



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

**The Department of Defense's
Second Chasm in RFID-UID Technology Adoption**

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December 2007**

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REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 2007	3. REPORT TYPE AND DATES COVERED MBA Professional Report	
4. TITLE AND SUBTITLE The Department of Defense's Second Chasm in RFID-UID Technology Adoption			5. FUNDING NUMBERS	
6. AUTHOR(S) Jonathan Gray, Sylvester Brown Jr., and Terrell Hood				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) This study examines the possibility of the existence of a Second Chasm in the DoD's Radio Frequency Identification (RFID) and Unique Identification (UID) adoption. The study focuses on the DoD's small business partner's willingness to conform to the RFID-UID mandates and their reasons why. The compliance information was collected through anonymous surveys of DoD small business suppliers. The study then discusses the results of the survey and the relevance of the data to the DoD, and concludes with our findings and recommendations for alternate implementation plans for the mandates.				
14. SUBJECT TERMS Radio Frequency Identification, Unique Identification, Chasm			15. NUMBER OF PAGES 89	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

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**THE DEPARTMENT OF DEFENSE'S
SECOND CHASM IN RFID-UID TECHNOLOGY ADOPTION**

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Submitted in partial fulfillment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

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THE DEPARTMENT OF DEFENSE'S SECOND CHASM IN RFID- UID TECHNOLOGY ADOPTION

ABSTRACT

This study examines the possibility of a Second Chasm in the DoD's adoption of Frequency Identification (RFID) and Unique Identification (UID). The study focuses on DoD's small business partners' willingness to conform to the RFID-UID mandates and their reasons why. The compliance information was collected through anonymous surveys of DoD small business suppliers. The study then discusses the results of the survey and the relevance of the data to DoD. The study concludes with a summary of findings and recommendations for alternate plans to implementation the mandates.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIS	Automated Information System
AIT	Automated Information Technologies
CCR	Central Contracting Registry
CLP	Certified Lenders Program
DFAR	Defense Financial Accounting Regulation
DoD	Department of Defense
DoDSIG	Department of Defense Suppliers Information Guide
EFT	Electronic Funds Transfer
EPC	Electronics Product Code
FOC	Full Operational Capability
FPDS-NG	Federal Procurement Data System-Next Generation
FY	Fiscal Year
GAO	Government Accountability Office
GC	Office of Government Contracting
GC/BD	Government Contracting and Business Development
Gen	Generation
GFP	Government Furnished Property
IFF	Identification Friend or Foe
IOC	Initial Operational Capability
IRB	Institutional Review Board
ISO	International Standards Organization
MIL-STD	Military Standard
NADEP	Naval Aviation Depot
NAICS	North American Industry Classification Codes
NATO	North Atlantic Treaty Organization
PAR	Performance and Accountability Report
PLP	Preferred Lenders Program
pRFID	Passive Radio Frequency Identification
RFID	Radio Frequency Identification
RFC	Reconstruction Finance Corporation
SBA	Small Business Administration
SBAOA	Small Business Association Office of the Advocacy Impact of Regulations on Small Business Report
SBAERP	Small Business Administration Economic Report to the President
SBGR	Small Business Goaling Report
SDB	Small Disadvantaged Businesses
SDPA	Small Defense Plants Administration
SWPC	Smaller War Plants Corporation
TAV	Total Asset Visibility
UID	Unique Identification
USD (AT&L)	Under Secretary of Defense (Acquisition, Technology and Logistics)

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ACKNOWLEDGMENTS

We would like to sincerely thank our advisors Dr Nicolas Dew and Dr Mark Eitelberg for their valuable insights and support of this project. We would also like to thank the businesses that participated in our study. Without their opinions, this research would not have been possible.

— Jonathan Gray, Sylvester Brown, Jr., and Terrell Hood

I would like to thank Jonathan Gray and Terrell Hood, whose enthusiasm and research significantly contributed to the completion of our project. To my wife Erica and my children, Ariel and Devon, thank you for being supportive throughout my naval career, especially during my long periods away from home.

— Sylvester Brown, Jr.

I would like to thank my friends Sylvester Brown Jr. and Terrell Hood for their untiring commitment and perseverance throughout this ordeal. For my wife India and my children, Mystique and Jonathan III, I thank you for your sacrifices, and for affording me the opportunity to reach another milestone in my career. I love you always.

— Jonathan Gray

First, I would like to thank God for the many blessings that he has bestowed upon me. To my wife Pamela and my children Felicia, Terrell II, Justice and Jillian, thank you for being supportive throughout my Marine Corps career, which helps motivate me to perform at a high level. Finally, thanks to my MBA partners Jonathan Gray and Sylvester Brown whose enthusiasm and research significantly contributed to the completion of our project.

— Terrell D. Hood

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I. PURPOSE

This project analyzes the adoption of the Department of Defense (DoD) Passive Radio Frequency Identification (pRFID) and Unique Identification (UID) mandates by small business suppliers. We study three key issues.

1. First, we suggest is that an adoption chasm exists between middle and late adopters of RFID and UID. If this is true, then DoD might be faced with many small business suppliers that will act as a drag on its planned adoption of pRFID and UID technologies. Data we collected for this study suggest that this conjecture is indeed reasonably valid.
2. Second, we examine some of the possible causes of this chasm, by analyzing whether these mandates mesh with small business regulations by identifying what barriers to adoption have been created.
3. Third, we identify ways DoD can get their remaining small business suppliers to traverse this chasm enroute to conformance. If an adoption chasm exists, then DoD will need to formulate new policies to encourage or compel these small business suppliers to conform to RFID and UID mandates.

A. BACKGROUND

1. Small Business Administration¹

Management of the United States economy is a primary concern to lawmakers, politicians, and business leaders. Over the years, various tools have been introduced that help to ensure these concerns have been continually addressed. In 1932, President Herbert Hoover created the Reconstruction Finance Corporation (RFC) to provide assistance to all businesses hurt by the Great Depression. Congress created the Smaller War Plants Corporation (SWPC) in 1942 to help small businesses obtain financial

¹ Small Business Administration about SBA Overview and History of SBA. Retrieved November 18 2007, from <http://www.sba.gov/aboutsba/history/index.html>.

resources to participate in World War II production efforts. During the Korean War, Congress created the Small Defense Plants Administration (SDPA), which functioned under the RFC to assist small businesses. Although all of these organizations were eventually abolished, their sole purpose was to provide businesses with the resources they needed to keep the economy prosperous.

In 1952, President Dwight D. Eisenhower proposed the creation of the Small Business Agency. Congress responded by creating the Small Business Administration (SBA). The purpose of the SBA is to aid, counsel, assist and protect the interests of small business concerns. The Small Business Act of 1953 also stipulated a fair proportion of government contracts and sales of surplus property were to be diverted to small businesses. From the Great Depression through the present, small businesses have received support from lawmakers and politicians, including financing from large businesses made possible through the SBA or one of its predecessors.

2. Department of Defense

DoD manages one of the largest logistical supply systems in the world. The FY 2006 DoD Performance and Accountability Report (PAR) estimated that the combined net asset value of the DoD's inventory and equipment totaled approximately \$700 billion, and it continues to grow on a daily basis (DoD PAR, 2006). Like most large organizations, DoD employs a significant workforce to manage these assets.

Unfortunately, this substantial DoD workforce has no idea of where a significant percentage of the \$700 billion in assets is located. In fact, according to a United States Government Accountability Office (GAO) report to Congress in 2005, DoD has not maintained positive control over these assets in years.²

In an effort to regain control of these vast assets, DoD took steps to implement an aggressive new Automated Information System (AIS), which includes several Automated

² "For many years, the DoD has been attempting to improve visibility over its inventory and equipment. The lack of visibility over inventory and equipment shipments increases vulnerability to undetected loss or theft and substantially heightens the risk that millions of dollars will be spent unnecessarily." (GAO, 2006)

Information Technologies (AIT). The technological roots of these new systems trace back to the initial days of aviation, when German and American Armed Forces struggled to perfect the long-standing issues of Identification of Friendly Forces (IFF), utilizing crude radar systems.³

DoD has decided to build upon these initial experiments, effectively revitalizing pRFID technology. Subsequently, DoD also plans to add UID technology into this process as well. UID is essentially an evolution of the industry-standard bar code system.

B. SCOPE

DoD has billions of dollars in assets disbursed around the world. One of the issues it hopes to resolve with the implementation of its pRFID and UID mandates is to gain better accountability and visibility of those assets. Improved visibility of assets is critical to the future allocation of resources and investments. DoD has adopted a suite of identification technologies, including aRFID (active RFID), pRFID (passive RFID) and UID (unique identification) technologies. Over time, these technologies will become part of DoD's supply chain management process. The desired end-state is that the combination of these and other technologies will provide total asset visibility, regardless of where those assets may be located. Ultimately, the technologies will become part of the DoD's broader AIT system. The system is designed to completely automate the tracking of assets. DoD plans to deploy this technology across its entire supply chain, and expects that once fully implemented, AIT will solve some of its most pressing asset management issues.

To accomplish this sizable task, DoD has issued a series of policy mandates to all of its stakeholders. These mandates contain what could be regarded as the blueprints of how DoD envisions this implementation process to evolve. When they were released, the

³ The Germans attempted to solve the identification problem by simultaneously rolling their aircraft in response to a signal from the ground radar station. This would change the radar reflection's polarization, creating a distinctive blip on the radars. This crude system was the first demonstration of active RFID using electromagnetic backscatter. The British responded by creating IFF, where long-range transponders actively modulated the reradiated ground radar signal so the aircraft itself did not have to. Parallel to these developments, Harry Stockman of the US Air Force Materiel Command published "Communications by Means of Reflected Power," the first public description of RFID technology. (Rieback, 2006)

mandates identified the stakeholders, provided directions as to how they should proceed with their relevant implementation processes, and attempted to discuss any potential problem areas where DoD was still searching for solutions. Additionally, DoD embedded within these mandates a set of specific timelines, to coordinate the implementation process. The feasibility of these mandates will be the focus this research effort. The research will analyze the processes used to implement pRFID and UID technology, and examine whether the guidance provided in the mandates is clearly interpretable throughout the department.

C. METHODOLOGY

The methodology used for this project consists of the following steps:

1. Analyze the pRFID and UID mandates for guidance on the compliance process.
2. Review small business regulations pertaining to DoD.
3. Review published literature on the mandates.
4. Define the technology adoption curve and the role chasms play in them.
5. Review the Central Contracting Registry for industries that may be affected by these mandates. Service industries were excluded and those industries involved in manufacturing were targeted. Industries located within the state of California were chosen due to budgetary and time constraints.
6. Conduct a phone survey of small businesses to determine compliance and reasons for their decisions.
7. Determine whether the sample represents the population.
8. Prepare a summary and make recommendations.

1. Details of the Mandates

In FY 2004, DoD issued two policy memorandums, or mandates, to its suppliers. The Radio Frequency Identification (RFID) Policy was released in July 2004. (Wynne, July 2004) It was preceded by the Policy for Unique Identification of Tangible Items (UID), which was released in July 2003. (Wynne, July 2003) It should be noted that DoD has released several other related policy updates and modifications since this time. Of significance was the United States Department of Defense Suppliers' Passive RFID (pRFID) Information Guide, Version 9.0. The guide stated that all solicitations awarded with the appropriate contract clause have pRFID tags affixed at the case, pallet, and UID item packaging level for material delivered to the Department of Defense. (DoDSIG, 2007) Additionally, DoD considers the cost of compliance a normal cost of doing business, and requires suppliers negotiate the costs with organizational contracting officials. (DoDSIG, 2007)

2. pRFID Implementation Approach

pRFID technology is expected to be implemented through a phased approach. DoD envisions all shipments of goods and materials will be phased in by procurement methods based upon class, commodity, location, and layer of packaging. DoD suppliers are required to follow the following implementation approach:

Commencing 2005, RFID tagging will be required for all DoD manufacturers and suppliers who have new contracts, issued with the appropriate contract clause, according to the following implementation guidelines:

The following Classes of Supply will require RFID tags to be placed on all individual cases, all cases packaged within palletized unit loads, and all palletized unit loads:

- Class I Subclass – Packaged Operational Rations
- Class II – Clothing, Individual Equipment, and Tools
- Class VI – Personal Demand Items

- Class IX – Weapon Systems Repair Parts & Components

In 2006, in addition to the classes stated for 2005, there are three additional classes:

- Class III(P) – Packaged Petroleum, Lubricants, Oils, Preservatives, Chemicals & Additives
- Class IV – Construction & Barrier Equipment
- Class VIII –Medical Materials (except Pharmaceuticals)

In 2007, DoD will not require suppliers to apply passive RFID tags to the unit packs during the 2007 calendar year. The Department will continue to evaluate the appropriate time frame to begin tagging at the unit pack level and will promulgate this requirement in advance of future issuances. (DoDSIG, 2007)

DoD has also provided additional guidance on where and how the pRFID tags should be affixed to the packages. In this guidance, suppliers will find instructions for affixing address labels and RF tags. Suitable locations where there is a minimum risk of damage and highest potential for successful interrogation must be achieved (MIL-STD-129P, 2007)

The guide provides significant information about supplier requirements; however, the requirements for DoD seem disproportionate given its stake in the overall program. DoD's role seems focused primarily on ensuring that the appropriate clause is placed into the solicitation for bids.

3. UID Implementation Approach

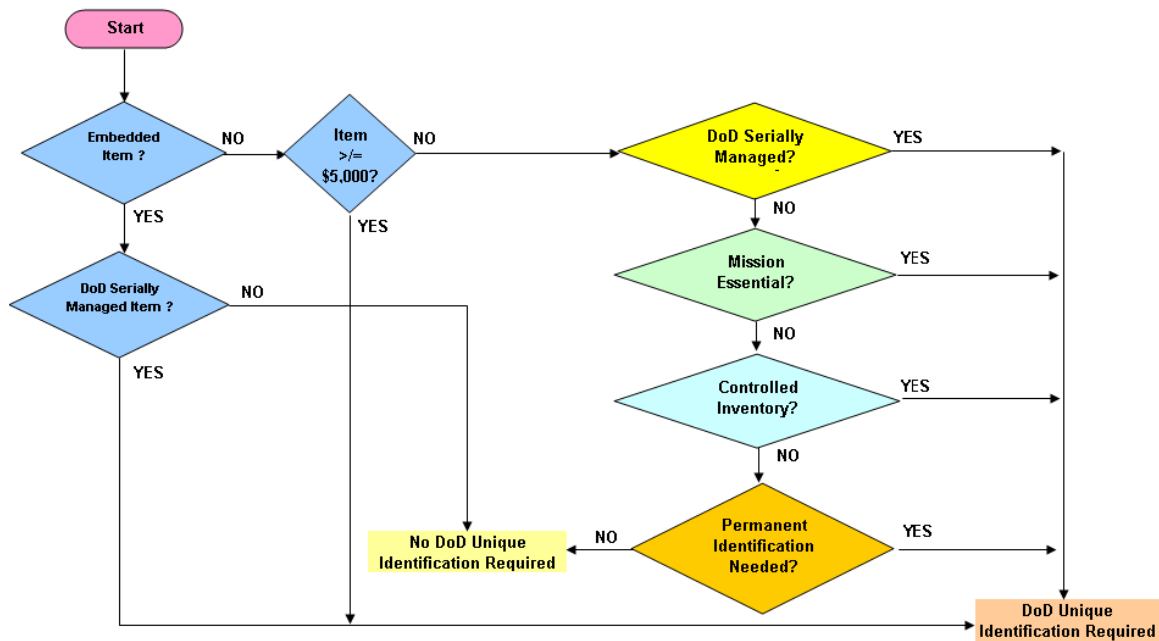
The latest UID implementation plan was issued in July 2007; however, it evolved from the initial policy memorandum issued July 2003. The original policy stated that UID would be a mandatory DoD requirement on all new equipment and materiel delivered pursuant to solicitations issued on or after January 1, 2004. Tangible assets manufactured by DoD's organic depots are to be considered "new" items that fall under UID marking policy, beginning January 1, 2005. It further stated that items considered significant would be uniquely identified if: (1) the acquisition cost (manufacturing cost

for DoD depots) is \$5,000 or more, (2) it is either a serially managed, mission essential or controlled inventory piece of equipment, or a repairable item, or a consumable item or materiel where permanent identification is required, (3) it is a component of a delivered item, if the Program Manager has determined that unique identification is required, or (4) a UID or a DoD-recognized UID equivalent is available. (Wynne, July 2003)

In a major policy update on 23 December 2004, the Under Secretary of Defense (Acquisition, Technology and Logistics) [USD(AT&L)] issued a Memorandum entitled “Policy for Unique Identification (UID) of Tangible Personal Property Legacy Items in Inventory and Operational Use, Including Government Furnished Property (GFP). This update extended the parts-marking and data-management requirements, previously applied only to newly manufactured items, to all significant items currently in the DoD inventory (Wynne, December 2004). The policy update had profound implications for DoD depots, both organic and commercial, in addition to DoD maintenance organizations.

Since parts were not expected to be removed from service for the sole purpose of UID marking, the policy update stipulated that a majority of legacy marking would take place in conjunction with a maintenance or modification action (“opportunistic marking⁴”). Figure 1 below depicts the DoD decision tree for UID tagging.

⁴ “The Services should plan on establishing initial depot operating capabilities for legacy items by July 2005 at those depot facilities currently involved with UID for depot manufactured items (i.e., NADEP Cherry Point, Letterkenny Army Depot, and Ofden Air Logistics Center). Planning will ensure that appropriate design authority approval is obtained prior to actual parts marking (which will be done IAW the associated policy and standards). After such Initial Operating Capability (IOC) is established, and based on corresponding lessons learned/experience gained, Full Operating Capability (FOC) at all organic depots will be put in place not later than FY 2007.” (Wynne, December 2004)



Source: UIDIP 2005

Figure 1. DoD Decision Tree for UID

4. Small Business Regulations

The Small Business Administration (SBA) was established as a proponent of small business concerns. Its primary role is to promote the welfare of small businesses. The Small Business Act of 1953 was established to assist small businesses obtain a fair share of government procurement contracts. It was designed to level the playing field between large and small business, and to foster overall economic growth. Small businesses are supposed to be able to utilize these tools to effectively conduct business with all federal organizations. Given this information, why does there appear to be implementation issues concerning the DoD's pRFID and UID mandates within the small business supplier base?

There are several avenues available for information to flow between DoD and its small suppliers. One method of communication is via the SBA Web site. Once logged-on, small businesses may search through the latest newsletters or sign up for e-mail notifications. The SBA is supposed to assist in this process, as stated in the Small

Business Act, which stipulates that the SBA is supposed to "...aid, counsel, assist and protect, insofar as is possible, the interests of small business concerns..." (SBA, 1953) The charter also stipulates that the SBA will ensure small businesses receive a "...fair proportion..." of government contracts and sales of surplus property. (SBA, 1953) The current Mission Statement of the SBA is to maintain and strengthen the Nation's economy by enabling the establishment and viability of small businesses and by assisting in the economic recovery of communities after disasters. (Coburn, 2007)

The SBA offers several programs that can assist small businesses in meeting the standards of the mandates. The programs are described briefly below.

- **Office of Entrepreneurial Development Network of Training & Counseling Services**

The Office of Entrepreneurial Development's mission is to help small businesses start, grow, and compete in global markets by providing quality training, counseling, and access to resources.

- **7(a) Loan Programs**

The SBA offers information on various lender programs. The Certified Lenders Program (CLP) is designed to provide expeditious service on loan applications received from lenders who have a successful SBA lending track record and a thorough understanding of SBA policies and procedures. The Preferred Lenders Program (PLP) is another step in SBA's process of "streamlining" the procedures necessary to provide financial assistance to the small business community. In addition, there is information on SBAExpress, Community Express and Secondary Market Programs. The following fall under 7(a) Lender Programs:

- [Patriot Express](#)
- [Certified Lenders Program \(CLP\)](#)
- [Preferred Lender Program \(PLP\)](#)
- [SBAExpress](#)
- [Community Express](#)
- [Secondary Market Programs](#)

- **Office of Government Contracting and Business Development**

The Office of Government and General Contracting was established to help enhance the effectiveness of small business programs by working with Government Contracting and Business Development (GC/BD) program offices and others to develop policies, regulations, and statutory changes.

- **Government Contracting**

The Office of Government Contracting (GC) works to create an environment for maximum participation by small, disadvantaged, and woman-owned businesses in federal government contract awards and large prime subcontract awards. GC advocates on behalf of small business in the federal procurement world.

- **Resources**

- [Search Contracting Only](#)
- [HUBzone](#)
- [Sub-Net](#)
- [Pro-Net/CCR](#)
- [Tech-Net](#)
- [Goaling](#)
- [For Contracting Officers Best Practices in Mitigating the Effects of Contract Consolidation on Small Businesses U.S. Department of Defense, Office of Small and Disadvantaged Business Utilization, "Benefit Analysis Guide Book"](#)
- [Interim Rule issued requesting comment on terminating the price evaluation adjustment](#)
- [SBA issues final rule ending the Very Small Business Pilot Program](#)

- **Small Disadvantaged Business**

The SBA administers two particular business assistance programs for small disadvantaged businesses (SDBs). These programs are the 8(a) Business Development Program and the Small Disadvantaged Business Certification Program. While the 8(a) Program offers a broad scope of assistance to socially and economically disadvantaged

firms, SDB certification pertains strictly to benefits in federal procurement. The 8(a) firms automatically qualify for SDB certification.

5. Literature Review

DoD has dedicated a tremendous amount of resources and effort to the implementation of pRFID and UID technology. Although it has invested significant resources in this effort, DoD is still far from achieving its intended goals. Originally, DoD estimated that it would have its pRFID system up and running by January 1, 2007. After it encountered implementation issues, DoD had to revise this date. The Government Accountability Office (GAO) now estimates that the system will not be fully implemented until at least 2016. (GAO, 2005)

Why has the DoD implementation plan suffered such significant setbacks? The list is long; however, some key contributors appear to be:

- pRFID is still an immature technology, i.e., the pace of evolution of the performance/capability of the core technology and many of the necessary complementary components (such as readers, middleware, implementation services, etc.) have affected DoD's implementation plans.
- Funding, budgeting and payback issues within DoD have affected implementation.
- Implementation plans have been affected by the slower than expected pace of evolution of industry standards.

Each of these contributors, taken in a vacuum, could be perceived as a potential showstopper for DoD's aggressive implementation plan. When combined, they could potentially justify terminating the plan altogether. So why is DoD experiencing these setbacks with its implementation plan? These are questions that have been posed by many, from DoD to "academia" and now even the U.S. Congress. In fact, Congress has called upon the GAO several different times since the plan's inception, in an attempt to uncover the root causes of these setbacks. As a result of these investigations, GAO placed DoD supply chain management on its high-risk programs list, a place where it still remains today. (GAO, 2007)

If DoD hopes to overcome these setbacks, it needs to address each issue independently, understand the motivational factors driving them, and then develop plans to mitigate their effects. The following attempts to address the concerns uncovered, and assess how they impact small business suppliers.

6. Passive RFID is an Immature Technology

When GAO initially studied DoD's pRFID implementation plan, it cited the immaturity of the technology as a primary factor inhibiting successful implementation. (GAO, 2005) Many organizations, both within industry and even DoD itself, were reluctant to implement the current generation technology. Most felt that it made little business sense to obligate funds for procurement of Generation 0 and 1 (Gen 0 & Gen 1, respectively) technology, when they knew that the Electronics Product Code (EPC) global Generation 2 (Gen 2) standard had already been developed. Further, DoD itself had already informed them, in the original RFID mandate, that it would be migrating to the Generation 2 standard as soon as the technology became available. (Wynne, July 2004)

On October 16, 2006, DoD made it official that it would be transitioning to the newer Gen 2 pRFID tags. It released a memorandum indicating that, as of February 28, 2007, only Gen 2 tags would be accepted, a month after all suppliers were supposed to be shipping all material with pRFID tags attached. The rationale offered for instituting the change after the deadline was to help ensure that contractors would not be left with large, obsolete inventories of Gen 1 tags. (Assad 2006)

While this seems like a noble gesture on behalf of DoD on the surface, it exposes flaws within the DoD pRFID implementation strategy. First, why would DoD assume that suppliers would need only a month to reduce its remaining inventory of Gen 1 tags? Second, what were suppliers supposed to do with any remaining Gen 0 tags? One would assume that DoD surveyed a sample of its supplier base to assess their remaining inventory of Gen 1 and Gen 0 tags. Further research needs to be conducted to determine if this is indeed the case. Another concern for DoD organizations is modifying existing

contracts to comply with the new regulation. This would mean they had to pay more money to existing contractors to modify their contracts. With decreasing budgets, this poses unique challenges.

Armed with this information, which has been made publicly available courtesy of GAO, is there any wonder why suppliers appear to be reluctant to conform to the pRFID mandate? According to a 2005 study of the impact of federal regulations on small businesses, many small businesses shoulder a disproportionate percentage of the estimated \$1.1 trillion costs resulting from federal regulations. (SBAOA, 2005) Given the significant investment of capital required up front to implement pRFID technology, is there any wonder why they would be more hesitant to shoulder more of these costs?

The performance capability of pRFID technology has been questioned ever since the decision was made to implement the technology. The read rate accuracy of the tags has produced mixed results from within DoD and industry as a whole. As GAO observes: *“Army officials told us that within DOD and private industry there is a concern about the level of accuracy for reading tags.”* (GAO, 2005)

For the technology to be successful, it must contribute to reducing the costs of the DoD supply chain. The manner in which the technology is supposed to reduce costs is by providing DoD with improved asset visibility. This asset visibility is obtained by accurately identifying where material is located throughout the supply chain.

As of the 2005 GAO report, tag accuracy rates ranged between 32 and 90 percent, between DoD and industry. Accuracy rates varied due to a number of factors such as placement of the tags and how the pallet was loaded. As stated in the 2005 GAO report: *“According to Wal-Mart officials, as of January 18, 2005, the accuracy of its read rate for tagged items on fully loaded pallets was 66 percent and stated that reading all cases on a fully loaded pallet remains the biggest challenge.”* (GAO, 2005)

Although many small businesses ship single line items to the DoD, many of these shipments are consolidated to minimize costs. Additionally, when a small business does ship more than a single line item to DoD, these too will most likely be consolidated whenever possible for similar reasons. If accuracy rates of the tags were reduced due to

this consolidation, it would make sense to avoid consolidating the pallets. However, if not consolidating the pallets would result in increased costs for the small business, they would be less likely to do so.

Charged with this decision, most prudent businesses would likely choose to avoid increasing their costs. If they know that their cost will increase if they choose to separate the shipments, and they also know that industry as a whole is having trouble with accuracy rates, then wouldn't the most logical and cost-effective decision be to avoid tagging the pallets until accuracy rates are improved? This decision would be most cost effective for the suppliers, and would make more sense than investing in technology that does not work. Our initial research seems to suggest that this is the case; however, further research needs to be conducted to legitimize this thesis.

7. Funding, Budgeting and Payback Issues

The War on Terror has placed considerable financial burdens upon DoD. With total cost of war estimates soaring past \$1 trillion as of FY07, DoD finds itself scrambling to justify its expenditures. (CRS, 2007) It estimates that to maintain its supply chain for just Iraq and Afghanistan, it is investing close to \$150 billion a year. (GAO, 2007) In total, DoD spends well over \$450 billion a year in supplies and services. (USD Comptroller, 2008) Many of these supplies originate from small businesses. In fact, recent data verify that DoD awarded approximately \$234 billion to small businesses in FY06. (SBGR, 2006) To put this into perspective, the federal government awarded small businesses about \$11 billion total on all Hurricane Katrina-related contracts in 2006. (GAO, 2007)

GAO estimates that the future funding costs to implement just pRFID will be approximately \$472 million, and not be completed until 2011. GAO also points out that this significant amount of funding does not include systems integration, which it estimates will be the most expensive element of the implementation. (GAO, 2005)

Given this environment, the individual service components have increasingly been reluctant to fund non-critical programs, such as pRFID implementation. As GAO

finds: *“The military services have expressed concern about the unknown return on investment for passive RFID, which has led to reluctance to provide funding for passive RFID.”* (GAO, 2005)

If the DoD components are reluctant to fund the implementation of pRFID, should it not come as a surprise that industry, especially small businesses, has also been reluctant to do the same? Studies seem to suggest that companies are reluctant to implement the technology because they don’t feel confident that they will be able to justify the Return on Investment (ROI), especially if they have limited dealings with DoD⁵. The studies also suggest that a significant amount of time, perhaps as long as five years, could lapse before companies would begin to see return on investments (ROI) to support implementation. (Gayle, 2005) Given this significant payback period, it would seem hardly prudent for most companies to adopt at this time. The results of the survey will be used to validate this thesis.

8. Implementation Plans Based on Long-Lead Policy Modifications

A significant contributor to the delays DoD is experiencing in implementing its UID mandates stems from forces beyond its control. An important milestone criterion for implementing UID is integration with the international community. Specifically, UID must be able to comply with the International Standards Organization (ISO) and North Atlantic Treaty Organization (NATO). While ISO standardization was achieved as planned, the NATO standard required ratification before it was accepted. (GAO, 2007)

Understanding that time-lines are fluid at best, especially when dealing within an international framework, DoD should have anticipated potential delays in achieving its mandate. Further, it should not have required conformance to its mandate until it was assured that the international requirements of its mandate were obtained before establishing a solid deadline.

⁵ Short-term contracts often discourage suppliers from investing in performance improvements because the payback period may exceed contract length or otherwise be too short to cover their costs. (RAND USAF Implementation, 2004)

As a result of this lack of foresight, DoD was forced to delay implementing its UID initiative. The compliance deadline had to be pushed back from January 2007 to January 2008. (GAO, 2007) While this may appear to be an isolated setback, given the tremendous accomplishments of the UID program to date, further insight into the issue may reveal a larger setback down the road in the context of the small business suppliers.

Prior to this seemingly isolated setback, DoD had experienced substantial participation in its UID implementation on behalf of its small business suppliers. In fact, the participation had been so substantial that the then Under Secretary of Defense for Acquisition, Technology, and Logistics, Michael W. Wynne, specifically commented on it in his policy update memo in 2005. He described how the voluntary participation of small business in the UID registry implementation process had risen from 23 to 43 percent of total supplier participation, in the span of only one month. (Wynne, May 2005)

It is probable that DoD may see a substantial slow-down in this level of compliance to its UID mandate as a result of the delays it has experienced. As was the case with pRFID, most businesses will likely not choose to invest valuable resources in a program that is experiencing significant setbacks. One must likely assume that the UID implementation program is no exception to this as well, especially given that it, too, has been added to GAO's high-risk programs list. (GAO, 2007)

II. DEFINING THE TECHNOLOGY ADOPTION CURVE AND THE ROLE CHASMS PLAY IN THEM

A. INNOVATION

Knowledge of innovation adoption curves is important to understand the process of diffusion of innovations such as new technologies (Rogers, 1995). This section focuses on select concepts and issues pertaining to the adoption of pRFID and UID by DoD; it then attempts to understand how DoD's small business suppliers may choose to adopt these innovations. The section concludes by exploring the role of adoption "chasms" in technology adoption curves, as popularized in Geoffrey Moore's best-selling book, "Crossing the Chasm" (1994).

Innovations are continuously developed and introduced to the marketplace. While some of this technology is truly innovating and may ultimately lead to the creation of an entirely new market, the majority of it is simply a new way of doing something better. Best-selling author and technology consultant, Geoffrey A. Moore, labels these phenomena as *discontinuous* and *continuous innovations*⁶ in his book, "Crossing the Chasm." He goes on to further distinguish the two by describing them in terms of their effects upon behavior. An example of how Crest toothpaste markets toothpaste is used to fortify the thesis:

...when Crest promises you whiter teeth, that is a continuous innovation. You are still brushing the same teeth in the same way with the same toothbrush. (Moore, 2002)

pRFID and UID technologies are two types of discontinuous innovations DoD is attempting to implement within its supply chain. Their introduction requires a shift in DoD's current business practices, as well as those of its suppliers. To utilize the

⁶ Discontinuous innovations can be described as innovations that require us to adopt entirely new methodologies, skill sets, et cetera, in order to take advantage of them. Moore submits the introduction of the HDTV and its subsequent requirement for an entirely new broadcasting standard (digital TV), as an example (Moore, 2002). Conversely, Moore describes continuous innovations as innovations that more or less are an evolution of an existing technology.

technologies effectively, a significant change to the infrastructure of DoD supply chains is also required. The change in infrastructure would include installing RFID readers at distribution centers, providing scanners for UID tags, and installing the software and middleware to make the entire system function as planned. According to Moore, this requirement for significant change serves as validation that pRFID and UID technologies are indeed discontinuous innovations (Moore, 2002).

Verification of pRFID and UID technology as discontinuous innovations does not lead to adoption of the technology. The next step in the process is to understand what motivates DoD's suppliers to willingly adopt such innovations.

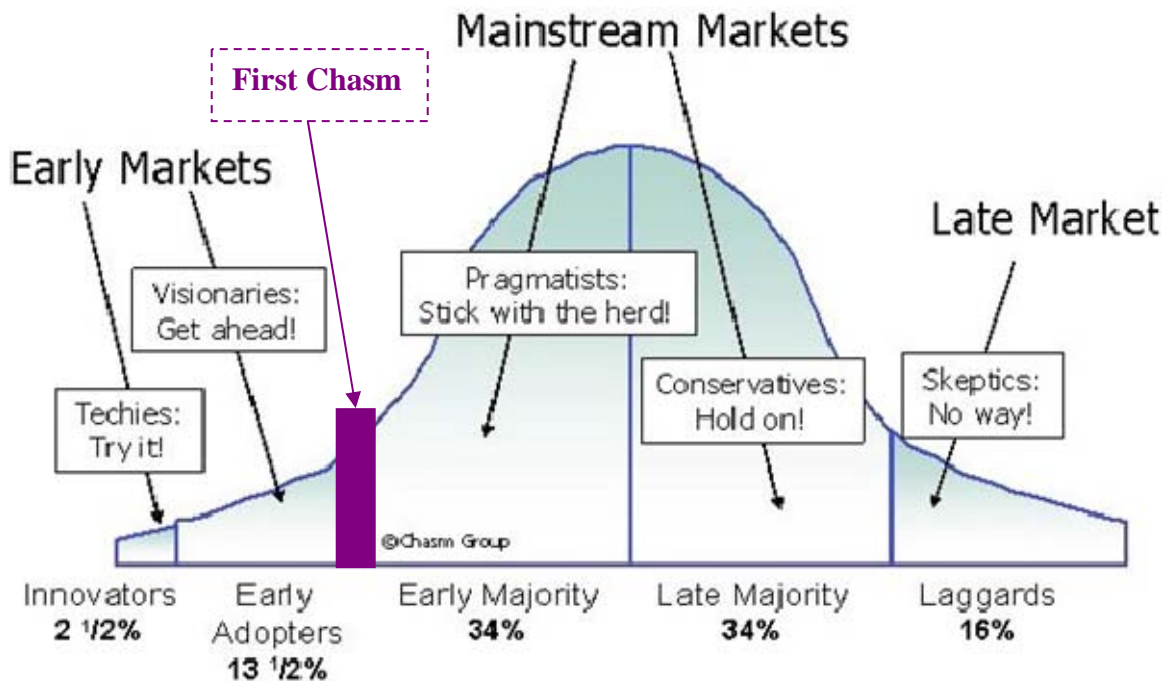
B. THE TECHNOLOGY ADOPTION CURVE

The technology adoption curve, or what Moore terms the "Technology Adoption Life Cycle," is determining when organizations choose to adopt a technological innovation. Specifically, he describes this "life cycle" as a series of points in time along a bell-shaped curve, where a firm may choose to adopt a new discontinuous innovation (for the context of this discussion, the "firm" is DoD and the new discontinuous innovations are pRFID and UID). According to Moore, these points can be segregated into five distinct classifications of adoption. A firm may be designated under any one of these classifications, based upon when it chooses to adopt the discontinuous innovation.

The five classifications of adoption along a discontinuous innovation curve are as follows:

- Innovators
- Early Adopters
- Early Majority
- Late Majority
- Laggards

Adoption classification can be divided into percentages of the total market for the discontinuous innovation. The adoption process occurs over a period of time, beginning with the innovators and concluding with the laggards. A graphical depiction of the classifications appears in Figure 2.



Source: Acuity Market Intelligence, 2007

Figure 2. First Chasm

The Innovators⁷ comprise the leading 2.5 percent of the adoption curve. Moore indicates that, although these “Technology Enthusiasts” may be insignificant in numbers, in comparison to the rest of the groups in the adoption cycle, the innovators play a very essential role in the cycle. This group is composed of the firms responsible for the

⁷ *Innovators* pursue new technology products aggressively. They sometimes seek them out even before a formal marketing program has been launched. This is because technology is a central interest in their life, regardless of what function it is performing. At the root they are intrigued with any fundamental advance and often make a technology purchase simply for the pleasure of exploring the new device’s properties. There are not many innovators in any given market segment, but winning them over at the outset of a marketing campaign is key nonetheless, because their endorsement reassures the other players in the marketplace that the product does in fact work. (Moore, 2002)

creation of the innovation. In the case of pRFID and UID technology, these firms include, but are not limited to, such RFID-pioneering companies as Intermec Technologies Corp⁸. (Mokhoff, 2004)

Early Adopters⁹ are considered to be *visionaries* due to the fact that they are able to take the raw innovations, and envision all the things that they could potentially become. In the case of pRFID and UID technology, the main catalysts that fall into this group would be DoD and Wal-Mart.

Moore describes the Early Majority¹⁰ as the *pragmatists*, due to their low-profile nature. This group does not like to be the focus of attention; however, the attention is automatically placed upon them because this is usually where a majority of the funds are located. The major defense contracting firms fall into this category. Examples of these firms include Boeing, Halliburton, Lockheed Martin, and Raytheon.

The Late Majority¹¹ group is considered to be the *conservatives*, due to the cautiousness by which they approach their endeavors. They do not believe in adopting technology until it has a proven track record. Additionally, they must always be considered because they make up a third of the total supplier base.

⁸ Intermec Technologies Corp., is an Everett, WA-based pioneer in RFID systems (Mokhoff, 2004)

⁹ “*Early adopters*, like innovators, buy into new product concepts very early in their life cycle, but unlike innovators, they are not technologists. Rather they are people who find it easy to imagine, understand, and appreciate the benefits of a new technology, and to relate these potential benefits to their other concerns. Whenever they find a strong match, early adopters are willing to base their buying decisions upon it. Because early adopters do not rely on well-established references in making these buying decisions, preferring instead to rely on their own intuition and vision, they are key to opening any high-tech market segment.” (Moore, 2002)

¹⁰ “*The early majority* shares some of the early adopter’s ability to relate to technology, but ultimately they are driven by a strong sense of practicality. They know that many of these newfangled inventions end up as passing fads, so they are content to wait and see how other people are making out before they buy in themselves. They want to see well-established references before investing substantially. Because there are so many people in this segment—roughly one-third of the whole adoption life cycle—winning their business is key to any substantial profits and growth.” (Moore, 2002)

¹¹ “*The late majority* shares all the concerns of the early majority, plus one major additional one: Whereas people in the early majority are comfortable with their ability to handle a technology product, should they finally decide to purchase it, members of the late majority are not. As a result, they wait until something has become an established standard, and even then they want to see lots of support and tend to buy, therefore, from large, well-established companies. Like the early majority, this group comprises about one-third of the total buying population in any given segment. Courting its favor is highly profitable indeed, for while profit margins decrease as the products mature, so do the selling costs, and virtually all the R&D costs have been amortized.” (Moore, 2002)

The final group is composed of the Laggards¹². This group is described as *skeptical* and is the group that this report is most interested in studying. This is the group into which a majority of DoD's small business suppliers fall. More importantly, the goal of the research is to validate whether this group is "generally not worth pursuing," as Moore claims. (Moore, 2002) For us to determine this, a final term must be defined.

C. THE CHASM

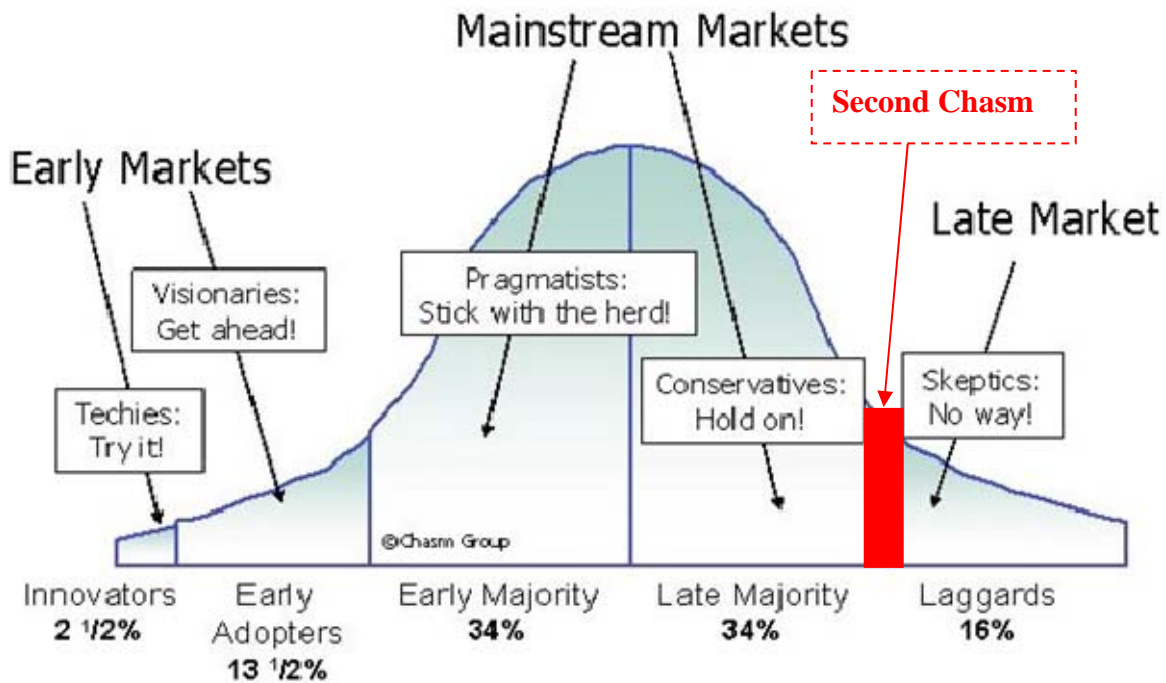
The American Heritage Dictionary defines a chasm as "a sudden interruption of continuity." (Berube, 1985) A chasm in the book, "Crossing the Chasm," is described as follows:

...the gulf between two distinct marketplaces for technology products-the first, and early market dominated by early adopters and insiders who are quick to appreciate the nature and benefits the new development, and the second a mainstream market representing ""the rest of us,"" people who want the benefits of new technology but who do not want to ""experience"" it in all its gory details. (Moore, 2002)

Both describe the chasm as an interruption, or disruption, of a continuing process. In simpler terms, a chasm would be the time horizon along the technology adoption curve between which two different groups (e.g., innovators and early adopters) choose to adopt a new technology. The greater the timeframe between the two groups, the larger the chasm (and vice versa).

For this research effort, the focus is primarily geared toward understanding if a second chasm might exist in the technology adoption curve. This second chasm is located between the late majority and laggards group. Figure 3 provides a graphical depiction of the second chasm.

¹² "Finally there are the *laggards*. These people simply don't want anything to do with new technology, for any of a variety of reasons, some personal and some economic. The only time they ever buy a technological product is when it is buried so deep inside another product-the way, say, that a microprocessor is designed into the braking system of a new car-that they don't even know it is there. Laggards are generally regarded as not worth pursuing on any other basis." (Moore, 2002)



Source: Acuity Market Intelligence, 2007

Figure 3. Second Chasm

Why would this second chasm exist along the technology adoption curve? As previously discussed in the section on innovation, many reasons can explain why an organization may choose to adopt an innovative new technology. For the purposes of pRFID and UID, these reasons can be narrowed down substantially. The authors conjecture/hypothesize that these reasons could include any combination of the following:

- High costs of implementation
- Technology standards issues, i.e., the requirement for pRFID Gen 0/1 compliance a month prior to Gen 2 conversion
- One size fits all approach of the mandate, i.e., not tailored to the needs of small businesses, versus large ones
- Lack of buy-in on behalf of DoD organizations themselves
- Lack of viable incentives from DoD
- Lack of technical expertise

The authors assume that small businesses would most likely fall into the laggard's category for this technology because, for many of these businesses, the cost of compliance may outweigh the benefits. Although the mandates stipulate that ultimately the cost can be rolled into the normal cost of doing business, the initial payment for the material and equipment must come from the suppliers. In other words, the supplier finances the money for DoD to get its program up and running, and then once in compliance they can come to DoD and seek payment through negotiations with the contracting organization. This concept, similar to the method in which many companies purchase facilities, exposes the supplier to risks in adopting new technologies for the benefit of DoD. These risks include:

- Supplier is now obligated to complete the implementation, regardless of whether it actually receives the contract award
- Supplier must account for all funds, with an approved government accounting system, that it claims for the implementation
- Contractor could potentially not recoup full interest lost on the money it has tied up on behalf of the government

Ultimately, the laggards, as described above, may not be worth the effort for DoD, because the cost to appease them may be too high. Consequently, many small businesses¹³ may believe that complying with DoD's pRFID and UID mandates may not be worth the risk.

¹³ The definition of a small business can be expressed in terms of revenues or amount of employees. For the purpose of this research the Laggards are those businesses that believe the initial cost of \$20,000 to buy the equipment is not worth the trouble. The additional cost will include middleware, training for employees, installation costs and any modifications that may be needed to the businesses networks or infrastructure. (RFIDSupplyChain.com. RFID Solutions for Supply Chain Management. Retrieved November 18, 2007 from <http://www.rfidsupplychain.com/Detail.bok?no=108>.)

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III THE SURVEY DATA

To better understand what might drive a second chasm in the pRFID and UID adoption curves, we undertook a survey of small businesses. This chapter of the report describes the survey and findings of the study.

A. THE POPULATION DATA

Central Contractor Registration (CCR) is the primary registrant database for the U.S. Federal Government. CCR collects, validates, stores, and disseminates data in support of agency acquisition missions, including federal agency contract and assistance awards. Both current and potential federal government registrants are required to register in CCR to be awarded contracts by the federal government. Registrants are required to complete a one-time registration to provide basic information relevant to procurement and financial transactions. CCR validates the registrant information and electronically shares the secure and encrypted data with the federal agencies' finance offices to facilitate paperless payments through electronic funds transfer (EFT). Additionally, CCR shares the data with federal government procurement and electronic business systems. (CCR home page, 2007)

The sample population was collected from California small businesses with active registrations. The total number of active registrants on November 8, 2007 was 452,458, with 44,353 located in California. For comparison purposes, registrants were separated into woman-owned, disadvantaged, and 8A businesses. The CCR did not have a category to separate registrants that were minority-owned. All registrants in the sample population that were categorized as minority-owned were placed in the other category for comparison purposes. For the purposes of the study, we assumed that firms registered on the CCR are representative of small firms conducting business with DoD. Since this is a critical assumption, we address the limitations of this sample later in this report.

B. THE SAMPLE DATA

Final approval of the survey was received from the Naval Postgraduate School's Institutional Review Board (IRB) on 17 September 2007. Actual telephone interviews commenced on 21 September 2007, and concluded on 12 October 2007. A total of 42 surveys were completed as of that date. The 42 respondents representing five diversified industries are depicted in Table 1.

Table 1. Distribution of Respondents Among Sampled Industries

Industry	Responses	Percentage
Surgical & Medical Instruments	15	36
Trucks & Utility Manufacturing	11	26
Laboratory Apparatus & Furniture	9	21
Sporting & Athletic Manufacturing	5	12
Dental Equipment and Suppliers	2	5
Total	42	100

As seen in Table 1, the Surgical and Medical Instruments industry represented the largest group of respondents, closely followed by the Truck and Utility Manufacturing industry.

1. Organizations Familiar with Radio Frequency Identification (RFID) and Unique Identification (UID)

A total of 42 respondents participated in the telephone survey. Of these 42 respondents, 26 indicated that they were familiar with RFID, while the remaining 16 indicated that they were unfamiliar with the technology. Although two types of RFID technology (active and passive) are generally identified, for the purposes of the survey, both were encompassed under the title RFID. The distribution of respondents who indicated they were familiar with RFID technology is presented in Table 2.

Table 2. Distribution of Respondents Familiar with Radio Frequency Identification (RFID)

Industry	Responses	Percentage
Surgical & Medical Instruments	12 of 15	80
Trucks & Utility Manufacturing	6 of 11	55
Laboratory Apparatus & Furniture	5 of 9	56
Sporting & Athletic Manufacturing	2 of 5	40
Dental Equipment and Suppliers	1 of 2	50
Total	26 of 42	62

Additionally, only 22 of the respondents indicated that they were familiar with UID technology, while the remaining 20 were unfamiliar with the technology. The distribution of respondents who indicated they were familiar with UID technology is presented in Table 3.

Table 3. Distribution of Respondents Familiar with Unique Identification (UID)

Industry	Responses	Percentage
Surgical & Medical Instruments	8 of 15	56
Trucks & Utility Manufacturing	6 of 11	54
Laboratory Apparatus & Furniture	5 of 9	56
Sporting & Athletic Manufacturing	2 of 5	40
Dental Equipment and Suppliers	1 of 2	50
Total	22 of 42	52

It is interesting that the survey results indicated only half of these disparate industries were familiar with RFID and UID technology. This is especially thought-provoking, given that DoD has mandated all of its suppliers to begin implementing these technologies by its self-imposed deadlines.

2. Awareness of DoD Mandates for RFID and UID Implementation

DoD has mandated that all of its suppliers implement RFID technology by January 2007 and UID technology by December 2010. When the respondents were asked about their awareness of the mandates, the responses were disproportionately negative. With the exception of the Surgical and Medical Manufacturing industry, a significant majority of respondents were unaware of the RFID and UID mandates. A total of 29 of the 42 respondents stated that they were unaware of the January 2007 RFID implementation mandate. The actual survey sheet stated this question based on a January 2008 deadline, a typing error that was clarified during the actual interviews. The results are listed in Table 4.

Table 4. Distribution of Respondents Familiar with RFID January 2007 Mandate

Industry	Responses	Percentage
Surgical & Medical Instruments	7 of 15	47
Trucks & Utility Manufacturing	4 of 11	36
Laboratory Apparatus & Furniture	1 of 9	11
Sporting & Athletic Manufacturing	1 of 5	20
Dental Equipment and Suppliers	0 of 2	0
Total	13 of 42	31

A total of 32 of the 42 respondents stated that they were unaware of the December 2010 UID implementation mandate. These results are shown in Table 5.

Table 5. Distribution of Respondents Familiar with UID December 2010 Mandate

Industry	Responses	Percentage
Surgical & Medical Instruments	4 of 15	27
Trucks & Utility Manufacturing	4 of 11	36
Laboratory Apparatus & Furniture	1 of 9	11
Sporting & Athletic Manufacturing	1 of 5	20
Dental Equipment and Suppliers	0 of 2	0
Total	10 of 42	24

The common theme that seemed to resonate from all the respondents was that they had not been notified about the mandates and their looming deadlines. This brings into question DoD's process of disseminating information to its contractors. Is it the responsibility of DoD to notify its small business contractors, or is it the responsibility of the contractors to seek out the information? The research seems to indicate that both parties should liaison with the Small Business Administration (SBA) to facilitate the flow of information.

Both parties rely upon the SBA for assistance with training small business contractors in government contracting procedures. Additionally, the small business contractors can also tap into SBA resources to find out the latest news on government policies and programs.

3. Influencers vs. Decision Makers

To validate how much of an impact the individuals surveyed would have in the decision process to adopt DoD mandates for RFID and UID, it is important to understand what role these individuals serve within the organization. The survey was crafted to separate the decision makers from the influencers, in an effort to reveal these roles. The results of the survey are depicted in Table 6.

Table 6. Positional Authority

Industry	Decision Maker	Influencer
Surgical & Medical Instruments	12	3
*Trucks & Utility Manufacturing	3	4
Laboratory Apparatus & Furniture	5	4
Sporting & Athletic Manufacturing	2	3
Dental Equipment and Suppliers	1	0
Total	23	14

*NOTE: 5 individuals served as both decision maker and influencer due to organizational structure.

The data indicate that 56 percent of respondents held positional authority to make a final decision on whether their organizations would adopt the RFID and UID mandates. Approximately one-third of the individuals surveyed were in a position to directly influence the individuals who would make the final decision to adopt or defer. Finally, 12 percent of the respondents served in both positions, resulting in 68 percent of the respondents capable of determining if their organization would comply with the mandates.

4. Types of Products Supplied to DoD

The next question in the survey was designed to understand what the contractors were actually supplying to DoD. The purpose of this question was to identify whether the respondents' organizations provided a product, service, or combination of the two to DoD. The rationale behind this was the desire to eliminate the contractors who only provided a service to DoD, since the primary purpose of RFID and UID technology is to track and identify the movement of products. The results of the question are depicted in Table 7.

Table 7. Product vs. Service

Industry	Product	Service
Surgical & Medical Instruments	15	0
Trucks & Utility Manufacturing	11	0
Laboratory Apparatus & Furniture	9	0
Sporting & Athletic Manufacturing	5	0
Dental Equipment and Suppliers	1	1
Total	41	1

Ninety-eight percent of the respondents provided a product. One respondent functioned as a distributor of products, sourced to the DoD, from a sub-tier manufacturer. This information was used to further validate the relevance of our sample base.

5. Percent of Total Business Production Dedicated to DoD

After validating the relevance of the sample base, the next step in the process was to determine what percentage of total production each contractor dedicated to DoD. The

motivation behind this question was to understand how much influence a DoD contract would have on the business strategy of the contractors.

The hypothesis was that contractors who relied significantly on a DoD contract would be more likely to conform to the mandates, as opposed to those with minimal investment at stake. Table 8 provides the responses in percentages of total business.

Less than two-thirds (62 percent) of the respondents claimed that no more than 10 percent of their total production was dedicated to DoD. Conversely, only 17 percent of the respondents had greater than 50 percent of their production dedicated to DoD. The remaining respondents fell somewhere between these two extremes, with one respondent unable to estimate what percentage of its production was dedicated to DoD.

It will be important to see if the hypothesis (that the contractors with significant investment in DoD contracts will be more likely to comply with the mandates) holds true in this case, given the results of the survey.

Table 8. Percentage of Business Product Production Dedicated to DoD

Industry	≤10%	≤20%	≤30%	≤40%	≤50%	≤60%	≤70%	≤80%	≤90%	≤100%
Surgical & Medical Instruments	14									1
*Trucks & Utility Manufacturing	5	1		1			1		1	1
Laboratory Apparatus & Furniture	6	1				1	1			
Sporting & Athletic Manufacturing	1	2	1	1						
Dental Equipment and Suppliers			1							1

*NOTE: One respondent was not included in the table because this person could not determine what percentage of the business was dedicated to DoD.

6. Regional Demographics

The survey questionnaire collected regional demographic data to see if location played a part in the likelihood of compliance. The methodology behind this was to start with contractors in the western United States, and see if enough data could be captured to adequately represent both sides of the thesis. If the selected sample proved inadequate, then the sample area would have to be expanded until sufficient data were collected.

The western states provided enough respondents to sufficiently address both sides of the thesis statement. Thus, the results of this question were deemed irrelevant.

7. Socioeconomic Status

Data pertaining to the socioeconomic status of the respondents were collected to see if they would shed more light on the motivation behind compliance. The survey segregated contractor socioeconomic status into five distinct categories, loosely based on SBA socioeconomic programs. The purpose of segregating the contractors in this manner was to see if socioeconomic status influenced the likelihood of compliance with the mandates. Table 9 categorizes the respondents based on socioeconomic status.

Table 9. Socioeconomic Status

Industry	8A	Minority-Owned	Women-Owned	Disadvantaged	Other
Surgical & Medical Instruments	1	*3	*3	0	9
Trucks & Utility Manufacturing		3	*2	2	5
Laboratory Apparatus & Furniture	1	0	3	0	5
Sporting & Athletic Manufacturing	0	1	3	0	1
Dental Equipment and Suppliers	*1	1	*1		

*NOTE: Respondents fell into multiple categories (e.g., Women-Minority Owned)

8. Employees

Employment data pertaining to the size of the businesses were collected to see if they would show how small businesses were affected by the mandates. The survey segregated the employee base into four distinct categories. The purpose of segregating was to see if the size of the company influenced the likelihood of compliance with the mandates. Note that, of the 42 companies surveyed, 95 percent employ up to 249 personnel. The remaining respondents fall into the remaining categories. The data do not indicate that size dictates compliance with the mandates. Table 10 categorizes the respondents based on number of employees.

Table 10. Number of Employees

Number of Employees	1-249	250-499	500-749	Other
Industry				
Surgical & medical instruments	15			
Truck & utility manufacturing	9	1		1
Laboratory apparatus & furniture	9			
Sporting & Athletic manufacturing	5			
Dental Equipment and Suppliers	2			
Compliance	40	1		1

9. Businesses Deciding to Conform

a. *Decided to Conform to the RFID Mandate*

This question attempted to determine if the respondents had decided to conform to the RFID mandate. A total of 16 of 42 respondents stated that they would not conform. Additionally, 17 respondents indicated that they were unsure at this time. The remaining 9 respondents indicated that they would not conform to the mandates at this time. The results are displayed in Table 11.

Table 11. Decided to Conform to the RFID Mandate

	Yes	No	Don't Know	Itemized Percent to Conform
Industry				
Surgical & medical instruments	4	8	3	10
Truck & utility manufacturing	2	3	6	5
Laboratory apparatus & furniture		3	6	0
Sporting & Athletic manufacturing	2	2	1	5
Dental Equipment and Suppliers	1		1	2
Total percent to Conform	21	38	41	- -

b. *Decided to Conform to the UID Mandate*

The same question was asked about the UID mandate. A total of 18 of 42 respondents stated that they would not conform, and 19 out of 42 were unsure at this time. Further, 5 out of 42 stated that they would conform. The data indicate that there may be gaps in the issuing of the mandates that DoD has not considered. The results are shown in Table 12.

Table 12. Decided to Conform to the UID Mandate

	Yes	No	Don't Know	Itemized Percent to conform
Industry				
Surgical & medical instruments	1	10	4	7
Truck & utility manufacturing	1	3	7	9
Laboratory apparatus & furniture	0	3	6	0
Sporting & Athletic manufacturing	2	2	1	40
Dental Equipment and Suppliers	1	0	1	50
Total Percent to Conform	12	43	45	- -

10. Businesses that will Conform by Published Deadlines

a. *Conformance with RFID Mandate by Published Deadlines*

When asked if they were in compliance with the RFID mandate already in effect, responses were varied. The results are presented in Table 13.

Table 13. Conformance with RFID Mandate by Published Deadlines

	Yes	No	Don't Know	Percent to conform
Industry				
Surgical & medical instruments	6	0	9	40
Truck & utility manufacturing	4	4	3	36
Laboratory apparatus & furniture	1		8	11
Sporting & Athletic manufacturing	1	1	3	20
Dental Equipment and Suppliers	1	1		50
Total Conformance Percentage	31	14	55	- -

b. Conformance with UID Mandate by Published Deadlines

Twice as many respondents stated that they intended to conform to the UID mandate by the established deadline. The average proportion to conform across the board is 29 percent. The results are shown in Table 14.

Table 14. Conformance with UID Mandate by Published Deadlines

	Yes	No	Don't Know	Percent to conform
Industry				
Surgical & medical instruments	4	2	9	27
Truck & utility manufacturing	4	4	3	36
Laboratory apparatus & furniture	1		8	11
Sporting & Athletic manufacturing	1	1	3	20
Dental Equipment and Suppliers	2			100
Total Conformance Percentage	29	17	55	- -

11. Reasons Not to Conform

When asked why they did not intend to conform to the mandates, respondents indicated that the primary factor was cost. Others indicated that they were waiting to see what the final standard would be. One person felt that it would not be helpful to the company, and furthermore that it would be a burden to DoD. Finally, one indicated that it was not mandated, too costly, too complex, and too much effort, and labor would be required for the company. The results are displayed in Table 15.

Table 15. Reasons Not to Conform

	Too costly	Wait for well tested system	Don't care to invest in new technology	Does not want to change	*Other	NA
Industry						
Surgical & medical instruments	*8	1			3	3
Truck & utility manufacturing	4				2	5
Laboratory apparatus & furniture	1			1	2	5
Sporting goods and Athletic manufacturing			1		1	3
Dental Equipment and Suppliers					2	

*Note: Other reasons included relevancy to business, redundancy, need for standardization, and complexity of implementation

12. Advantages to Adopting RFID/UID Technology

Of the 25 respondents who answered this question, the highest proportion stated that cost is the limiting factor. Research conducted into the costs found that businesses could spend upwards of \$20, 000 to obtain a fully compliant system¹⁴. These significant costs for a compliant system do not include training and maintenance expenses, however, according to GAO. (GAO, 2005) Respondent motivations for adopting the technology are shown in Table 16.

¹⁴ Significant financial resources are required to pay for implementation and ongoing expenses of IOS (Iacovou, Benbasat, and Dexter 1995) and RFID. A. T. Kearney (2003) estimates the cost for a large retailer to adopt RFID as \$400,000 per distribution center and \$100,000 per store, plus \$35 to \$40 million to integrate systems across the entire organization. Industry analysts predict that a large consumer goods manufacturer would spend \$9 to \$25 million to implement RFID (Shutzberg 2004). (Whitaker, 2007)

Table 16. Advantages to Adopting RFID/UID Technology

	Help win DoD contracts	Help expand business with non-DoD customers	Other	No Advantage	NA
Surgical & Medical instruments	3	2	3	5	2
Truck & Utility manufacturing	4			1	6
Laboratory apparatus & Furniture			1		8
Sporting Goods & Athletic manufacturing	1			1	3
Dental Equipment and Suppliers	1				1
Total	9	2	4	7	20

13. Classification Based on Willingness to Invest in RFID/UID Technology

When the respondents were asked about their willingness to invest in the RFID/UID technology, the responses were closely related. A total of 24 of 42 considered themselves to be in the top three categories, which suggests that they like to be on the cutting edge. At the other end of the spectrum, 18 of 42 were in the last three categories, which indicates their unwillingness to invest or change the way that they do business. The results are shown in Table 17.

Table 17. Classification Based on Willingness to Invest in RFID/UID Technology

	Innovator	Early Adopter	Early majority	Late majority	Laggard	Combination of all of them
Surgical & Medical instruments	1	3	4	2	5	
Truck & Utility manufacturing	5	2	1	2	1	
Laboratory apparatus & Furniture	1	1	2	2	3	
Sporting Goods & Athletic manufacturing		1	2		2	
Dental Equipment and Suppliers	1					*1
Total	8	7	9	6	11	1

*Note: This respondent stated their classification would change based on the application.

14. Buying the Equipment vs. Outsourcing It

The decision to either buy or outsource was fairly close. About 40 percent chose to buy and implement the equipment, while approximately 49 percent chose to outsource. Only about 12 percent of the respondents were still undecided. One company in the Trucks and Utility Manufacturing Industry stated their decision would be based on volume and price. They would buy and implement the equipment on some of their products, but may choose to outsource smaller volumes of product lines based on the cost of outfitting the products. The distribution from each industry is shown in Table 18.

Table 18. Buying the Equipment Versus Outsourcing It

Industry	Total	Buy (%)	Outsource (%)	Undecided (%)
Surgical & Medical Instruments	16	31	56	13
Trucks & Utility Manufacturing	10	40	50	*10
Laboratory Apparatus & Furniture	9	33	44	22
Sporting & Athletic Manufacturing	5	80	20	0
Dental Equipment and Suppliers	2	50	50	0
Total	42	40	48	12

*Note: One company responded they might do both based on volume and price.

15. Reason for Deciding Whether to Buy or Outsource

a. *Reasons for Buying the Equipment*

The purpose of this question was to determine how respondents would procure the necessary equipment. The reasons for deciding to buy were varied, but most fell into five categories:

1. Process Control
2. Logistical concerns
3. Costs
4. Staff Capability
5. Available Equipment Suppliers

The most popular response was to control the process, followed by logistical concerns, and then costs. It is also important to note that 4 of 17 respondents did not respond to this question, which is the same number stating they wanted to control the process. The distribution of the reasons for choosing to buy is presented in Table 19.

Table 19. Reason(s) for Buying the Equipment

Industry	Process Control	Logistics Concerns	Costs	Other
Surgical & Medical Instruments	3			2
Trucks & Utility Manufacturing	1		2	1
Laboratory Apparatus & Furniture			1	2
Sporting & Athletic Manufacturing		1		3
Dental Equipment and Suppliers	1			
Total (%)	29	6	18	47

b. Reason for Outsourcing the Process

The purpose of this question was to determine why a company would choose to outsource the process. The majority of the respondents stated financial resources as the primary factor in the decision to outsource, followed by a lack of customer demand. Three respondents stated that, along with cost, volume of sales was also a reason to outsource. Other reasons included convenience, software, indecision, and, finally, being a distributor. Table 20 shows the industry distribution for outsourcing.

Table 20. Reason(s) for Outsourcing the Process

Industry	Financial Resources	Lack of Customer Demand	Familiarity with Technology	Other
Surgical & Medical Instruments	6	1	2	
Trucks & Utility Manufacturing	1	2		2
Laboratory Apparatus & Furniture	2		1	1
Sporting & Athletic Manufacturing	1*			
Dental Equipment and Suppliers				2
Total (%)	48	14	14	24

*Note: Lack of technical expertise was also given as a reason.

16. Impact of Choosing Not to Implement RFID or UID Technology

This question was designed to assess the overall impact non-compliance would have on the respondents. No distinction was made to evaluate the effect of implementing the technologies independently. The responses were divided into the following categories:

- No Impact
- Moderate Impact
- Major Impact
- Extreme Impact

The majority of the respondents felt that failing to implement this technology would have either no impact or a moderate impact on their business. Only 31 percent of the respondents felt that non-compliance would have a major or extreme effect upon their overall business. The distribution by industry is shown in Table 21.

Table 21. Impact of Choosing Not to Implement RFID or UID Technology

Industry	None	Moderate	Major	Extreme
*Surgical & Medical Instruments	5	6	2	3
Trucks & Utility Manufacturing	4	2	3	1
Laboratory Apparatus & Furniture	5	3	1	
Sporting & Athletic Manufacturing		4	1	
Dental Equipment and Suppliers			1	1
Total (%)	33	36	19	12

*One response was given as significant and was placed in the major category.

17. Explain Your Evaluation of the Impact

The purpose of this question was to allow the respondents to further elaborate on their response(s). The common responses across all categories referred to the volume of business conducted with DoD. Other factors included whether there was a requirement for the technology, and if it would be compatible with the product. One respondent stated that they provided a distribution service that subcontracted out to a sub-manufacturer. (This was the one service provider from the surveys.) Given this unique position, the respondent felt that they were not directly affected by the mandate, rather their subcontractor was. This prompted the respondent to assume that the mandates indirectly affected them. The distribution by industry is displayed in Table 22.

Table 22. Explain Your Evaluation of the Impact

Industry	None or Moderate based on Volume of Business	None to Moderate Other Reasons	Major or Extreme based on Volume of Business	Major or Extreme Other Reasons
Surgical & Medical Instruments	4	Not our problem (3), No Value Added, Incompatible, Subject to Requirement (2),	4	
Trucks & Utility Manufacturing	3	Does Not Apply (2) No Value Added	2	Does not Apply, Does not meet security Requirements
Laboratory Apparatus & Furniture	3	Mandate is N/A, Lack of Data, Sub-tier Contractor Existing Relations help get contracts	1	
Sporting & Athletic Manufacturing	2	Specialized Items, Depends on Mandates	1	
Dental Equipment and Suppliers	1		2	
Total (%)	31	38	24	7

18. What Would Motivate You to Change Your Stance on RFID/UID Adoption?

Motivating a company to change their stance on this issue could not always be answered with a simple solution. One company bought the equipment and could not get clarification about how items were supposed to be tagged. Some respondents stated equipment, incentives, technical help, or a competitor would motivate a change of stance. Others answered a combination of those choices would be sufficient. The main theme was that, unless it was required for their particular product, conformance would not be a willing choice and thus some type of enticement would be needed. Table 23 shows how respondents answered to the question of motivation.

Table 23. Motivators to Change Stance on RFID/UID Adoption

Industry	Competition	Incentives	Technical	Equipment	Other
Surgical & Medical Instruments	3	4	2	4	Requirement, Tangible Benefits, Implementation Cost, Lack of DoD Business, Lower Labor Costs, Legal Obligation
Trucks & Utility Manufacturing		5	1	2	Nothing – Small % and Increased Business (2)
Laboratory Apparatus & Furniture		4	2	2	Cost/Benefit Analysis
Sporting & Athletic Manufacturing		Volume of Business (2), Specialized Items, Depends on Mandates	Volume of Business		
Dental Equipment and Suppliers	1	1			

19. Possession of Government Equipment

Government Furnished Equipment (GFE) is administered to provide contractors with the equipment necessary to generate a product for the government. The purpose of this question was to determine how significant the UID-mandated requirement to tag GFE would be on small businesses. The Truck and Utility Manufacturing industry composed the largest percentage of respondents with GFE. Most respondents with GFE indicated that they would comply. One respondent indicated that they would not comply because they only repaired GFE. Does the mandate require that they still tag the material? The data suggest that not many small businesses are using GFE in performing their government contracts. Table 24 shows a distribution of responses to the question on GFE.

Table 24. Possession of Government Furnished Equipment

Industry	Yes	No
Surgical & Medical Instruments		16
Trucks & Utility Manufacturing	2	8
Laboratory Apparatus & Furniture	1	8
Sporting & Athletic Manufacturing		5
Dental Equipment and Suppliers		3
Total (%)	7	93

NOTE: Percentages are rounded

20. How Long are You Authorized to Use It?

The purpose of this question was to determine if long-term contracts would motivate respondents to comply. Only three respondents possessed GFE. Their

authorized usage ranged from 1 to 10 years. One company answered only that it was based on their contract length. The industry distribution is provided in Table 25.

Table 25. Length of Authorized Use

Industry	Contract Length
Trucks & Utility Manufacturing	1 - 10 years
Laboratory Apparatus & Furniture	Based on Contract Length

21. Will You Comply with the 2010 Mandate for All DoD Assets to be Marked with UID Tags?

The purpose of this question was to see if the respondents would now consider compliance, given that the deadline was still a few years off. The respondents who possessed GFE stated they would be in compliance by the deadline. The respondents that did not possess government equipment had mixed opinions; some stated they would comply and others stated either they needed more information or were uncertain about their answer due to costs or volume of business. A few of those who stated they would comply also stated that they required guidance, equipment, or technical help. An industry breakdown is provided in Table 26.

Table 26. Compliance by 2010 for DoD Assets to be Marked with UID Tags?

Industry	Yes	No	Uncertain	Need More Information	N/A
Surgical & Medical Instruments					15
Trucks & Utility Manufacturing	3	2	3		2
Laboratory Apparatus & Furniture	5	1	1	2	
Sporting & Athletic Manufacturing	5				
Dental Equipment and Suppliers		2			1
Total (%)	31	12	10	5	43

C. ARE THE SURVEY DATA REPRESENTATIVE OF THE POPULATION OF SMALL BUSINESSES WITH WHICH DOD DEALS?

For our survey data to be reasonably valid, we have to consider whether the sample of small businesses we surveyed is representative of the small businesses with which DoD usually deals. To answer this question, we looked at several indicators of representativeness.

The state of California accounts for about 9.8 percent of all the active registrants on the CCR. When the California population is compared with our sample, some differences emerge. Our sample falls short by 12 percent in the “other” category and by 4 percent in the “disadvantaged” category. Our sample contained more businesses that were “woman-owned” (11 percent greater) and the “8A” category (5 percent over). The data in the CCR are dynamic, so an assumption was made that the distribution of registrants within the categories being compared for the population remained the same

during the research period. Overlap exists in both distributions due to registrants claiming more than one category. Figure 4 compares the population and sample distributions.

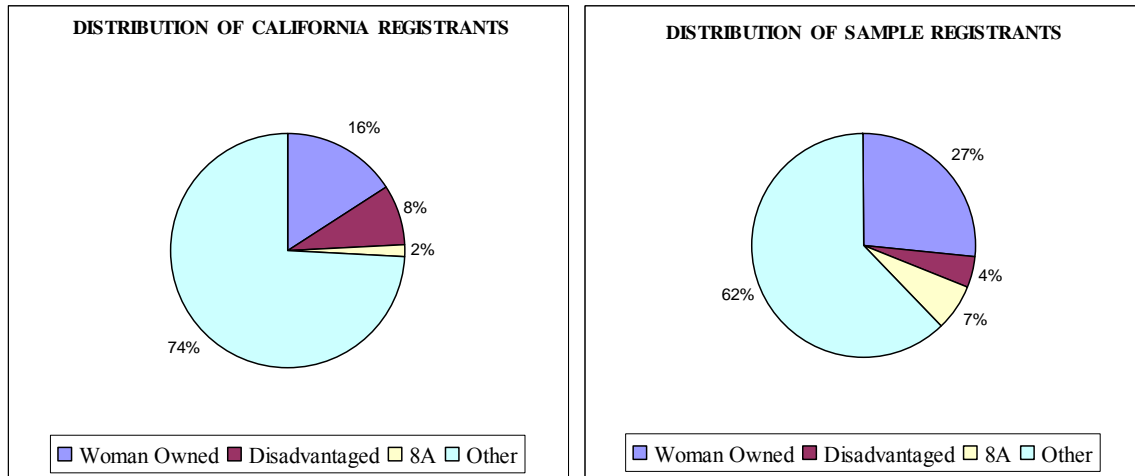


Figure 4. Comparison of Businesses in California

The survey data collected during our research came from North American Industry Classification Codes (NAICS) within the manufacturing industry. The purpose was to gain information from industries with a product that fit DoD’s guidelines for both RFID and UID tags. Based on the description, the manufacturing industry was the industry that appeared to be the best fit to the sample from which we collected data. (i.e., those who would use both RFID and UID tags).

The Small Business Association Office of Advocacy defines a small business as “an independent business having fewer than 500 employees.” These businesses are separated into employer firms and non-employer firms, with the difference being one has an annual payroll to employees and the other does not. In 2007, they published a report estimating there were over 5.9 million employer firms in 2004. A total of 98 percent of these firms had fewer than 100 employees. Within the U.S. manufacturing industry, 99 percent of the firms had fewer than 100 employees; in California alone, the number in the manufacturing industry was 92 percent. The sample population had 95 percent the respondents having 250 or fewer employees.

Based on the survey, no distinction was found for firms with less than 250 employees, although about one-third of the respondents indicated having 100 or fewer employees. It is important to note that approximately 75 percent of the firms in the manufacturing industry had 20 or fewer employees based on data collected in 2004. Figures 5 and 6 show the various industry distributions.

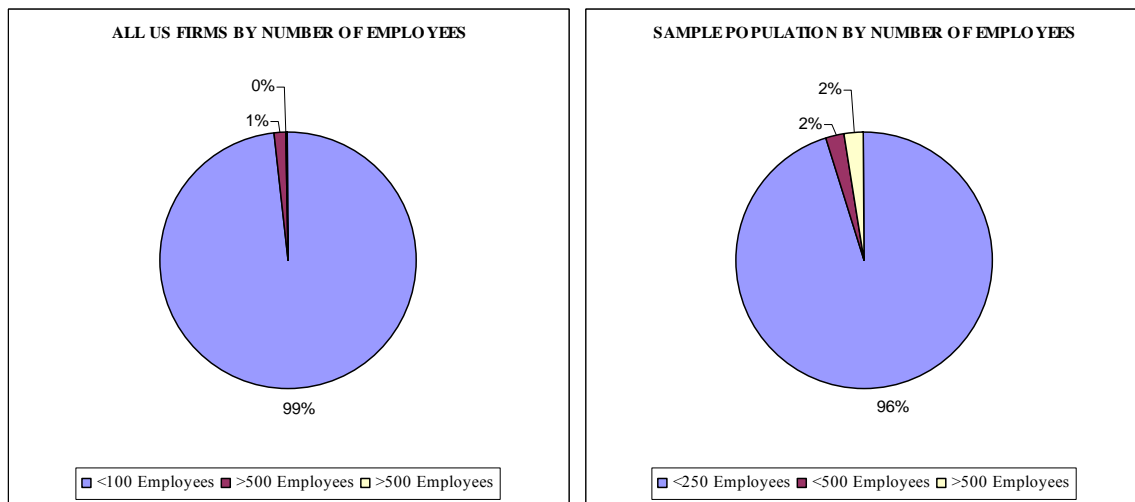


Figure 5. Comparison of United States Businesses



Figure 6. Comparison of California Firms to United States Total Firms

Finally, we were unable to determine the number of contractors that conduct business with DoD from the information obtained through the CCR because this data is

collected by any known sources. We were able to obtain financial data that detail federal contract actions that were obligated by the executive departments and agencies. Fiscal year (FY) 2005 data obtained from the Federal Procurement Data System,¹⁵ which compiles procurement actions collected from the CCR,¹⁶ revealed that the federal government spent approximately \$378 billion. Of this total, DoD spending accounted for approximately \$268 billion, or 70 percent. Additionally, \$53 billion, or 14 percent of this \$378 billion, was spent specifically on DoD small business contracts. These data are presented in Figure 7.

¹⁵ The Federal Procurement Data Center (FPDC), part of GSA, manages the Federal Procurement Data System – Next Generation (FPDS-NG) which is currently owned and operated by Global Computer Enterprises (GCE). FPDS-NG is the central repository of statistical information on federal contracting. The system currently collects detailed information on contract actions over \$2,500 and purchase card data on procurements of less than \$2,500. (<https://www.fpds.gov>)

16 Federal Procurement Data System - Next Generation (FPDS-NG)

The Government needs to understand where tax dollars are spent. The ability to look at contracts across government agencies, in greater detail, is a key component in establishing trust in our government and credibility in the professionals who use these contracts. Further, it provides opportunity for the government to better assess where its money is being spent, thereby offering opportunities to better determine how to most effectively and efficiently expend those resources. FPDS-NG contains contracting data that allows for this kind of insight. It is also relied upon to create recurring and special reports to the President, Congress, Government Accountability Office, federal executive agencies and the general public.

The system collects and stores data related to all contract actions, and interfaces with the Central Contractor Registration (CCR) to obtain the primary source of vendor validation. Additionally, the system interfaces machine-to-machine with contract writing systems across the federal government to allow for near real-time updates. Finally, the system allows for government and public users to run an array of standard, semi-configurable on-line reports as well as utilize more advanced ad hoc queries. (http://www.acq.osd.mil/dpap/pdi/eb/federal_procurement_data_system_-_next_generation_fpds-ng.html).

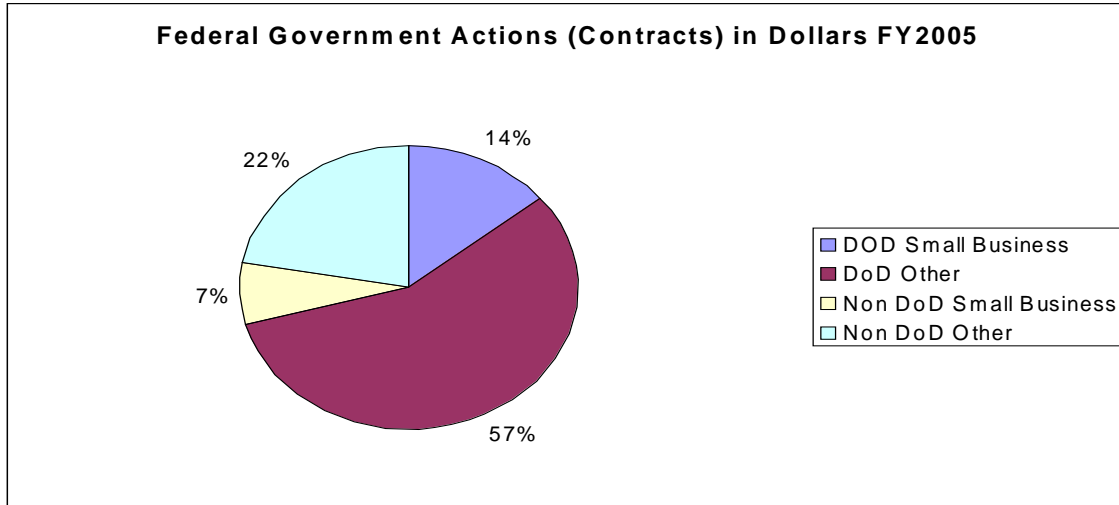


Figure 7. DoD and Non-DoD Government Actions (Contracts)

Source: Federal Procurement Data Systems Web site. (<https://www.fpds.gov>)

DoD controls the majority of the federal procurement funds issued to businesses listed on the CCR. Based on the procurement power of DoD relative to the CCR, it is reasonable to assume that our sample of small businesses represents a valid population of potential DoD suppliers. However, it should be noted that the small sample size is a limitation of this study. Given that there are over 200 million small businesses in the U.S. alone, the present study should be considered exploratory, just skimming the surface of the full population of small businesses supplying DoD. This possibility could explain why a minority of small businesses acknowledged awareness of the RFID and UID mandates. Additional studies could address these shortcomings by expanding the sample size of small businesses on the CCR.

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IV. CONCLUSIONS AND RECOMMENDATIONS

A. WHAT IS REVEALED?

So what does our research reveal about DoD's strategy to implement Passive Radio Frequency Identification (pRFID) and Unique Identification (UID) technology with its small business suppliers? Our survey indicates that only 31 percent of the DoD's small business partners currently plan on complying with the pRFID mandate, and only 29 percent with the UID mandate under the current guidelines. This suggests that there is indeed a chasm in DoD's adoption plans.

Our first supposition was the possibility that a second adoption chasm exists between the middle and late adopters of pRFID and UID technology. The results of our survey suggest that less than a third of DoD's small business suppliers plan to adopt the technology by the current deadlines. Additionally, DoD obligates over a quarter of its annual budget to these suppliers. This equates to over \$39 billion in supplies shipped to DoD sans pRFID and UID markings at current spending levels.

Next, we attempted to uncover possible sources of this chasm, by analyzing whether these mandates mesh with small business regulations, and to determine whether barriers to adoption have been created. We discovered that, while DoD has embedded incentives within the mandates designed to solicit supplier participation, these incentives have actually had an adverse effect on adoption. Survey respondents cited muddled policies, such as the requirement to adopt Gen 0/1 standards, that DoD itself stated would become obsolete a month after the pRFID mandate took effect, as reasons to hold-up adoption until a later date.

Finally, we identified ways DoD could possibly get its remaining small business suppliers to traverse this chasm enroute to conformance. Many of the survey respondents cited different incentive policies, such as implementation assistance, instead of actual cash reimbursements, as methods that could expedite their decision to adopt.

Ultimately the survey served to validate our view that the current DoD pRFID and UID mandates have done little to entice small business suppliers to conform. DoD needs to revisit its approach to motivating these critical suppliers. The next section provides some suggestions for policy changes DoD might consider to create that motivation. These recommendations are integrated with major findings from the survey in the discussion.

B. WHAT IS AT STAKE?

DoD expects the successful deployment of its Automated Information System (AIS) to solve its inability to effectively manage the logistics supply chain. Once fully employed, the system is supposed to provide DoD with TAV. The success of the system is intricately tied to the implementation of pRFID and UID technology, which are critical components of the overall system. Although well into their implementation life cycles, both have been under increased scrutiny since their initial deployment. They have been plagued by continuous setbacks and cost overruns, yet the DoD is still forging ahead with its mandates. Each has had its own specific setbacks, and they will be individually addressed here with the hope of finding a solution to forge ahead.

C. PRFID

The pRFID policy is essential to managing supplies, but implementation by small businesses has been slow. The authors' 2007 survey found that about 62 percent of the respondents were familiar with pRFID technology, while only 31percent actually knew about the DoD policy. DoD cannot possibly expect to implement a policy that is unknown, and must therefore improve the lines of communication between itself and its small business suppliers. One logical place to start would be with the liaison entrusted to perform that function, the Small Business Administration (SBA).

When asked whether they planned to conform to the mandate, 21 percent of the survey respondents said yes, while another 31 percent stated they estimated they could conform if the deadline were in 2008. Provided that, as of 2007 many of the small business suppliers surveyed were still unaware of the mandates, it seems highly unlikely

that they could comply by January 2008. A more logical option for DoD would be to repair the communication issues, and then establish realistic deadlines for compliance thereafter.

Interestingly, 62 percent of the respondents stated that they provided less than 10 percent of their business to DoD. Additionally, only 21 percent of the total sample cited obtaining additional DoD contracts as an advantage gained through adoption. This response brings into question the relevance of mandating compliance for all small businesses at the present time. If many of these businesses seem to be non-critical partners for DoD, and pRFID technology has not yet reached a level of maturity that would allow them to realize noticeable return on investments (ROI) for its implementation, then it only makes prudent business sense to release them from mandatory compliance at this time.

Releasing these businesses from compliance would prevent DoD from wasting critical funding that is better spent elsewhere. The incentives that DoD has authorized may have little effect upon this group, because the problems related to adoption at this time far outweigh the gains that they may realize. For a group of suppliers already burdened by increasing government regulations, the mandates will only serve to increase the resentment and further stifle business relationships with DoD. The ramifications of this could have a significant impact on DoD; small businesses account for 99.7 percent of the total DoD supplier base. Further, the federal government is required by law to divert 23 percent of its total annual obligations to small business concerns, and DoD obligations alone should account for 70 percent of that total. (SBAERP, 2006)

Small businesses are often constrained by financial resources, which may affect their adoption of new technologies. The initial cost of buying the equipment to implement for pRFID can reach in excess of \$20,000. This amount does not include the cost of middleware, training for employees, installation costs, or any modifications that may be needed to support businesses networks or infrastructure. This is a significant financial investment for a small business. Ultimately, DoD's desire to get small business suppliers to finance their respective implementation does not seem realistic, especially given the limited appeal of federal contracts to the suppliers' bottom line.

Attempting to understand how companies who planned to comply would implement the technology, 49 percent concluded they would probably outsource the process while another 12 percent were undecided. Of the 49 percent who would outsource, 48 percent again stated financial restrictions as the reason. Additionally, lack of customer demand and familiarity with the technology each accounted for 14 percent of the remaining reasons not to adopt. An abundant supply of outsourcing solutions has come to market since the mandates were instituted. Unfortunately, they too need to be paid (many are also small businesses), further complicating the DoD financing plan.

Small businesses may not suffer much from failing to comply with the pRFID mandate. Approximately 70 percent of them stated non-compliance would have a moderate to no effect on their business. This fact simply reinforces the notion of attempting to institute policies with no teeth. DoD has been unable to get its own component commands to comply with its mandates; thus, it is highly unlikely that any commercial business would fear its ramifications should they choose not to comply. (GAO, 2005) Further, there may be the perception of other underlying reasons why the component commands are not complying that is causing the suppliers to follow suit. This is a signaling¹⁷ issue that must be addressed if DoD maintains any hope of enforcing its mandates.

It is also worth mentioning that nearly 74 percent of the respondents stated they would be motivated by equipment, technical help, or other incentives to change their stance on adopting pRFID. DoD has chosen to use the expectation of future efficiencies as an incentive to motivate compliance with its pRFID mandate. While this may seem practical for large defense contractors who are intricately linked to DoD, the approach seems flawed for small businesses with less than 10 percent capacity dedicated to DoD. As the survey revealed, a better incentive for this group would be in the form of technical

¹⁷ Signals may be announced intentions and explanations for such actions as new investments, production processes, pricing systems, or product introductions. (Robertson, Thomas S., *Journal of Marketing*, Vol. 50, No. 3 (July 1986), pp. 1-12.

assistance to bring them into compliance. While a full analysis of the pros and cons of this approach was beyond the scope of this effort, further research in this area is needed to help solve DoD's implementation issues.

D. UID

The UID implementation appears to be running much smoother than that for pRFID, yet it too has also experienced problems. The UID policy is an upgrade of an older policy designed to bring serialized identification into the 21st century. The updated policy from 2003 significantly modified the implementation process, affording DoD the ability to manage significantly more equipment, parts, and supplies while contributing to TAV.

The UID policy has required manufacturers to tag their products since January 2005, but here again many small businesses surveyed have not "seen the memo." Our research indicates that only 52 percent of the companies surveyed were familiar with UID technology, while a significant 76 percent were unaware of the mandate. Although 12 percent of them stated they would conform to the policy, this response is likely influenced by the fact that the survey used 2010 as the ultimate deadline.

Here again, DoD may have to consider alternate incentives to get small businesses to conform. Considering the magnitude of DoD assets that met the criteria for UID tagging, the financial impact to implement this program may be substantial. Approximately 62 percent of respondents said they conducted less than 10 percent of their business with DoD. This could mean that more money will be spent by DoD organizations on future contracts as they try to stay in compliance with the small business regulations.

E. IMPLICATIONS: LOOKING AHEAD

Financial resources may be the deciding factor in whether DoD's implementation is a success. The SBA employs programs designed to provide loans to small businesses for technology improvements, but Congress may need to intervene for DoD's sake to provide funding on such a large scale. A small percentage of small businesses have

committed to compliance, while a large share may need some type of support. If DoD sticks with this plan, more attention should be focused on finding common ground with small businesses. Money will have to be set aside to provide GFE, and other resources will need to be made available for technical assistance.

Ultimately, DoD may need to reconsider its implementation policies for pRFID and UID. The current policies are unlikely to be effective with small businesses. DoD leaders need to realize that a “one size fits all” concept does not work with many small businesses. These leaders should also recognize mixed signals are sent to small businesses when organizations within DoD are slow to adopt. For these mandates to be credible, DoD has to establish a set of consequences against “slackers” that it can enforce. Small businesses often lack the specialized technical knowledge required to implement new technologies. For these mandates to succeed, Congress will need to provide extra funding, the SBA will need to spread the word, and DoD will need to set realistic timelines.

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APPENDIX

Anonymous Telephone Interview Questionnaire

1. Are you familiar with Radio Frequency Identification (RFID) and Unique Identification (UID)?

- a. Yes
- b. No

2. Are you aware that the DOD has mandated that all of its suppliers implement RFID technology by the year 2008 and UID technology by the year 2010?

- | RFID | UID |
|--------|--------|
| a. Yes | a. Yes |
| b. No | b. No |

3. In your position with this company would you consider yourself the person to make the decision to conform to this mandate or do you influence the person that would make this decision?

- a. Decision Maker
- b. Influencer

4. Can you describe the types of products you supply to the Department of Defense (DOD)?

- a. Provide a product
- b. Provide a service
- c. Provide both

5. If you provide both a product and service, approximately how much of your business with the DOD is dedicated to a product?

- a. 10%
- b. 20%
- c. 30%
- d. 40%
- e. 50%
- f. 60%
- g. 70%
- h. 80%
- i. 90%

6. In what region of the country is your company located?

- a. East
- b. Northeast
- c. Southeast
- d. North
- e. Midwest
- f. South
- g. West
- h. Northwest
- i. Southwest
- j. Other – please specify

7. Which categories best describe your company's socioeconomic status?
(Circle all that apply)

- a. 8A
- b. Minority owned
- c. Woman owned
- d. Disadvantaged
- e. Other – please specify

8. How many people do you typically employ at your company?

- a. 1-249
- b. 250-499
- c. 500-749
- d. Other – please specify

9. Has your company decided to conform to the mandate?

- | RFID | UID |
|----------------|----------------|
| a. Yes | a. Yes |
| b. No | b. No |
| c. Do Not Know | c. Do Not Know |

10. If yes, do you intend to conform by the mandates published deadlines?

- | UID | RFID |
|--------|--------|
| a. Yes | a. Yes |
| b. No | b. No |

11. If no, can you please explain why?

- a. Too costly
- b. We wanted until the industry has a well tested system.
- c. Do not care to invest in any new technology.
- c. Our business does not want to change.
- d. Other – please specify _____

12. If yes, what do you see as the advantages in adopting RFID/UID technology due to the DOD mandate?

- a. Helps win DoD contracts
- b. Helps to expand our business with other (non-DoD) customers
- c. Other – please specify _____

13. Please classify yourself into one of the categories below based on your preference to invest in RFID/UID technology?

- a. Innovator – Seek out new technology because we like new stuff.
- b. Early Adopter – Seek out new technology because of its benefits.
- c. Early Majority – Seek it for the benefits to my company, but will wait until it is tested by others.
- d. Late Majority – Wait until technology is widely used by others.
- e. Laggard – I will only invest if I have to.

14. If you were to implement UID or RFID technology, what method will you select to ensure compliance?

- a. Buy the equipment and implement it ourselves
- b. Outsource it to another company

15. Why?

- Please specify _____

16. If you chose not to implement UID or RFID, what impact would you expect this to have on your business with DoD?

- a. None
- b. Moderate
- c. Major
- d. Extreme

17. Which of the following explanations best supports your response to the last question?
– please specify _____
18. What would motivate you to change your stance on RFID/UID adoption?
- a. Competition doing it
 - b. Incentives provided by DoD
 - c. Technical help is provided by DoD
 - d. Equipment is provided by DoD
 - e. Other – please specify _____
19. Do you possess any government equipment?
- 1. Yes
 - 2. No
20. If yes, how long are you authorized to use it?
- a. One Year
 - b. Two Years
 - c. Five Years
 - d. Other – please specify
21. Will you comply with the 2010 mandate to have all DOD assets marked with UID tags?
- a. Yes
 - b. No

ENDS.

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