AD-A282 282

IMPROVING THE PROCUREMENT OF INFORMATION TECHNOLOGY COMMODITIES

A Policy Analysis Exercise

John F. Kennedy School of Government
Harvard University
12 April 1994

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94-22865

94 7 20 106

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-01

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
		THESIS/DISSERTATION

4. TITLE AND SUBTITLE IMPROVING THE PROCUREMENT OF INFORMATION TECHNOLOGY COMMODITIES

5. FUNDING NUMBERS

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

AFIT Student Attending:

HARVARD UNIVERSITY

8. PERFORMING ORGANIZATION REPORT NUMBER

AFIT/CI/CIA-
94-094

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
DEPARTMENT OF THE AIR FORCE
AFIT/CI
2950 P STREET
WRIGHT-PATTERSON AFB OH 45433-7765

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for Public Release IAW 190-1
Distribution Unlimited
MICHAEL M. BRICKER, SMSgt, USAF
Chief Administration

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

DTIC QUALITY INSPECTED 1

14. SUBJECT TERMS			15. NUMBER OF PAGES
			35
			16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

NSN 7540-01-280-5500

EXECUTIVE SUMMARY

The Department of Defense (DoD) has been advancing acquisition reform for decades. However, in today's era of military downsizing, tight resources, and rapidly changing national security objectives, the need for reform--especially with respect to commercial information technology (IT) commodities--is particularly urgent. The current system often takes too long to award and administer contracts. In addition, it can be difficult for contracting personnel to award and maintain contracts that reflect current market prices and cutting edge technology. Taxpayers too often bear the costs of inefficiency and over-regulation in terms of lost performance, quality and innovation. Responsible reform will address these deficiencies while retaining or maximizing the many values of the current system.

AVC, formerly known as the Air Force Computer Acquisition Center, is an agency that makes improvements and advances reform on its own. They have been successfully meeting their customers needs since 1963. Our intention is not to discount their experience or competence, but to highlight potential areas for improvement. The following proposals will allow AVC to serve its customers in a way that is faster, cheaper, and easier. Two proposals would alter the current procurement system to improve the purchase of IT commodities, and one would make better use of available IT to improve the general procurement system

- **Expand the use of multiple awards to create mini-markets.**

  Awarding IDIQ (indefinite delivery, indefinite quantity) contracts to multiple vendors preserves the competition of the market after contract award rather than confining it to the pre-award phases. The benefits to customers include better prices, better service, and the quicker appearance of new technological advances on the contract. The costs

include a loss of compatibility (though this can be addressed with already existing technical standards) and increased time spent in contract management. AVC should rely more on multiple awards to procure IT commodities.

- **Use technology improvement clauses to stay abreast of the commercial market.**

  In the past, the technology improvement clause was a standard feature on all IT contracts. Current AFMC policy prohibits their use (as part of a general restriction on all "non-standard" clauses). Contracting officers, equipped with the technology improvement clause, are empowered with the necessary flexibility to pursue the best value products for their customers. This proposal would be most effective if officers could rely on market tools to determine what is "fair and reasonable" instead of requiring cost and pricing data for non-competitive modifications. ESC/AV should actively advocate for the technology improvement clause to be included in future Air Force IT procurements, which would more closely align Air Force policy with the rest of DoD and the federal government.

- **Apply Electronic Data Interchange (EDI) to order processing at AVC.**

  Implementing EDI at AVC and throughout the Air Force will make it easier for AVC's customers to order IT commodities from IDIQ contracts. Transforming paper processes into electronic transmissions would yield average direct cost savings of almost $5 per document, with indirect savings estimated to be almost twice that amount. When customers become EDI-capable, the length of time to order from AVC's contracts would decrease substantially. We recommend the following specific steps:

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1. Provide EDI capabilities (hardware, software, telecommunications, systems integration, and program support) to link AVC with vendors, DCMAO, DFAS, and customers at local bases.

2. Ensure that the system accommodates established ANSI transaction sets for the following forms: DD Form 1155, SF 30, and DD Form 250. These are the most frequently used forms and so would yield the highest cost savings.

3. Install a centralized contract database. This would provide customers with an ability to easily determine what is available on each DoD contract and help local contracting offices complete purchase orders, shortening the ordering process by approximately 2 weeks.

4. Centralize the Central Order Processing Offices. By consolidating AVC and SSC's order processing responsibilities, oversight agencies could more closely monitor contract activity and performance, and the centralized office would provide one point of contact for vendors and customers.

The chief obstacles to EDI implementation are the costs that primarily result from *upgrading hardware and modifying existing applications. ESC should attempt to draw* from financial resources available at the DoD level.

Although Congress is advancing high-level acquisition reform with Senate Bill 1587, true reform cannot be achieved unless AFMC and installation policies are also examined and rewritten.

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1. INTRODUCTION

The means by which the US Air Force acquires information technology (IT) evolved historically from the extensive procurement experience of the military services as a whole. Originally designed in the Progressive Era as a response to cries of favoritism and corruption, this acquisitions process reflects a legacy of detailed specification and lengthy bureaucratic review. Over the years, the massive military (and federal) procurement machinery has grown into an instrument of prudent caution and thoughtful calculation. Despite the sensationalism surrounding $2,000 toilet seats, in the overwhelming majority of cases military procurement agencies succeed in achieving their mission: securing the best value products and services for their customers.

However, the process was *not* designed to handle the dynamic environment of high-tech, commercial goods. The technological and commercial life cycle for IT not only continues to shrink over time, it does so at an ever increasing rate. When faced with this accelerated pace of technological change, the traditional procurement system sometimes breaks down, resulting in contracts for out-dated technology at above-market prices.[1]

Moreover, this phenomenon takes place in the modern environment of the ever-shrinking defense dollar. By FY 1997, defense spending will have been reduced in real terms by over 40% compared to 1985, and the procurement budget will have declined more than 60% in real terms.[2] Without dramatic changes in the procurement of IT, the Department of Defense (DoD) will have to struggle to maintain its edge while meeting the new national security challenges (political, economic, and military) of the 21st century.

1.1 Background

The current process of procurement by competitive proposal originated out of an attempt to make government fair, ensure standardized treatment of contractors, prevent fraud

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and to protect taxpayer's dollars. However, for all its good intentions, the process has become increasingly problematic. While each of the almost 900 laws and thousands of pages of Federal Acquisition Regulations may be individually justified, they collectively form an overloaded system that is often paralyzed and ineffectual, and at best cumbersome and complex. The sheer weight of the rules stifles creativity and obstructs the pursuit of excellence. People are encouraged to conform--to follow the rules, to document their actions, and to avoid risk, rather than innovate and use good business judgment. Government pays the cost in terms of prices, performance, quality, and lost innovation. In fact, the Carnegie Commission on Science, Technology and Government calculated that overhead costs accounted for about 40% of the DoD acquisition budget, as compared to 5% to 15% for commercial firms.[3]

In addition, the process has made it substantially more expensive for vendors to do business with DoD. Some studies have indicated that Government contracts cost vendors up to 30% more than identical commercial contracts.[4] Table 1-1 describes the sources of this financial burden.

Table 1-1. Laws and Regulations Imposing Additional Costs on Vendors

Audit and oversight requirements
Socio-economic requirements
Requirements to provide product cost data
Requirements for rights to technical data
Government cost accounting standards
Unique product and process specifications
Access to competitively sensitive financial data

1.2 Client

We are conducting this analysis in the service of Mr. Matt L. Mleziva, the director of Command and Control Systems (AV) at Hanscom Air Force Base near Bedford, Massachusetts.

AV is a component of Electronic Systems Center (ESC), one of four major product development centers under Air Force Materiel Command (see Appendix A). Mr. Mleziva's responsibilities include the oversight of six different program acquisition offices, including AVC, formerly known as the Air Force Computer Acquisition Center (AFCAC). Through AVC he has authority over, and is thus vitally concerned with, the procurement of IT commodities and services.

Since its inception in 1963, AVC's primary mission has been to acquire non-developmental communications-computer systems and associated automation products. Acting as the "middleman" between customers (Air Force and other federal agencies) and vendors (commercial contracting firms), its duties encompass the buying or leasing of hardware, software, maintenance, training, and data. Some of AVC's primary activities include guidance and participation in the preparation of the specifications (requirements), development of solicitation documents (Requests for Proposals), proposal validation and evaluation, negotiations, contract life cycle pricing, and contract award. AVC also has the distinct function of managing contracts (order processing) after award.

Organizational Character. AVC was a recent victim of the current drive to downsize military forces. They have suffered both budget and personnel cuts and can now only handle a fraction of the number of acquisitions they managed in the past.

Compared to other procurement agencies, though, AVC is rather advanced when it comes to administering IT commodity procurements. Some current AVC practices that illustrate this behavior are listed in Table 1-2.

Table 1-2. Innovative Procurement Practices at AVC

1. Practicing *best value* contracting.
2. Considering past vendor performance with other government agencies.
3. Expressing specifications in a functional manner (describing what needs to be accomplished rather than how to accomplish it).
4. Relying on market acceptance criteria to initially screen for quality and value.
5. Employing an evaluation rating scheme based on colors, rather than numbers (yielding increased judgment to acquisition officials).
6. Conducting market research by presenting open problems to industry and inviting creative solutions.

Related Agencies. In the Air Force, AVC shares the duty for IT procurement with Standard Systems Center (SSC), located at the Gunter Annex to Maxwell Air Force Base, Alabama. Not long ago, SSC and AVC operated completely independently of each other, but as a result of a recent reorganization, they are now consolidated under ESC. Although their formal mission statements are nearly identical, in practice they manage different types of contracts. AVC focuses on integrated IT systems, and SSC specializes in managing contracts for software development. The responsibility for large-scale commodity contracts is divided between the two agencies. AVC's most recent (and current) projects include the minicomputer ("Super-mini"), database machine, and workstation contracts; while SSC has managed the recent desktop procurements (Desktop IV and V) and the Base Level Phase IV (Unisys Mainframes) contract. When an upcoming acquisition does not clearly fall within one of the agencies' areas of expertise, specific responsibility is delegated by ESC after consulting the managers of both AVC and SSC.

In the federal government, the primary agency for all acquisitions is the General Services Administration (GSA). Under one of the provisions of the 1965 Brooks Bill, GSA was directed to "provide for the economic and efficient procurement of automated data processing equipment."[5] The practical implication of this statute is that customers must seek a delegation of procurement authority (DPA) to procure IT commodities, except when the requesting program is exempt under the Nunn-Warner amendment.

1.3 Statement of Purpose

Our goal is to provide Mr. Mleziva with the means to meet the needs of his customers in a way that is faster, cheaper, and easier to use than the current system. Rather than responding to a specific crisis or aiming at a fixed and predetermined target, our client directed us to explore areas with the most potential for reform. We chose to make a balanced survey of characteristics, both good and bad, of the current IT procurement system. In response to this review, we then make specific proposals to Mr. Mleziva for consideration.

1.4 Reader's Guide

This report lays the foundation for responsible reform, beginning with a careful assessment of the practices and procedures associated with contemporary IT procurement. Section 2 explicitly states the assumptions upon which our subsequent analysis relies and describes the terms and concepts used later in the report. In this section, we try to capture the essential characteristics of the IT acquisitions process, distinguishing between desirable qualities we would like to preserve and deficiencies we would like to eliminate. Finally, we explore the general relationship between IT and procurement, allowing us to categorize our subsequent proposals as "target" reforms or "tool" reforms.

Sections 3 through 5 contain our proposed reforms. We will treat each proposal separately, with independent discussions of the arguments in support, benefits, tradeoffs and problems or obstacles to implementation. Section 6 is the conclusion to our analysis.

2. RESPONSIBLE REFORM

Responsible reform demands responsible analysis, built on a foundation of clear definitions and explicitly stated assumptions. Moreover, since we are addressing a system that has developed over time, we must take extra care that our proposals do not throw out the good with the bad. To this end, and to ensure that our suggestions do not merely substitute a new set of problems for the old ones, we carefully inventory the characteristics of the current system. We distinguish between values we would like to retain and deficiencies we would prefer to eliminate. Finally, we explore the interactive relationship between IT and procurement. Just as better procurement policies can lead to improved purchases of IT commodities, so can better uses of technology serve to strengthen general procurement practices. We will address this synergistic interaction by defining and differentiating between *tools* and *targets* of procurement reform.[6]

Our first step is to define our subject: "'Information technology' has become the generally accepted umbrella term for a rapidly expanding range of equipment, applications, services, and basic technologies. They fall into three primary categories: computers, telecommunications, and multimedia data, with literally hundreds of subcategories. Increasingly, the three elements have become interdependent."[7] The nature of technological advance is such that IT refers to an ever increasing number of goods and services. Distinctions can be made within the industry along a number of different dimensions.

2.1 Commodities vs. Systems

Information technology procurement occurs on a spectrum, with *pure commodities* on one end and *integrated systems* on the other. Because they are separated by a substantial gray area, it is difficult to establish a clear line of demarcation between the two. In general, though, commodities are off-the-shelf products that are easy to describe and widely useful

without much site-specific coordination, like printers and PCs. Systems include integrated bundles of hardware, software and services, often dedicated to one unique function, such as a customized accounting package designed for a specific agency. Systems are more apt to depend on the vendor for installation, maintenance, and software updates.

Clearly, commodities and systems should be approached by the acquisition manager with different mindsets. Perhaps they should be addressed with different procurement processes. In any case, the first step for any procurement reform should be distinguishing between the two in a manner both meaningful and widely applicable.

To align our analysis with parallel reform efforts underway in Congress, we chose to adopt, as our definition of a commodity, the following language in Senate Bill 1587, the Federal Acquisition Streamlining Act (proposed).[8]

The term "commercial item" means

(A) property, other than real property, that is of a type regularly used by the general public or by non-governmental entities in the course of normal business operations for purposes other than governmental purposes and (i) has been sold or licensed to the general public; (ii) has not been sold or licensed to the general public but has been offered for sale or license to the general public; or (iii) is not yet available in the commercial marketplace but will be made available for commercial delivery within a reasonable period;

(B) any item that, but for minor modifications made to meet Federal Government requirements or modifications of a type customarily available in the commercial marketplace, would satisfy the criteria in subparagraph (A);

(C) any combination of items meeting the requirements of subparagraph (A) or (B) that are of a type customarily combined and sold in combination to the general public; and

(D) installation services, maintenance services, repair services, training services, and other services if such services are procured for support of an item referred to in subparagraph (A), (B), or (C) and if the source of such services (i) offers such services to the general public and the Federal Government contemporaneously and under similar terms and conditions; and (ii) offers to use the same work force for providing the Federal Government with such services as the source uses for providing such services to the general public.

To simplify the following analysis, we will regard any product not meeting the above definition as a system. This further ensures that our chosen line of demarcation, and hence our reforms, are both conservative and practical.

2.2 Assumptions

In our paper, we will restrict our attention to commodities, as defined above. We do so for two reasons: 1) In order to focus our analysis on a manageable aspect of IT procurement; and 2) Because most acquisitions administered by AVC fall under our definition of commodities.

We guided our thinking by regarding the upcoming C2 (command and control) Workstation project as a "model contract," the basis for our analysis. This contract, covering both high-end workstations and software, is projected to be awarded in the second or third quarter of FY 95. Contract duration will consist of three years of hardware and software ordering, followed by two years of maintenance. During the ordering period (FY 96-98), Air Force projections show that 12,000 workstations should be required. C2 Workstation will be awarded as an IDIQ (indefinite delivery, indefinite quantity) contract, to support the C2 needs of Air Mobility Command, Space Command, Strategic Command, and Transportation Command. The workstations should be "reliable, lightweight, easily transportable, and simple to operate/maintain." In addition, all hardware must be specifically designed for backward compatibility with hardware and software currently used in TBM (Theater Battle Management), CTAPS (Contingency Theater Automated Planning System) and WCCS (Wing Command and Control System). As it stands right now, customers will be restricted to Air Force war-fighting commands; therefore, a delegation of procurement authority (DPA) will not be required.[9]

One advantage of using the C2 Workstation as a model is that this particular acquisition will be AVC's next major task. We also believe that, at least for the foreseeable future, AVC's future acquisitions will be similar in size and scope.

2.3 Characteristics of the Current System

2.3.1 Values to be Retained

Federal and military procurement policies evolved over time to address the specific needs of purchasing customers. For procurement reform to be successful, these essential elements must first be recognized and, to the fullest extent possible, preserved. We identified six characteristics as values we should strive to retain: economy, quality, accountability, fairness, compatibility and sustainability.

Economy simply means getting the lowest price possible. Federal procurements are almost always aggregated to accentuate the tremendous buying power of the government. Buying in bulk often ensures increased savings through volume discounts.

Because government agencies are only stewards of taxpayer money, they must ensure that they are getting the best *quality* product for their dollar. Fraud, waste and abuse cannot be tolerated in any form.[10]

Another characteristic that grows out of government's stewardship role is *accountability*, defined as "the degree to which acquisition decisions are adequately documented and can withstand public scrutiny and post-decision audit, by citizens and their elected representatives."[11]

We would also like our procurement system to exhibit the quality of *fairness*. A government contract can often be large enough to make or break competing firms, and radically alter the landscape of the relevant market. Faced with such immense power, vendors must be protected from favoritism and arbitrary government decisions.

In addition, our government should be able to share information across its many agencies, particularly in DoD. *Compatibility* thus becomes a value. Even when our systems cannot be fully portable from agency to agency or service to service, we would certainly expect most of the data used by the systems to be transferable. Again, buying in bulk can guarantee service interoperability, especially in active theaters of operation.

Finally, government relies on the private sector for goods and services because of a fundamental recognition that private vendors have acquired vast amounts of expertise in the chosen areas. The government must tap this expertise over the full useful life of the product, often long after the final unit has been sold, and so desires *sustainability*. Vendors may want government business so badly that they contract to provide the necessary services (installation, training, maintenance, etc.) out of their own self-interest.

2.3.2 Deficiencies to be Eliminated

For all its inherent value, the procurement system for IT also has substantial problems. Among the deficiencies we would like to eliminate, or at least address, are the length of time it takes to award and administer a contract, the incentive for losing bidders to file multiple protests against the contract award, and the systematic inflexibility of the IT procurement system (which often makes it difficult for contracting personnel to award and maintain contracts that reflect current market prices and cutting edge technology).

Customers must often wait a very long time to get the products that they need. If a contract for the desired product is not already in place, the user must first wait through the lengthy formal source selection process. In 1989, for example, AVC's acquisitions took, on average, 20.5 months from the time of first customer contact to contract award.[12] And even if a contract has previously been awarded for the required items, the order alone can still take many months to process.

Because government business can be so important to individual firms, there is a strong incentive for losing bidders to protest contract awards. These protests are often based

on technicalities that, ironically, would have no basis were it not for the heavily legislated and regulated nature of the procurement process. Rules intended to make government procurement more fair and less susceptible to protests instead offer losers both the means and motive to formalize their objections and delay final contract award. "The customer is always right" is a maxim that unfortunately does not seem to apply when the customer is our government.

Ultimately, we must find a better way to reconcile the inflexibility of the current IT procurement system with the dynamic nature of the commercial IT market. Admittedly, only rarely does the government find itself burdened with a contract for out-dated technology, yet this situation is too often averted only by the enterprising actions of dedicated managers and administrators working against the grain and outside of the system. Even incremental improvement to make such outcomes systematic (rather than entrepreneurial) should be viewed as an important and necessary success.

2.3.3 Tradeoffs

Obviously, any reform of the current system is likely to involve tradeoffs. Removing or alleviating identified deficiencies could also undermine the values we would like to retain. For example, reforms that would remove incentives to protest are also likely to result in a system that is less fair (or perceived as less fair) than the current one. There are even tradeoffs among different values; simply put, we cannot have it all. Even in the private sector, quality and economy are values that often come into conflict with one another.

Because of the complex nature of all these tradeoffs, it is unlikely that any single reform can address every deficiency while maintaining or maximizing every value. Therefore, we present our proposals as independent reforms individually intended to alleviate *some* of the deficiencies in order to promote *some* of the values. Where our proposals involve potential tradeoffs, we clearly discuss the relevant benefits and costs. Often, the value added

to the system by our suggestions can only be determined by the manager on the spot, taking into consideration the needs and desires of the users and ultimate customers.

2.4 Of Tools and Targets

The relationship between IT and procurement is interactive. On one hand, innovations in the way the procurement process is structured and administered can yield better quality IT commodities with less effort on the part of contract managers and administrators. On the other, better use of IT can streamline the procurement system, yielding benefits across a wide range of products and services. While improved IT procurement can be a target for reform efforts, IT can also be used as a tool to enhance procurement in general.

The reforms we have chosen to highlight in this report reflect this division of tools and targets. We first discuss two proposals intended to specifically improve the procurement of IT commodities: the use of mini-markets and technology enhancement provisions. Then, our third and final proposal views IT as a tool, exploring a method to employ IT and electronic data interchange (EDI) to streamline the ordering process.

3. MINI-MARKETS

Several positive characteristics of the current procurement system are supported by large, bulk contracts. We listed economy, compatibility, and sustainability as values to be retained. Making government purchases as large as possible secures, and often maximizes, each of these specific goals. On the other hand, the sheer size of the typical contract also leads directly to a few deficiencies. Large purchases must often cover several years to generate a sufficient number of orders. Yet during the life of the contract, technology can, and often does, advance, leaving the procurement agency and its customers with a contract that must be renegotiated to be kept current. Also, the larger the contract, the greater its importance to vendors. Potential bidders stand to "hit the jackpot" if they are given the award. Thus, losing bidders are given a significant incentive to protest every adverse decision.

The most common approach to trying to alleviate these problems is to simply decrease the duration and size of the contracts For example, Emmett Paige, Jr., an Assistant Secretary of Defense, stated in an October 1993 memo, "I believe that the rapid rate of change in microcomputer technology and the inherent difficulties in conducting large, multi-item, multi-agency procurements . . . make it necessary for the Department to adopt a practice of conducting PC procurements of relatively small scope and short duration." He further mandated a maximum hardware/software ordering period of two years and limited the scope of IT procurements to single military departments.[13] However, reacting in this way can also eliminate the positive characteristics of bulk buying, particularly economy. The following proposal is an attempt to correct the deficiencies of the large contracts without sacrificing the attendant values.

In the Air Force acquisition agencies, contracts for IT commodities are typically IDIQ contracts awarded to a sole vendor. This runs counter to the practice of other procurement

agencies, particularly at the state level. Because IDIQ awards are often so large, they are more effectively awarded to two or three vendors. A contract award to multiple vendors serves to establish a "miniature market," in which customers can choose the vendor and product that best fits their needs. Such an approach, however, is suitable only for commodity contracts, and should not be applied when purchasing integrated systems.

3.1 Benefits

The strength of the mini-market comes from the preservation of competition after contract award. The current process confines competition to the pre-award phases. Once the winning bid is accepted, there is little incentive for the contractor to work very hard.

The Air Force already has some experience in awarding IT contracts to more than one vendor. The Unified Local Area Network Architecture (ULANA I) contract was dually awarded to EDS and TRW in 1990. Price discrepancies between the two vendors were quickly resolved once ordering began, as the prices almost exclusively settled on the lower of the two bids. In addition to better prices, customers also noted that service was generally better than expected, and contract managers observed that it was much easier to put new products on the contracts.[14] As expected, EDS and TRW, each afraid of falling behind the other, frequently rushed to be the first to offer new improvements. Overall, the experience was exceptionally favorable from the point of view of both managers and customers,[15] and worth attempting to duplicate.

Most of the benefits of the mini-market accrue to customers since they would have a choice between two or more contractors. Not only could users choose the price/technology mix that most closely matches their preferences, they could also choose products with strengths that most closely match their individual requirements.

3.2 Obstacles

One of the most readily visible tradeoffs of the mini-market is its corresponding loss of compatibility. Engineers will always be able to declare two systems (manufactured by different companies) incompatible at some level. However, what is material in this case is not that two particular machines be perfectly compatible, but that they use and produce data in a bilaterally consistent manner. Standards to ensure the required levels of data interchangeability already exist in the Applications Portability Profile (APP), published by the National Institute for Standards in Technology (NIST). In fact, these standards are currently enforced on most applicable IT contracts. As the APP continues to grow, so does compliance in the commercial market, as vendors position themselves to secure the most government business they can. Particularly for commercial items, compatibility is an issue that is swiftly disappearing.

Another drawback would be an increased burden for the contract manager, who would have to deal with more vendors (post-award) than (s)he otherwise would. Dealing with two vendors requires twice the number of contract modifications, twice the number of contract close-outs, etc. Most of this burden would be carried by the contracting offices, AVK and PK. The costs associated with increased management workload cannot be avoided, and must be weighed against the mini-market's benefits for AV's customers.

The related increase in administration (order processing) difficulties can be virtually eliminated with EDI. Even without EDI, order volume would remain constant regardless of the number of vendors, and expanding the contract award from one contractor to a group of contractors in a mini-market would have little impact on the overall administration load.

3.3 Implementation

Mini-markets can be established in many different ways. One approach is to base solicitation and award strictly on a technical competition. Price competition would only take

place after the award, within the mini-market. Although implementation in this fashion would most perfectly preserve the mini-market's strengths, it would also require a fundamental restructuring of the source selection process.

A more realistic implementation would leave the current source selection procedures mostly intact. Contract award would still be based on technical performance and price bids, together. However, in addition to awarding the contract to multiple bidders, the manager of the acquisition would allow the competing contractors to freely refresh the price and/or technology of their products (in accordance with current practices). Awarding contracts to multiple vendors eliminates the requirement for cost and pricing data to approve these contract modifications since the manager can simply rely on the discipline of the mini-market to ensure the government continues to get the best deal possible. Collusion between mini-market competitors to keep prices artificially inflated is a potential threat. However, AVC can guard against this by closely comparing the magnitude of the discounts to the GSA Multiple Awards Schedule over time.

We recommend that AVC rely more on multiple awards to procure commercial items. Taking into account the increased burden on contract management, these experiments should be restricted to dual awards, as long as budgetary restrictions constrain personnel in the contracting offices. Of course, the desires of the customer must be taken into consideration, and if customers do not want to deal with multiple vendors, they should not be forced to. Nonetheless, they should be made aware of the potential benefits they would forego, in the case that they prefer a single contractor.

4. TECHNOLOGY ENHANCEMENT PROVISIONS

In the past, technology enhancement provisions were a standard feature on contracts for IT. The "technology improvement clause" (TIC) allows the vendor to put new technology on the contract with the approval of the contract manager, even if the cost for the new item is greater than the item being replaced. AVC has extensive experience using TICs, but starting in 1989 (when AVC was still organized as AFCAC), Air Force Communications Command (AFCC) began disapproving their use. Reorganized under Air Force Materiel Command (AFMC), AVC has continued to be restricted from inserting any "non-standard" clauses -- including the TIC--into their contracts. The rest of DoD and GSA continue to rely on the technology improvement clause as an important and necessary tool for efficient contract management.

4.1 Benefits

As an independent initiative, utilizing the technology improvement clause would yield benefits for the Air Force, its acquisition managers and their customers. In the broadest sense, it would help keep the Air Force from holding contracts for yesterday's technology, and would more closely align Air Force policy with the rest of DoD and the federal government.

Acquisition managers, equipped with the technology improvement clause, would be empowered with the necessary flexibility to pursue the best value products for their customers. Currently, the only standard provision for changing the technology on a contract is found in the "changes" (or "substitution") clause. But the typical changes clause stipulates that substitutions may only be approved for items with equivalent performance and the same or lower life-cycle cost.[16] Since substitutions for better technology at higher prices are not permitted under the changes clause, the ability of the manager to act in the best interests of the

users is severely limited. With the TIC, managers would be more free to ensure the contracts under their supervision reflect the realities of the swiftly evolving commercial IT market.

Customers are also certain to benefit from the implementation and exercise of technology improvement clauses. As a hypothetical example, suppose a contract was awarded in the summer of 1992 that included as one of its components a 2400 baud modem, which was then the commercial "standard." The technology for modems has advanced rapidly in the intervening two years, through the introduction of the 9600 baud modem and on to the present widespread use of the 14.4k baud modem. Even though 2400 and 9600 baud modems are still commercially available, the 14.4k baud models continue to outsell them. This indicates that, at least to the average private consumer, the marginal benefit of the increased transmission rate outweighs the marginal cost, reflected in the increased price. We assume that the same marginal benefit and cost calculation would hold for the typical government consumer in our hypothetical world. However, under the provisions of the contract, the government would be forced to continue to purchase the old modems—a misallocation of society's resources and a misuse of taxpayer dollars. The technology improvement clause, by allowing substitutions first to 9600 baud modems and then to 14.4k baud, would avoid the waste to customers caused by forcing them to make an inefficient purchase of older and obsolete technology.

Combined with the implementation of the mini-market proposal, the TIC becomes especially powerful. Its use would provide customers another dimension along which they could choose. By offering users effective options between old technology/low price and new technology/higher price, they can more closely match their means and desires.

4.2 Obstacles

There are three primary arguments that could potentially be used against the inclusion of technology improvement clauses in standard IT contracts: 1) Technology improvement clauses are anti-competitive; 2) Substitutions can already be effectively made with the changes

clause; and 3) Substitutions under the technology improvement clause would require cost and pricing data, burdening both the vendor and the government with excessive paperwork. Each of these objections can be defeated, in turn, by sound counter-arguments.

- **Technology improvement clauses are anti-competitive.**

This objection forms AFMC's primary argument against the TIC. In addition, it is most likely to be raised by bidders who lost on the original contract award and by contract managers who are sensitive to such protests. The losing vendors will claim that the government, by allowing a technological improvement to the original contract, has in effect made a second award. They will almost certainly demand that the improvement be competitively re-bid.

However, as long as the contract manager ensures that the substitution meets the same functional specification and addresses the same requirement as the item being replaced, there are no grounds to release a second RFP to re-bid all or part of the first contract. In fact, a losing bidder recently raised a legal challenge to a decision by the GSA to amend a portion of its telecommunications contract with a technology improvement clause. The objection was thrown out in court.[17]

- **Substitutions can already be effectively made with the changes clause.**

This is the argument used by AFMC (and by AFCC before them) to justify the current prohibition against technology improvement clauses. They claim that the changes clause provides the necessary discretion for contract managers to keep their contracts up to date and abreast of the commercial market.

However, we have already illustrated the differences between the changes clause and the technology improvement clause. The changes clause only allows substitutions for the same or better technology at the same or better price. Replacements are not allowed that would result in a higher price, even if they would give the customers more value for their money. Furthermore, the changes clause was originally intended to address a much different problem:

what to do when a contractor wants to close a product line that is currently on government contract. The changes clause was never meant to allow customers to keep up with rapidly advancing technology. Using it to achieve that purpose clearly runs counter to contracting law.

• **Substitutions under the technology improvement clause would require cost and pricing data, burdening both the vendor and the government with excessive paperwork.**

Currently, exercising the technology improvement clause requires the collection of cost and pricing data from vendors, which is problematic. The purpose of this requirement is to ensure that the government is getting the best possible price in the absence of competition. However, cost and pricing data is often difficult for vendors to collect, and they are often reluctant to part with information they consider to be proprietary. In addition, it is simply inappropriate for the government to determine an acceptable amount of profit for a contractor based exclusively on the firm's costs--one of the marketplace's built-in functions is to determine "fair and reasonable" prices. In the jungle of the market, commercial firms do not establish prices solely on the basis of cost records--they also consider product differentiation, performance, reliability, capability, and quality.

Although AVC no longer requires this cost or pricing data for competitive acquisitions, regulations still demand it for sole-source procurements. The easiest way to avoid its use is to combine the use of technology improvement clauses with multiple award contracts. In the absence of such competition, however, contract administrators could still apply practices used in the commercial marketplace to determine a "fair and reasonable" price instead of using cost data. For example, contract officers can analyze the price history of products used to perform similar functions or the price history of the technology being replaced. Similar methodology can be applied to the administration of TICs. Since the old technology (on the original contract) is typically offered at a discount to the GSA listed price for that item, the price of the

new technology could be evaluated on the basis of its relative discount over its own GSA listed price. If the discount is equivalent or better, then the technology improvement (or contract modification) should be approved. In the absence of GSA prices for one or both items, a market index price could be used instead. The government does not need to force vendors to divulge sensitive business data in order to justify technology improvements. The only time cost or pricing data should be requested is when the contracting officer is totally unable to determine "fair and reasonable" prices through any of these means.

An independent initiative addressing the requirement for cost and pricing data would have obvious benefits. It eliminates a primary obstacle to contractors doing business with DoD (because they would no longer be required to keep dual accounting systems or divulge sensitive information). Over the long-run, vendor costs would decrease, and the resulting savings should be passed on to the government. In addition, the elimination of unnecessary delays and paperwork benefits both government contractors and customers.

4.3 Implementation

Technology enhancements are often difficult to justify, regardless of the authority or clause under which they are carried out. In order to remain accountable both to auditors and taxpayers, government activities must always buy to meet their minimum requirements. Actions that seek to take advantage of emerging technology are often viewed with suspicion, unless the agency requesting the enhancement can demonstrate that its originally contracted requirements have changed since the award. Granted, in some cases the newest IT gadget is not worth its higher cost to the government, but this is a decision best left to the discretion of the customer and contract administrator.

In light of the stewardship government must display when handling taxpayer dollars, such caution is understandable. Yet this conservative position overlooks the tremendous productivity gains that may be realized through the use of the latest and best technology.

Particularly in an era of shrinking defense budgets, the long-run cost savings made possible by technology enhancement provisions should not be overlooked nor discounted.

In the real world, contract managers can (and sometimes do) make technology improvements (even for higher-priced technology) under the authority contained in the changes clause. Another method to provide for technology enhancement is to submit the relevant guidelines as an attachment to the Statement of Work.[18] Yet both of these ad hoc responses demonstrate the need for a more formal TIC.

Rejecting the TIC as just another non-standard clause ignores the fact that the market for IT commodities is itself very "non-standard." New products often revolutionize the entire industry. Likewise, existing goods evolve at an extraordinarily rapid pace. Without the TIC, defense (and other government) agencies cannot take full advantage of the opportunities present in swift technological advance.

The relevant decision is not whether AVC will administer technology enhancements, it is how this administration will take place. On one hand, contract managers can continue to apply the available "band-aid" techniques (relying solely on the changes clause or attaching technology enhancement provisions to the Statement of Work). On the other, AV can reconcile practice with policy by lobbying its superiors to lift the restriction on TICs.

Our recommendation is for AV to pursue the latter course. Technology enhancement is a vital tool for contract managers and the customers they serve. Keeping TICs out of Air Force IT contracts only creates a barrier against long-run efficiency. The current policy ignores the nature of the IT market, and does not square with current practice or the policies of other federal and DoD acquisition agencies.

5. ORDER PROCESSING WITH EDI

Use of EDI and Electronic Commerce (EC) to support DoD procurement processes is widely supported as the next phase of contracting automation. In May 1988, the Deputy Secretary of Defense issued a policy directive that EDI was to become the "way of doing business" for DoD; on September 7, 1993, the National Performance Review recommended that EC/EDI be expanded within the federal acquisition system; and in December 1993, Colleen A. Preston, the Deputy Under Secretary of Defense (Acquisition Reform), and her Process Action Team published a report that assessed current contracting EC/EDI capabilities and presented a comprehensive DoD-wide implementation plan.

The use of EDI at AVC and throughout the Air Force has tremendous potential to make it easier, faster, and cheaper for AVC's customers to order IT commodities from IDIQ contracts. AVC began automating its procurement processes many years ago with the use of electronic bulletin boards and other initiatives. However, newer applications like electronic order placement are now ripe for implementation—especially since AVC now administers and manages most of the contracts that it awards. Various agencies throughout the federal government already have this capability, including the GSA and the Defense General Supply Center who have used a system called POPS (Paperless Ordering Placement System) since 1983. In addition, the COPO (Central Order Processing Office) for the Army is now planning to test EDI through a pilot initiative that will link itself with PRC, the Super-mini contract's primary vendor. If the Army pilot is successful, EDI capability will eventually spread to AVC. However, the many benefits associated with EDI compel independent action by AVC.

EDI is defined as the computer-to-computer exchange of routine business information. To apply EDI to order processing, AVC would first need to establish an umbrella contract—a long-term paper contract—that documents contractual obligations and

responsibilities, including a clause authorizing placement of electronic orders. AVC would put considerable initial effort into making awards to vendors and establishing the written agreement, but subsequently AVC and its customers need expend only relatively minor effort to electronically communicate the line-item details--what the customer wanted delivered, when, and where. Once this previously negotiated contract is in place with all the required clauses and certifications, orders could be placed with a minimum of documentation and processing delays.

By examining the current information flow of a contract order (and its EDI counterpart), it becomes evident why EDI is so beneficial.

Figure 5-1. Contract Order Information Flow
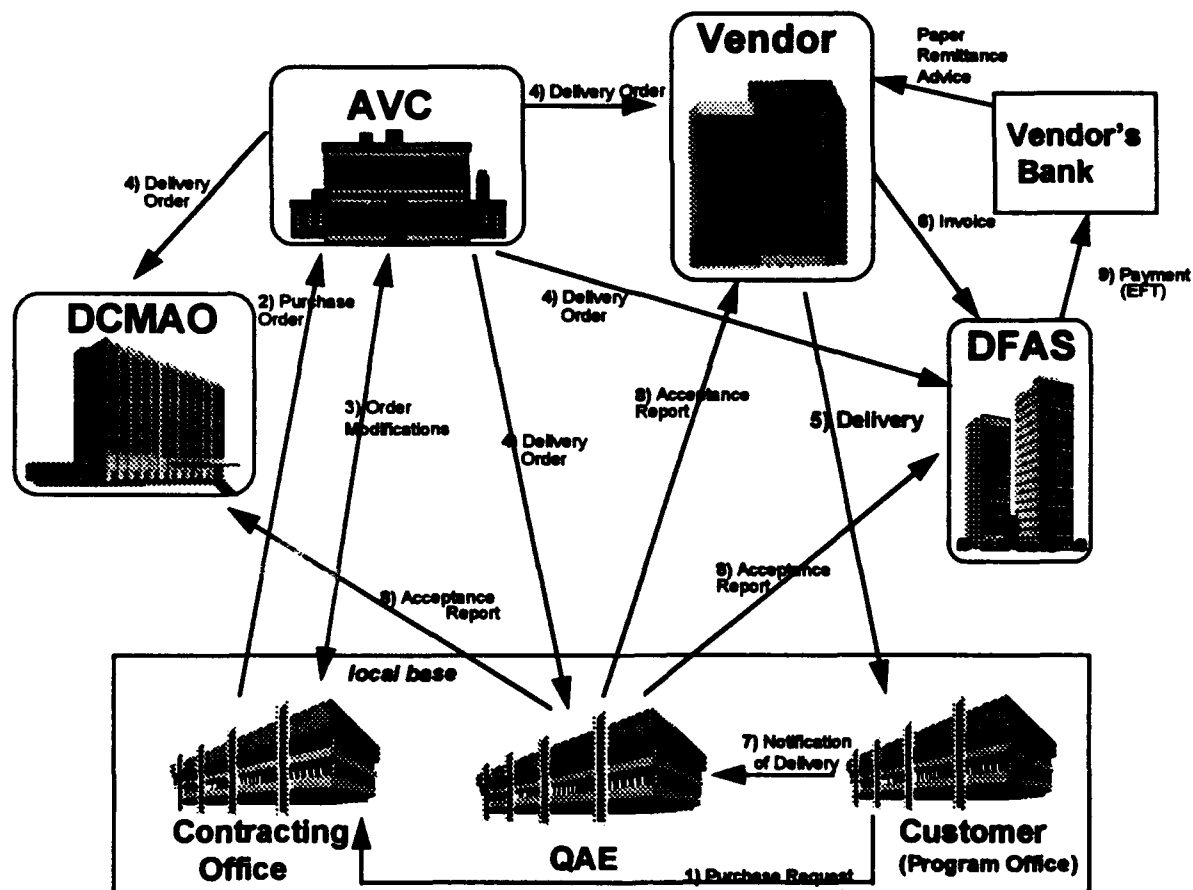
1. The customer first accesses information about the relevant contract at hand from AVC's Electronic Bulletin Board, and then requests funding and seeks approval through Air Force command channels. If approved, the customer--along with the vendor--formulates a draft purchase order. The customer then sends a Purchase Request to the local contracting office that specifies a description of the item(s), estimated value, need date, priority, delivery point, and other line-item data.

2. The local contracting office reviews the contract and the Purchase Request. If they are not familiar with the relevant contract, they must mail or fax a request for the contract to AVC, await its delivery, and then incorporate the relevant contract information into their internal records. Electronic access to a centralized contract database could greatly streamline this process. Finally, the contracting office sends a DD Form 1155 Purchase Order to AVC (with EDI, they would generate an electronic purchase order and send an ANSI 850 transaction set via a value-added network or VAN).

3. AVC double-checks the order and requests any necessary modifications. The local contracting office must then generate and send Forms SF 30 Contract Modifications or Change Orders (or, alternatively, they can electronically send ANSI 860's) until the order is satisfactory.

4. AVC issues a DD Form 1155 Delivery Order (with any modifications), providing either a paper copy of the order or sending it electronically using ANSI 850, to:
   - The vendor
   - DFAS (Defense Finance and Administration) or, in some cases, to the local accounting and finance office
   - DCMAO (Defense Contracting and Management Administration Office)
   - QAE (the local Quality Assurance Evaluator)

5. The vendor delivers the material to the customer.

6. The vendor sends an (electronic) invoice to DFAS.

7. The customer notifies the local QAE of delivery.

8. The QAE inspects the equipment and sends DD Form 250, a material inspection and acceptance report (or ANSI 856/861) to the vendor, DFAS, and DCMAO.

9. DFAS pays the vendor with a check or electronic funds transfer (EFT)--in which case the vendor's bank would send a paper copy of the remittance advice describing the amount and purpose of the payment to the vendor.

Based on the above information flow, we recommend the installment of an EDI electronic order system. More specifically, we prescribe the following actions:

- **Provide EDI capabilities to link (in order of priority):**

    1. AVC and the vendor (assuming that the vendor is willing). While such an isolated link would be more advantageous to the vendor than to AVC or the customer, it is a relatively low-cost first step.

    2. AVC, DCMAO, and DFAS.[19] This, too, is a relatively low-cost step that would enable most of the administrative paperwork not involving the customer to be accomplished electronically.

    3. AVC and the local bases (at local contracting offices, QAEs, or both) so that customers have a complete EDI link to all parties involved. Only then will the process truly work effectively to reduce costs and lead-times. However, establishing this link will be very costly (explained below).

- **Ensure that the system accommodates the following established ANSI Transaction Sets (since their corresponding forms are the ones used most frequently):**

Table 5-1. Recommended Documents for EDI Implementation

Document Type	Form	EDI Transaction Equivalent
Purchase Order Delivery Order	DD Form 1155	ANSI 850, *Purchase Order*
Contract Modification Change Order	SF 30	ANSI 860, *Purchase Order Change*
Material Inspection and Acceptance Report	DD Form 250	ANSI 856, *Shipping Notice* ANSI 861, *Receiving Notice*

- **Install a centralized contract database.** This would provide two crucial benefits. First, customers would know what is available to them for purchase on all the existing contracts. Currently, customers often do not know what products are available, who to call, or how to find out. In addition, since customers would be instantly aware of *all* known contracts that would satisfy their requirement, they could choose to buy products

from the one that best matches their preferences. Secondly, a centralized database itself could shorten the entire ordering process by about two weeks. This is the time that it currently takes for local contracting offices to determine if a contracts exists and who manages it, request a copy of the contract with its most recent modifications, await its arrival in the mail, and rekey all the required information.

- **Centralize the COPOs (Central Order Processing Offices).** In the Air Force, both AVC and SSC act as COPOs, and numerous others exist throughout DoD. Centralization has four main benefits: 1) Increased information processing power--for example, consolidated reports could instantly tell GSA or Congress the exact amount that has been ordered off each contract and by whom; 2) One point of contact or interface both for customers and for vendors--everyone would know "who to call;" 3) Standardized contract administration; and 4) Installment of EDI capabilities would be necessary at only one location.

5.1 Benefits

Applying EDI to order processing has many benefits. There are no data input errors, misdirected distributions, or unreadable orders. Data are manually entered once, edited, and, if accepted, electronically passed to other internal computer applications and through a telecommunications network to the supplier. Network communication summaries list transactions sent and received. Acknowledgments verify the receipt of order details. Periodic follow-up messages indicate delivery status. Ship notices, invoices, and payments can all be made automatically and electronically. Ultimately, customers enjoy significantly faster service. Not only are the values of *economy* and *quality* advanced, but so is *accountability*.

Specifically, benefits can be broken down into *direct* and *indirect* benefits, which is especially useful when attempting to quantify the cost savings that result from implementing EDI.

5.1.1 Direct Benefits

Direct benefits are those that result from transforming manual paper processes into automatic electronic transmission. Although calculating projected cost savings is important when considering any investment, the decision to invest in EDI can be based on a substantial experience base. In both the public and private sectors, EDI has proven to merit the required investment, provided normal reasoning is used in its application. The Defense Logistics Agency, DoD's former Executive Agent for EDI, prepared a business case for Electronic Commerce which analyzed the potential cost savings within DoD. It reported that DoD could realize cost savings totaling $1.2 billion over a 10-year period by replacing 16 commonly used paper documents (8 of which are relevant to procurement and contract administration) with their electronic equivalents.[20] Although the private sector routinely claims savings of between $10 and $50 for every paper document eliminated through EDI, the business case predicted savings averaging a conservative $2.40. The savings figures are based upon engineered work standards developed by DFAS--Indianapolis Center. Table 5-2 lists common DoD processing operations along with business case estimates of projected savings (on a per-document basis) that could result if DoD replaced the manual processing with EDI.[21]

Table 5-2. Direct Cost Savings Through EDI for Recommended Documents (Dollars)

Activity	DD 1155	DD 250	SF 30
Document distribution	0.04	-	0.06
Mailing	0.26	-	0.26
Document Receipt	0.07	0.16	0.14
Document Processing	0.82	1.82	1.53
Document preparation and control	0.76	2.25	1.41
Data entry	0.57	1.19	0.92
Error resolution	0.32	0.49	0.29
Document storage and retrieval	0.68	0.16	0.38
Total	3.52	6.07	4.99

Total Savings per Year = Cost Savings per Document x Annual Volume

Therefore, direct costs savings for each EDI link would vary, depending on their particular document volumes. For example, AVC's annual volume with vendors is between 350 and 450 documents while DFAS's is in the thousands (if not millions). However, document volumes for the Air Force's COPOs, AVC and SSC, would substantially increase if they were centralized.

5.1.2 Indirect Benefits

The real value of EDI lies not in the reduction of paper flow but in laying the foundation for strategic and fundamental changes to business processes. EDI aims at *total process re-engineering*. These are the indirect benefits--those that typically result from changes in business practices made possible by EDI, like improvements in customer service, streamlined operations, improved quality control, enhanced contract management and auditing, and reduced interest payments. Although the indirect benefits from EDI have the potential to be substantially larger than the direct benefits, they are more difficult to estimate. Some studies indicate that the indirect savings may exceed direct savings by a factor of three.[22] DoD's business case predicts that for every dollar in direct savings, DoD would indirectly save an additional $1.80.[23]

For AVC's customers, the indirect benefits could be substantial. Currently, it can take several months (estimates range from 4-7 months, including up to 60 days for delivery) from the time the customer initially formulates a draft order to the time of delivery.[24] With EDI, the total process could be cut to 1-3 months (1 month for processing and up to 60 days for delivery), which would allow the customer to receive their purchases while the technology is still fresh. However, since much of the current processing time passes at the customer's local base, fully realizing this benefit will be dependent on establishing appropriate capabilities at each local contracting office rather than simply at AVC.

5.2 Obstacles

The primary obstacle to implementation of the above proposal is *funding*. Some links would obviously be more costly to install than others. For COPOs like AVC, the costs apply to implementation at *one* agency only. In addition, the primary vendors of large, multi-year, IDIQ contracts will provide little resistance to EDI compliance because of the benefits that they can expect; if they are reluctant, though, AVC can simply make it a requirement in the RFP (and vendors may then pass on the investment costs to customers). However, when implementation of EDI reaches the stage of linking individual contracting offices (and/or QAEs) at each of the 300-plus bases, the costs become quite substantial. Some contracting offices do not even have a modem with which to use AVC's electronic bulletin board--and some who do are unable to use them! Most bases still have the old Wang computer systems, and the costs to upgrade them to new hardware will be very significant. However, these system must be upgraded anyway, so the money will be spent regardless if the bases are made EDI-capable.

The key question is, *who pays*? While it may be impossible to convince each local contracting office to voluntarily upgrade their hardware out of their own budgets, an opportunity exists for central funding.

The following is a description of the investment costs for a typical EDI project:[25]

1. **Hardware** costs are mostly determined by the technical configuration of the operating concept (either a front-end or a host configuration); the choice of hardware depends upon a number of considerations, including the volume, processing speed, and storage requirements.

2. **Software.**

    *   *EDI translation software* formats flat files of data to and from ANSI X12 standard transactions--numerous commercially available packages appropriate for DoD are available.

    *   *Communications Software* is used to automatically dial and establish a connection with the VAN and send/receive EDI-formatted data to/from the VAN.

    *   *Mapping Software* is an interface program that extracts information from an activity's application system and formats it into an American Standard Code for Information Interchange (ASCII) flat file that is accepted by the EDI translation *software.*

3. **Telecommunications** set-up costs include, for example, the installation of dedicated telephone lines.

4. **Systems Integration** costs are often *the largest single category of investment costs* during EDI implementation. They include:

    *   *Interface programming* that formats data from the EDI translation software into flat-file records for processing by the applications systems.

    *   *Enhancements to applications systems*--some of an activity's systems may need to be modified to process EDI data. Some activities may expend upwards of 50 percent of all EDI investment costs in this area.[26]

5. **Program Management** costs include promoting and coordinating EDI initiatives among program participants, revising operating procedures and developing new procedures to govern EDI transactions, and establishing and nurturing trading partner relationships and agreements.

6. **Implementation support** includes planning and coordination, training, trading partner expansion, etc. In some cases, these responsibilities may command the full-time attention of at least one individual for the first couple of years of an EDI project.

In addition, although document processing costs should decrease dramatically following implementation of EDI, the activity is likely to experience increases in two categories of operating expenses--telecommunications and software maintenance.

5.3 Implementation

Implementation must be evolutionary, taking one link and one document at a time. An activity typically should allow at least 5 to 6 years to achieve its target implementation goal (that is, the percent of documents that are transmitted electronically).[27] Most private-sector companies plan for an implementation rate of less than 15 percent during the first 2 years of an EDI project, primarily because of the time required to procure hardware and software and make the necessary enhancements to internal applications systems and operating procedures.[28]

In addition, ESC must ensure that its new EDI project is compatible with the broader DoD EDI/EC architecture and plans. Compliance with the broader plan will help ensure access to centralized funding. Compatibility with the implementation plan of Colleen Preston's Process Action Team and other DoD-level efforts will maximize the possibility of outside financing.

6. CONCLUSION

Our objective was to provide Mr. Mleziva with specific proposals for his consideration that would allow AVC to serve their customers faster, cheaper, and easier. In response, we offered proposals in three different areas--mini-markets, technology improvement clauses, and EDI applied to order processing. Although we presented them as independent proposals, they are effectively linked. For example, technology improvement clauses will be easiest to administer and most successful within a mini-market, and EDI eases the extra administration requirements of multiple awards.

Ultimately, we must acknowledge that our study has gone forward within a much more comprehensive framework of procurement reform. In fact, Senate Bill 1587, acting on the recommendations of the Advisory Panel on Streamlining and Codifying Acquisition Laws ("Section 800 Panel"), encompasses some of the above proposals (and many more) and is currently being debated in committee. The most significant feature of the bill is that it facilitates the purchase of commercially available items like IT commodities. However, the obstacles to comprehensive reform are significant, especially since federal agencies have a bureaucratic stake in the status quo. Moreover, congressional reforms will have little effect unless they are supported by similar reinvention at the installation level.

It is our belief that improving the procurement of information technology commodities holds a great deal of promise for DoD and the rest of the federal government. It is our hope that such improvements will always be both sought and striven for.

Endnotes

[1] Most military procurement agencies, and certainly AVC, closely monitor the GSA Multiple Awards Schedule to ensure the listed GSA price for an item does not fall below the contract price for an identical item. Contractors also monitor the GSA prices (often 10-15% below commercial prices), and will usually come forward on their own to preserve their price advantage over the GSA in the event of a decrease. However, the Multiple Awards Schedule is updated on an annual basis, which is not often enough to keep pace with some IT markets where prices can fall dramatically over a period of months rather than years.

[2] Perry, William J. "Acquisition Reform: A Mandate For Change." Feb. 9, 1994. Page 1,4.

[3] *A Radical Reform of the Defense Acquisition System.* December 1, 1992.

[4] Perry 5.

[5] John Springett, Improving Federal Acquisition of Information Technology: Opportunities and Obstacles diss., Harvard U, JFK School of Government, 1990 (Cambridge, Harvard U, 1990) 11.

[6] Steven Kelman, Jerry Mechling, and John Springett, Information Technology and Government Procurement (Cambridge: Strategic Computing and Telecommunications in the Public Sector Program, JFK School of Government, Harvard U, 1992) 17-18.

[7] Peter G. W. Keen, Every Manager's Guide to Information Technology: A Glossary of Key Terms and Concepts for Today's Business Leader (Boston: HBS Press, 1991) 98.

[8] Senate Bill 1587 was introduced on November 1, 1993 and referred to the Committee on Governmental Affairs. Its sponsors are Senators Glenn, Bingaman, Levin, Nunn, Bumpers, and Lieberman.

[9] Lloyd K. Mosemann, II, Deputy Assistant Secretary (Communications, Computers, and Support Systems), memorandum for ESC/CC, 1 Feb. 1994.

[10] In the current jargon, *best value* is used to capture the goals of both quality and economy.

[11] Springett 6-7.

[12] AFCAC internal memo. 31 Oct. 1989.

[13] Emmett Paige, Jr., Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), memorandum for Secretaries of the Military Departments, Directors of the Defense Agencies, Director, Joint Staff, and Directors of the DoD Field Activities, 25 Oct. 1993.

[14] Personal Interview.

[15] Personal Interview.

[16] Life-cycle cost includes the initial acquisition cost, the price of spares, the expected useful life of the equipment and reliability estimates.

[17] Personal Interview.

[18] This method is being used in the current contract for Video Teleconferencing (VTC) equipment.

[19] DFAS has been involved with EDI for contract payments since mid-1991. Initial operation for the MOCAS (Mechanization of Contract Administration Services) application for commercial invoices was anticipated to begin in the first quarter of FY94. As a next step, DFAS has coordinated with other DoD activities to implement electronic invoicing for the form DD 250. The ability to handle purchase orders and purchase order changes by EDI is a long range goal. Eventually, though, they expect to use ANSI X12 transaction sets that include all of those recommended in this proposal.

[20] Thomas Hardcastle and Thomas Heard, A Business Case for Electronic Commerce (LMI Report DI001-06R1, September 1990) iii.

[21]Thomas P. Hardcastle, <u>EDI Planning and Implementation Guide</u> (LMI Report DL203RD1, August 1992) 3-5.

[22]Arthur D. Little, Inc, <u>Electronic Data Interchange for the Grocery Industry: Feasibility Report</u> (Wash, April 1980).

[23]Hardcastle and Heard. iii.

[24]Personal Interviews.

[25]Hardcastle. 3-11 - 3-18.

[26]Hardcastle. 3-15.

[27]Hardcastle 3-15.

[28]Hardcastle 3-7.

Organizational Chart

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                    ┌──────────────────┐
                    │      AFMC        │
                    │     General      │
                    │  Ronald W. Yates │
                    └──────────────────┘
                             │── Test
                             │── Operational Support
                             │── Specialized Support
                          Development
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Human Systems Center	Aeronautical Systems Center	Electronic Systems Center General C.E. Franklin	Space and Missile Systems Center

AV Mr. Matt Mieziva	SSC

- AVC — Ms. Mastrocola
- AVD
- AVJ
- AVM
- AVW
- AV-2
- Support Offices