with the purchased data. Without a clear understanding of TDRs, the S&T project officers may misunderstand what is legally or contractually permissible and incorrectly establish technology contracts that may tie their hands at the end of the TD period and result in delivery of a product that cannot be used by other government offices or industry participants. Furthermore, the project officers must incorporate appropriate contract clauses for acquiring both the data rights and corresponding data. This needs to be done in coordination with both the PM and the appropriate government contracting offices. The purchasing of data rights and data delivery must be in an acceptable form for use by either the PM or the associated contractor who will have responsibility for incorporating the new technology into the acquisition program.

3) Prepare an overarching written Technology Agreement document to increase communication between the S&T project offices and PMs on the TDRs approach. In addition to describing items such as the expected technology performance, schedule, test methodology, and funding, the Technology Agreement also needs to define and include the agreed upon TDRs for the technology to be provided. By incorporating the TDRs plan as part of the overall Technology Agreement, both the S&T and PM communities will understand the rationale and justification and can clearly communicate a written agreement that will avoid ambiguity or misinterpretation as programs move forward and as individuals within the organizations change. The discussion process that results in an agreed upon Transition Agreement will help ensure that the S&T organization maintains a customer focus and that there is an open dialogue between the S&T community, as technology provider, and the PM, as technology recipient. Having a customer focus

and a transparent dialogue between parties have been identified in literature as key factors in achieving successful technology transition. A written data rights plan will help ensure these key elements are realized.

Limitations

Among the limitations of the research was the number of responses returned without identifying the data rights. That the data rights were unknown could indicate a lack of detailed project knowledge on the part of the respondent, a lack of understanding of the various categories of TDRs and what is legally permissible with each, or a deeper problem where, as was indicated in several survey responses, TDRs were not part of the discussions and project agreement between the S&T organization and the PM. Another limitation of this research was that it assessed transitions to PoRs. Transitions from the S&T community can take other paths to get new technology to the field. These transition paths could include non-ATD projects, an urgent needs program, nonprogram of record acquisitions within a PM office, or industry. It is unclear if these other technology paths will result in a different impact of government ownership of TDRs and transition success.

Areas for Future Research

Six additional areas are suggested for further research. First, expand the projects researched beyond just ATDs since the S&T community also invests in and develops technologies through smaller programs. Second, evaluate the effects of policy changes in the area of data rights on program success. Third, evaluate the specific return on investment (ROI) of investing in data rights. Fourth, research whether program acquisition strategies clearly provide an appropriate data rights strategy for the S&T community to follow. Fifth, research how the documented agreements between the S&T community, as technology providers, and the PM community, as technology adopters, communicate the needed rights to enable technology transition and technology use in major acquisition programs. The last area offered for additional research is to assess the effect the S&T product form (i.e., system, hardware, software, component, knowledge product, etc.), has on data rights appropriate for subsequent S&T project transition success. For example, knowledge products may only require limited rights to specify interfaces, while software may need unlimited rights if the software is intended to be integrated into a larger system, reused, or modified for future purposes.

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Glossary of Acronyms and Terms

ANOVA...............Analysis of Variance

AMSAA...............Army Materiel Systems Analysis Activity

ATD.....................Advanced Technology Demonstration

DAU.....................Defense Acquisition University

DFARS ....Defense Federal Acquisition Regulation Supplement

DoD......................Department of Defense

DoDD...................Department of Defense Directive

DoDI ....Department of Defense Instruction

EMD.....................Engineering and Manufacturing Development

FAR......................Federal Acquisition Regulation

FY ....Fiscal Year

GAME..................Grupo Activador de la Microelectronica en España

GAO.....................Government Accountability Office (formerly the General Accounting Office)

H_0 ....Null Hypothesis

H_1 ....Alternate Hypothesis

JUON ....Joint Urgent Operational Need

MDR ....Milestone Decision Review

NRC ....National Research Council

PEO......................Program Executive Officer

PEO CS&CSS......PEO Combat Support and Combat Service Support

PEO C3T..............PEO Command, Control and Communications—Tactical

PEO GCS ....PEO Ground Combat Systems

PEO IEW&S........PEO Intelligence, Electronic Warfare, and Sensors

PEO STRI ....PEO Simulation, Training and Instrumentation

PM........................Program Manager

POM.....................Program Objective Memorandum

PoR.......................Program of Record

QRC ....Quick Reaction Capability

RDEC...................Research, Development and Engineering Center

RDECOM ....Research, Development, and Engineering Command (U.S. Army)

ROI.......................Return On Investment

S&T......................Science and Technology

TD ....Technology Development

TDR......................Technical Data Rights

U.S.C. ....United States Code

WSARA...............Weapon System Acquisition Reform Act

Appendix A—Survey Questionnaire

AMSAA requests your assistance in confirming technology transition information on the following S&T Advanced Technology Development project. RDECs supplied project information. Please use the check boxes to indicate if you agree/disagree with the provided information and enter comments in the text box if you disagree. Status, recipient, form and factor definitions are shown on pages 2 and 3.

Title: <title> **Project #:** <project number>
Project Description:
<project description>

Start Date: <start date> **End Date:** <end date>

PEO: <peo> **PM:** <pm>

Status: reflects the framework under which the S&T product delivery/transition occurred.
Primary: <pri status>
Secondary: <sec status>
Agree with status: ☐
Please enter your comments:
Enter comments here

Recipient: characterization of the organization that received the S&T product from the laboratory or RDEC.
Primary: <pri recipient>
Secondary: <sec recipient>
Tertiary: <ter recipient>
Agree with recipient: ☐
Please enter your comments:
Enter comments here

Form: depicts the nature of the S&T product that was provided to the recipient.
Primary: <pri form>
Secondary: <sec form>
Tertiary: <ter form>
Agree with form: ☐
Please enter your comments:
Enter comments here

Intellectual Property: depicts who owns the Technical Data Rights and Intellectual Property of the S&T product.
Primary: <pri form>
Secondary: <sec form>
Please enter your comments:
Enter comments here

Factors that affected technology transition (positive or negative):
Primary Factor: <pri factor>
Secondary Factor: <sec factor>
Primary Factor: <ter factor>
Agree with factors: ☐
Please enter your comments:
Enter comments here

Was the product implemented in the program?
Enter comments here

Did the product get into the hands of the Warfighter?
Enter comments here

Definitions:
Recipient: characterization of the organization that received the S&T product from the laboratory or RDEC.

1. Warfighter. S&T product is provided directly to the warfighter typically through a direct fielding initiative without first being incorporated into a Program of Record.
2. Army Program of Record (POR). Recipient is a formal Army POR that is led by a Program Executive Officer, Program Manager, Project Manager or Product Manager.
3. Army Non-Program of Record. Recipient is an Army organization other than a POR, or the Army Test and Evaluation Center (ATEC) which is listed below. Examples include TRADOC, G-1, G-2, etc.
4. Army Test & Evaluation Center (ATEC).
5. DoD (non-Army). Any non-Army DoD recipient.
6. Industry. S&T product is picked-up by industry for further development; incorporation into a POR system; or adopted for direct production. Sometimes referred to as Technology Transfer.
7. S&T Organization. Intra-Army S&T transition, normally a 6.2 to 6.3 transitions from ARL to an RDEC, but could be to any organization within the Army S&T enterprise.
8. S&T Inventory. Reflects the completion of an S&T development effort that does not transition, or is not provided to another organization for further development and/or fielding. Reflects a potential solution to a future capability need.
9. Other. Recipient is to an entity no listed above.

Status: reflects the framework under which the S&T product delivery/transition occurred.

1. Endorsement. Nonofficial indication of support/interest from the intended recipient such as an e-mail; minutes from a meeting, etc.
2. Memorandum. A memorandum of understanding or agreement, but not a formal Technology Transition Agreement (TTA), that formally documents the support/interest from the intended recipient for the S&T product being developed.
3. Technology Transition Agreement (TTA). A formal, signed TTA is in place between the S&T entity and the recipient organization.

4. Technology Program Agreement (TPA). A formal signed intra-S&T agreement between two Army S&T organizations (typically between ARL and an RDEC).
5. Direct. A direct fielding to the recipient that does not pass through an Army Program of Record
6. Future Capability. Primarily used for intra-S&T transitions or for an effort that will, or is not anticipated to, transition to a non-S&T recipient immediately on task/effort completion.
7. None.

Form: depicts the nature of the S&T product that was provided to the recipient.

1. System. A complete, multicomponent system (e.g., Extended Area Protection & Survivability (EAPS)) that will be used or produced by the recipient.
2. Hardware End Item. A materiel product that will be used or produced by the recipient.
3. Component. A (sub)component of a Hardware End Item.
4. Software/ Waveform/ Algorithm.
5. Knowledge Product.
   a. Inform requirements (inform state of possible, technology tradeoffs).
   b. Inform acquisition (proof of concept, inform AoA, specification/basis for RFP, Technology Data Package (TDP), inform milestone decisions).
   c. Standards, certification & accreditation (Industry/Military) (test methods, process methodology, etc.).
   d. Other data analysis, report, documentation, publication (M&S/wargaming, tradeoff assessments, assessment reports, concept development/exploration).
   e. S&E support for follow-on development/ demonstration/ experimentation/ assessment (concepts, risk mitigation options, novel approaches, integration exploration).
   f. Training, Leadership & Education, Personnel, Facilities change requirements: TTP, training, etc.
6. People. Matrixed personnel/SME provide to a non-S&T organization for technical expertise/knowledge.

Intellectual Property: depicts who owns the Technical Data Rights and Intellectual Property of the S&T product.

1. Unlimited Rights—Right to use, disclose, reproduce, prepare derivative works, or distribute copies in any manner and for any purpose, and to have or permit others to do so.
2. Limited Data Rights—Data delivered with Marking specifying how the Government may use or disclose the data; conversely, the data may be withheld from delivery or specified via only form, fit, and function information.
3. Restricted Computer Software—Develop at private company's expense and Marked with Restricted Rights, thereby limiting the Government's use of the restricted computer software; conversely, the data may be withheld to protect it.
4. Copyright—Contractor asserted a copyright for the data.
5. Patent— a monopoly over a unique, nonobvious process, mechanical device, article of manufacture, composition of matter, etc. In the U.S. patents are issued by the Patent and Trademark Office.

a. Contractor retains title to the patent.
b. Government holds the patent title.

Factors: affecting transition (positive and negative)

1. POR Canceled (negative)—A Program of Record being canceled either ended portions of an ATO, forced technologies to be developed under an alternate ATO, or delayed the ability of a product to transition due to the need to find a different POR partner.
2. User requirements
    a.(positive.) The user requirements remained static— allowed for a smooth transition; some programs were quick reaction = direct requirement from the user/field.
    b.(negative.) Significant requirement changes forced cancelation or delayed transition of ATO (perhaps rendering the technology being developed no longer valid for the program's interest); TRADOC did not commit to a requirement.
3. Program funding——funding cuts resulted in technologies not being further matured; technologies deemed too expensive for fielding.
4. Schedule (negative).
5. Technology maturity.
    a. (positive.) The effort developed advanced techniques used for QRC.
    b. (negative.)The product technology did not reach the level of maturity necessary to transition to a POR; some had to be developed under alternate ATO or received additional funding from PM; sometimes dependent of other factors (funding, HQDA—raised maturation requirement, user requirements).
6. Lack of agreed upon deliverables— lack of signed MOA or TTA.
7. Data rights——no government ownership of data rights.
8. POR acquisition strategy
    a. (positive.) "Good acquisition strategy"; lining up multiple partners for transition.
    b. (negative.) Contract restrictions prevent transition of technology; "push" effort; POR choosing different type of technology than that being developed in current effort; requires multiple competitive sources; transition partner shift.
9. Testing challenges—challenges in testing the technology to ensure required readiness level
10. HDQA priority— includes initiative in 2006 timeframe to consolidate the number of ATOs (ATO delisting);HQDA requirement for projects to support a particular POR.
11. Communication—close relationship with the PM eased transition; proximity allowed for good communication, reviews, etc.
12. Proximity—geographic location was a positive influence on transitioning products, allowed for good communication, reviews, etc.
13. Leveraged previous S&T——products that were transitioned from a previous STO/ATO.

Appendix B—Summary of Survey Results

Project/ATO #	Title	Data Rights	Transition
D.C4.2006.03	Tactical Mobile Networks	Unlimited	Yes
D.C4.2008.02	Tactical Information Technologies for Assured Network Operations (TITAN)	Unlimited	Yes
D.FP.2008.05	Combat Vehicle Armor Development (Formerly FCS Armor Development and prior to that Vehicle Armor Technology (VAT))	Unlimited	Yes
D.IS.2006.01	3rd Gen IR Technology	Unlimited	Yes
D.IS.2007.03	"Soft" Target Exploitation and Fusion (STEF)	Unlimited	Yes
D.LG.2008.03	Non-Primary Power Sources	Unlimited	Yes
III.C4.2003.07	Networked Fires Using NLOS-LS	Unlimited	Yes
III.IS.2003.01	Sensor Counter Measure	Unlimited	Yes
III.MD.2004.04	Advanced Medical Training Technologies	Unlimited	Yes
III.MS.2003.05	MATREX	Unlimited	Yes
III.WE.2002.01	Advanced Miniature Multi-Role Precision Guided Missile Technology (AMMPGM)	Unlimited	Yes
III.WP.2001.01	Objective NLOS Mortar Technology	Unlimited	Yes
III.WP.2004.04	Lightweight Dismounted Mortar Weapon	Unlimited	Yes
IV.MS.2007.01	Severe Trauma Simulations	Unlimited	Yes
IV.SN.2002.04	Advanced Robotics Simulation	Unlimited	Yes
D.FP.2006.03	Rotorcraft Survivability	Limited	Yes
D.FP.2008.02	Standoff IED/Mine Detection and Neutralization for Route Clearance ATO-D	Limited	Yes
D.FP.2009.04	IED/Mine Detection for In Road Threats	Limited	Yes
D.FP.2010.03	Advanced Aviation Survivability D.FP.2008.01 Intelligent Decision Aiding for Aircraft Survivability (IDAS)	Limited	Yes
D.LE.2004.01	Non-Line-of-Sight Launch System Technology (NLOS-LS)	Limited	Yes
D.LE.2008.04	Advanced Lasers and UAS Payloads ATO-D	Limited	Yes
D.LG.2008.04	Capability-Based Operations & Sustainment Technologies—Aviation	Limited	Yes
D.SO.2008.04	Soldier Blast and Ballistic Protective System Assessment and Analysis Tools.	Limited	Yes
D.STT.2007.1	Scalable Embedded Training and Mission Rehearsal ATO-D	Limited	Yes
III.AV.2002.02	Survivable, Affordable, Reparable, Airframe Program	Limited	Yes
III.AV.2003.04	Manned/Unmanned Common Architecture Program	Limited	Yes
III.AV.2004.01	III.AV.2004.01—Small Heavy Fuel Engine (SHFE)	Limited	Yes
III.BC.2002.01	Coalition Combat Identification (CCID) ACTD	Limited	Yes

III.GC.2003.01	FCS Engine/Technology Development	Limited	Yes
III.SE.2005.01	Close-In Active Protection System (CIAPS)	Limited	Yes
III.WE.2002.04	Fire Control Node Engagement Technology	Limited	Yes
III.WP.2003.01	FCS 120mm LOS/BLOS System	Limited	Yes
III.WP.2004.06	MCS and Abrams Ammo System (MAAST)	Limited	Yes
IV.HS.2003.02	Rapid Construction of Urban Terrain Databases for Training.	Limited	Yes
IV.SP.2002.04	Embedded Training for Dismounted Soldiers STO	Limited	Yes
IV.SP.2003.04	Embedded Combined Arms Team Training and Mission Rehearsal	Limited	Yes
D.IS.2007.01	Objective Pilotage for Utility and Lift (OPUL)	Limited	Yes
IV.WP.2004.02	Hardened Combined Effects Penetrator Warhead Technology	Limited	Yes
III.LG.2000.03 - JE.27	Joint Precision Airdrop System (JPADS) ACTD	None	Yes
III.IS.2002.02	Head Tracked Sensor Suite	None	Yes
D.LE.2008.02	Scalable Technologies for Adaptive Response	Unlimited	No
III.WP.2005.01	Fuze and Power for Advanced Munitions	Unlimited	No
III.WP.2005.04	NLOS-C NL Payloads for Personnel Suppression	Unlimited	No
D.C4.2008.01	Close Combat Networking of Weapons & Sensors (CCNSW&S)	Limited	No
D.FP.2006.02	Extended Area Protection & Survivability	Limited	No
D.FP.2006.04	Kinetic Energy Active Protection System	Limited	No
D.LG.2006.02	Advanced Lightweight Truck	Limited	No
D.LG.2009.01	High Performance LW Track	Limited	No
III.GC.2004.04	Integrated Survivability	Limited	No
III.GC.2004.06	Full Spectrum Active Protection Close In Layered Shield	Limited	No
III.WP.2005.03	Common Smart Munitions	Limited	No
IV.GC.2006.02	High Power Density Engine	Limited	No
IV.MS.2005.02	Computer Generated Forces Scalability	None	No
D.LG.2004.02	Precision Airdrop - Medium	None	No
D.SO.2002.01	Future Force Warrior ATD.	None	No
III.WP.2002.02	IR Seeker CCM for the Laser Threat	None	No
IV.LG.2004.02	Water from Air	None	No