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CASE STUDIES IN THE ANALYSIS OF THE
DoD MIGRATION SYSTEM SELECTION PROCESS

THESIS

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THESIS

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Acknowledgments

The inspiration for this research came from my duties in the Logistics Automation Section at Headquarters, Air Mobility Command. The purpose of this research was to shed some light on the migration systems selection process. In that respect, this thesis contains a review and analysis of the current literature on the system selection process in the DoD and in industry. A key to many of our current reengineering and streamlining programs is information systems. It is important that we understand the process of selecting systems and the outside factors which affect the selection process.

Several individuals were instrumental in the completion of this research effort. First, I wish to thank Mr. Roy Creasy and Mr. David Kenyon at Headquarters, Air Mobility Command. With their guidance and assistance, I was immersed into the field of logistics automation. Second, I would like to thank Major William Scott for his assistance in providing a direction for my research efforts. Next, I would like to thank Lt Col Karen Currie for graciously agreeing to be my reader at a very late date.

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Paul E. Boley, II

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Abstract

One of the focuses of Corporate Information Management (CIM) initiative in the Department of Defense is the elimination of duplicate automated information systems. This thesis is a case study examination of the selection process in the logistics, transportation, and health functional areas. The case studies were performed through a one time review of documents relating to system selections in each functional area. A review of strategic information systems planning and systems implementation literature is used to examine the results in the three areas. The thesis concludes with three suggestions for improving the selection process with a emphasis on systems implementation.

CASE STUDIES IN THE ANALYSIS OF THE DoD MIGRATION SYSTEM SELECTION PROCESS

I. Introduction and Background

General Issue

In 1989 the Department of Defense (DoD) found during its Defense Management Review that over 1800 automated information systems (AIS) and applications were being used in its services. Many of these systems and applications were duplicates. It was often the case that each service had a separate system for processes that were similar between services. In many instances, there were duplications and overlaps of functionality within the services themselves. Over the past few years, the DoD has realized that several problems are caused by this duplication across its military services. Excessive cost of maintenance and a lack of interoperability and data sharing are two consequences of this duplication.

Background

In answer to these problems, the DoD has set forth several programs to standardize systems between the services. On January 29, 1991, Deputy Secretary of

Defense Donald Atwood created the Corporate Information Management (CIM) initiative (Taylor, 1996:1). The management structure of CIM was developed with four *pillars* that support improved defense capabilities: common information systems; shared data; reengineered processes; and computer and communications infrastructure (ASD C3I, 1994:x). The initial goals of CIM were to reduce non-value-added work and costs, and to improve the standardization, quality, and consistency of data from DoD's *multiple management information systems* (ASD C3I, 1995).

Migration Systems. Based upon the first pillar, common information systems, one objective of the program was to reduce the number of management information systems used within the DoD. In order to meet this objective, DoD had to identify the current systems and applications in use. These systems were referred to as "legacy" systems. From this list of legacy systems it would need to identify the overlaps and duplications in functionality. This would facilitate a selection process to identify systems that would best meet the needs of DoD users. The legacy systems could then be eliminated and the selected "migration" systems could be modified over time to supply all of the functionality required by users DoD wide. The migration systems would be the only systems that would be funded for maintenance and enhancement from that point forward.

Program Development. Since that time, the CIM program has made several changes in course and speed. On October 13, 1993, Deputy Secretary of Defense William Perry issued a memorandum, Accelerated Implementation of Migration Systems,

Data Standards, and Process Improvement. Secretary Perry was concerned that we "get on with the job" of selecting migration systems (DEPSECDEF, 1993:1). He set two goals that were to be given the highest priority by all DoD components:

- Selection of migration systems within six months, with follow-on DoD-wide transition to the selected systems over a period not to exceed three years.

- Complete data standardization within three years by simplifying data standardization procedures, reverse engineering data requirements in approved and proposed migration systems, and adopting standard data previously established by individual functions and components for DoD-wide use wherever practical.

Shortly thereafter another memorandum, Selection of Migration Systems, was issued by the Assistant Secretary of Defense (C3I), Dr. Emmett Paige. It provided generic evaluation criteria for the selection of migration systems. Selection was to be made based upon functional, technical, programmatic, and data factors (ASD C3I, 1993:1). Again, emphasis was placed on expediting the selection of migration systems.

Still, by the end of 1995, very little progress had been made in the selection and implementation of migration systems to support the CIM initiative. A 1995 GAO report said the initiative was to have saved billions by streamlining operations and managing resources more efficiently. But CIM has yielded few results. "Few redundant systems have been eliminated and significant savings have not yet materialized" (GAO, 1995B:10). There have been some positive results reported by the DoD (such as selection of 4300 data standards and paring the list of legacy systems from 1849 to 247) (ASD C3I, 1995). But, progress has been significantly slower than initially planned.

Some of the blame for slow progress can be attributed to the service components' concern about losing needed functionality for their troops. Secretary Perry recognized the these concerns in his November 1993 memo. He stated:

> It is understood that the implementation of standard migration systems may result in the loss of automated functionality by selected system users, whereas others may gain functionality. Loss of functionality should not be used as a reason to delay migration system selection and deployment unless there is a documented adverse impact on readiness within the deployment period, or an inability to comply with the law. (DEPSECDEF, 1993:1)

Specific Issue

This thesis will address the issues involved with the first pillar of the CIM program: the migration system selection process. It will explore the current selection process, efficiency of the selection process, and suggest a model for successful selection, acceptance, and implementation of migration systems.

Investigative Questions

1. How are migration systems currently selected?
2. How can selections be made which will facilitate implementation of the selected system?
3. What steps should be taken to implement a better model?

Definition of Terms

To establish a common understanding of several key terms and acronyms used throughout this thesis, a Glossary of Terms is included in Appendix A, and a Glossary of Acronyms is included in Appendix B.

Thesis Overview

Chapter II describes the multiple-case methodology used for this effort. It explains the specific methods for collecting data on previous migration system selections. Chapter III is a review of the literature concerning efforts on migration system selection and system performance measures. It also includes a history of systems use in DoD, how the systems were initially developed, and the need for a more efficient array of systems. Chapter IV explains and analyzes the data collected. Chapter V includes conclusions based on the research and recommendations for action and further research.

II. Methodology

Introduction

This chapter describes the methodology used to conduct this research project. It will describe the case study design and explains why it best fits this study. The chapter will also include the methods for data collection and case selection method.

Research Design

In their 1987 article, The Case Research Strategy in Studies of Information Systems, Benbasat, Goldstein and Mead observed, "The information systems area is characterized by constant technological change and innovation. IS researchers, therefore, often find themselves trailing behind practitioners in proposing or in evaluating methods for developing new systems" (Benbasat and others, 1987:370). Because of this characteristic of information systems, researchers usually learn by studying the innovations put in place by practitioners. "We believe that the case research strategy is well suited to capturing the knowledge of practitioners and developing theories from it" (Benbasat and others, 1987:370).

The Case Study

In selecting a research method, Dr. Robert K. Yin suggests that the researcher examine three conditions: "(1) the type of research question posed, (2) the extent of control an investigator has over actual events, and (3) the degree of focus on

contemporary as opposed to historical events" (Yin, 1989:16). Within this framework, each condition is examined below as it pertains to the research documented in this thesis. Table 1 summarizes Yin's framework for research strategies.

Type of Research Question. As described in Chapter I, the purpose of this thesis is to explore the current selection process, efficiency of the selection process, and suggest a model for successful selection, acceptance and implementation of migration systems. The research questions related to this purpose were:

1. How are migration systems currently selected?
2. How can selections be made which will facilitate implementation of the selected system?
3. What steps should be taken to implement a better model?

The strategies applicable to answering the "how" questions, as identified in Table 1, are experiment, history, and case study. The survey and archival analysis methods are ruled out.

Extent of Control. The decisions and actions taken to date and their affect on the current situation cannot be changed. Therefore, no behavioral control is possible for the researcher in this case. From Table 1, the experimental strategy is ruled out. All other strategies require no behavioral control.

Focus. There is no doubt that historical events have an impact on this study. However, the historical events are taken in the context of how they effect the current situation. Previous events have impacted the current systems available to DoD users.

Since the focus is on contemporary events, the history method is ruled out and all strategies except the case study are now eliminated.

Table 1. Relevant Situations for Different Research Strategies

Strategy	Form of Research Question	Requires Control over Behavioral Events?	Focuses on Contemporary Events?
Experiment	**how**, why	yes	**yes**
Survey	who, what,* where, how many, how much	**no**	**yes**
Archival Analysis (e.g., economic study)	who, what,* where, how many, how much	**no**	**yes/ no**
History	**how**, why	**no**	no
Case Study	**how**, why	**no**	**yes**

* "What" questions, when asked as part of an exploratory study, pertain to all five strategies.

(Yin, 1989:17)

According to Yin's analysis, the case study is the appropriate research method. Benbasat and others also recognize the usefulness of the case methodology stating, "Case methodology is clearly useful when a natural setting or focus on contemporary events is needed" (Benbasat: 1987:372). They note eleven characteristics of case studies, many parallel to Yin's. The characteristics are:

1. Phenomenon is examined in a natural setting.
2. Data are collected by multiple means.
3. One or few entities (person, group, or organization) are examined.

4. The complexity of the unit is studied intensively.

5. Case studies are more suitable for the exploration, classification and hypothesis development stages of the knowledge building process; the investigator should have a receptive attitude towards exploration.

6. No experimental controls or manipulation are involved.

7. The investigator may not specify the set of independent and dependent variables in advance.

8. The results derived depend heavily on the integrative powers of the investigator.

9. Changes in site selection and data collection could take place as the investigator develops new hypotheses.

10. Case research is useful in the study of "why" and "how" questions because these deal with operational links to be traced over time rather than with the frequency or incidence.

11. The focus is on contemporary events.

The Multiple Case Design

Benbasat and others indicate that the decision to use a single-case or multiple-case design is central to any research project. They note that most research requires a multiple-case design. Single-case designs are appropriate for research in the early stages of theory building or when testing the boundaries of a well formulated theory. Multiple-case designs are desirable when the intent of the research is description, as is the case with this research effort.

In his book, Applications of Case Study Research, Robert Yin specifically addresses research design issues in using the case study method to study management information systems (Yin, 1993:43-51). Yin suggests that a researcher makes three

choices which specify the research design. First, once the decision to use a case study is firm, the researcher must decide whether to do a one time data collection, or to extend data collection over a period of time. Next, the researcher must define a unit of analysis. Finally, the researcher must define theoretical propositions about the topic of the study. Each of these decisions is further discussed below.

Data Collection. Yin's first choice is related to data collection. There are two basic options for data collection. The collection can be a one time effort or a more extended period, usually a year or more. Yin rules out an extended period of data collection for research accomplished by one individual studying multiple cases. The one time data collection is typically a short number of days per case that is studied (Yin, 1993:47).

Yin identifies six instruments of research that can be used separately, together, or any combination in order to collect data. The six sources are documents, archival records, interviews, direct observation, participant-observation, and physical artifacts (Yin, 1989:84). Data collection for this research was accomplished through a one time review of documents, and interviews of key personnel within the organizations making systems selections. Documentation was in the form of charters, implementation plans, test plans, correspondence and external evaluation reports (such as Government Accounting Office or Inspector General reports). The documentation was used to establish the history and provide a vision of the direction of the systems selection process. Interviews were used for clarification and focus not provided by the documentation.

Unit of Analysis. Yin's second choice for research design is "that of defining the unit of analysis, or the unit of study" for the case study (Yin, 1993:47). He provides the following examples of units of analyses in MIS research:

- The workstation, including machinery and the individual at the workstation (e.g., studies of ergonomics).
- A local area network or an extended network (e.g., a study of electronic mail).
- The information flow within an organization (e.g., a study of the control over information within an organization).
- A collaborating set of organizations (e.g., a study of coordination among the affiliates of a holding company or the agencies in a single jurisdiction). (Yin, 1993:48)

Yin provides a further example that applies to management information systems. His example is that of computer software development. "The entire software development process—a series of organizational and technical activities taking place over time—may be the unit of analysis for a case study" (Yin, 1993:48). This is parallel to the topic of this research. In the case of migration systems selection, each functional area is responsible for selecting systems within its functional area. The migration systems selection process in each functional area, then, is the unit of analysis.

Theoretical Propositions. The third, and final choice, of approach to the case study has to do with definition of specific theoretical propositions for the topic of study (Yin, 1993:49). Yin states that, "An appropriately developed theory not only facilitates the data-collection phase of a case study but also reflects the level at which generalization of the case study results will occur" (Yin, 1993:49). Yin notes that the theories need not be grand or formal, merely related to the subject in a way to lead data collection. The

following theories, which are further discussed in Chapter III, will guide data collection for this research:

1. An organizational approach to systems planning leads to successful implementation (Earl, 1993:17).
2. Top management support and involvement are key IS planning success factors (Earl, 1993:6).
3. Political and bureaucratic resistance can stifle implementation (Yin, 1977:91; Weill, 1989:12; Lundsgaarde, 1995:5).

The first proposition is based on Earl's research on strategic information systems planning. Planning leads to systems investment. Earl defines five different approaches to planning. The organizational approach focuses on actual implementation of systems (Earl, 1993:17).

The second proposition is also based upon Earl's study. Earl conducted interviews and asked what factors led to success within organizations. Of 142 respondents, 54 said that top management support and involvement are key to successful planning (Earl, 1993:6).

The third proposition has been well documented. Yin calls this resistance in government organizations *Bureaucratic self-interest* (Yin, 1977:90-91). This is the tendency for public organizations to do what is in their self-interest, rather than that which promotes effectiveness or efficiency. Weill notes than political considerations can eclipse technical and economic considerations (Weill, 1989:12). Lundsgaarde documents

a case where users resorted to sabotage to hinder implementation of a system (Lundsgaarde, 1995:6).

Case Selection

Case selections were made using Yin's framework described above. The unit of analysis is the selection process within each functional area. Functional area selections are made by the Office of The Secretary of Defense (OSD) Principal Staff Assistants (PSA). Table 2 below lists the PSAs that are charged with making migration system selections and the number of selections to date.

Table 2. Selection PSAs

Function	Responsible PSA	Selections to Date
Command and Control	DASD(C3)	36
Communications	ASD(C3I)	2
Environmental Security	DUSD(EnvSec)	11
Finance	USD(C)	55
Health	ASD(HA)	56
Human Resources	DASD(R&R)	20
Information Management	ASD(C3I)	5
Inspector General	OSD(IG)	2
Intelligence	DASD(I&S)	71
Logistics	DUSD(L)	62
Meteorology	USD(A&T)	34
NCB Defense Programs	ATSD(NCB)	8
Policy	USD(P)	7
Procurement	USD(A&T)	1

Initially, the organizations with the highest number of selections to date were chosen as the subjects of case study. However, an initial search for information in the Intelligence area found that much of the information was not available due to classification and sensitivity. This left the Health and Logistics areas, with 56 and 62 selections respectively, as the top candidates for case study. An initial search revealed that information was available in these areas. The final case selections were Health and Logistics.

Further searches for data were performed in two areas. First, a library search was performed. The search involved a library catalogue inquiry. The inquiry looked for sources on information systems planning, information systems investment, legacy information systems, migration information systems, innovations, corporate information management and business process engineering. Next, a search of Internet resources was performed. Searches were performed with Infoseek, Defense Technical Information Center (DTIC), and Government Accounting Office search tools. As data was collected, follow-up phone calls and e-mails were made for clarification.

Summary

The design for this research is the multiple case design. Data collected will be primarily through a one time review of documentation, with interviews used for clarification. Cases were selected with Yin's framework.

III. Literature Review

Introduction

Historically, computer systems within the Department of Defense have been developed based upon the needs of relatively small groups of functional users. As the need arose, a system was developed that specifically met the needs of that user community, usually with little or no coordination with other functional areas. Thus, there are usually multiple applications operating in different Commands, Services and Agencies performing essentially the same functions. This results in duplicate applications and infrastructure (people, equipment, physical plant, etc.) with significant waste of resources across the DoD. The lack of coordination has also resulted in the fact that these duplicative applications frequently use the same data but store them in incompatible formats. The result is data which can only be shared within the community by printing it out and reentering it into each stovepipe system. Again, this is a significant waste of resources. This review will highlight some of the history associated with this problem and current literature addressing issues related to it.

History

During the 1989-1990 Defense Management Review, the DoD realized that its automated information systems were costly and duplicative. The total cost to maintain the 1849 systems in the DoD is approximately $9 billion (ASD C3I, 1995; NAPA,

1996:9). This realization led to the establishment of the Corporate Information Management (CIM) program. CIM was implemented to improve operations and reduce costs associated with DoD information management through business process reengineering, consolidating and integrating similar functional information systems through the *migration systems process*, and enhancing information technology (NAPA, 1996:10). In order to integrate similar systems, the DoD had to identify current systems and their functionality (legacy systems) and select the systems that would receive funding and provide the functionality in the future (migration systems) (NAPA, 1996:35).

The DoD's implementation of CIM and the selection of migration systems has had several stops and starts. Initial plans called for each of the 1849 identified systems to be reviewed, by functional area, for functional and technical adequacy for all services (DEPSECDEF, 1993). Each of the functional areas (including Finance, Health, Human Resources, Information Management, Inspector General, Legal, Logistics, Meteorology & Oceanography, Policy, Procurement, Science & Technology, Systems Acquisition Management, Test & Evaluation, Reserve Components, Command & Control, and Intelligence) was tasked to evaluate systems in its area (ASD C3I, 1995). Some organizations were chartered to make selections for the DoD. For example, the Joint Transportation CIM Center (JTCC) was chartered under USTRANSCOM to make selections of transportation systems (GAO, 1996b:5).

The pace of selection and implementation, however, was not as desired by then Deputy Secretary of Defense William Perry. On October 13, 1993 he issued a memorandum addressing the accelerated implementation of migration systems. His

policy called for selection of migration systems within six months, and DoD wide implementation of selected systems within three years (DEPSECDEF, 1993). The Assistant Secretary (C3I) then issued a memorandum which directed that selection be made based on these four factors:

> Functional: To be selected as a migration system, the information system will have to be based on defined work processes and will have to be based on the degree to which the system meets the information needs of users within and across functional areas. A decision should be generally supported by the functional user community within the DoD Components, including the Chairman, Joint Chiefs of Staff (CJCS) representing the unified combatant commands.
>
> Technical: The system can evolve (migrate) to be supported by the integrated, standards-based architecture prescribed for the future Defense Information Infrastructure (DII).
>
> Programmatic: A functional economic analysis that documents a reasonable range of alternatives that meet both functional and technical objectives is required. The alternatives must be within programmatic constraints (resources, schedules, and acquisition strategy), and justify adopting the migration system to the Department. Given the compressed time frames, the PSAs may elect to base their migration decision on an abbreviated functional economic analysis. Acquisition strategy planning factors will be considered in accordance with Acting ASD(C3I) memorandum of February 4, 1993, "Acquisition Strategy Planning for Corporate Information Management (CIM) Migration Systems."
>
> Data: The ability to transition to data standards is a fundamental requirement for an information system in order for it to be selected as a migration system. Applications should lend themselves to data sharing within their design. Migration plans must include transition to DoD standard data and shared data concepts. (ASD C3I, 1993)

CIM in the DoD

In June of 1994, the DoD Corporate Information Management Strategic Plan was released. It was, in part, an answer to Secretary Perry's concern over the slow pace of migration systems selection. The plan was an implementation strategy based upon four *pillars*, as depicted in Figure 1, that support improved defense capabilities: Business Process Improvement (BPR), Shared Data; Information Systems, and Computer and Communications Infrastructure (ASD C3I, 1994:x).

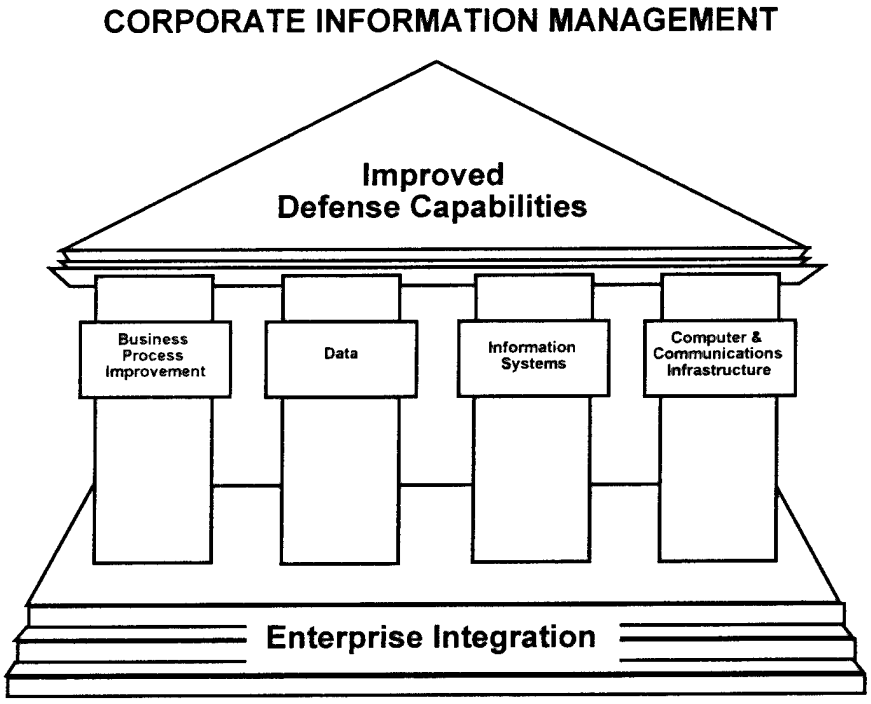

Figure 1. CIM Structure

(ASD C3I, 1994:6)

The overarching goal of CIM was to, "Enable the commanders of military forces and the managers of support activities to achieve the highest effectiveness, agility and efficiency in their operations through the effective use of information applied in improved

functional processes" (ASD C3I, 1994:x). The plan also contained six broad goals which represented the framework for organizing the major programs and projects in the CIM initiative. The goals are summarized below and further explained on the following pages.

1. Reinvent and reengineer DoD functional processes to achieve greater mission effectiveness at lower cost.

2. Tie DoD together through the use of common, shared data.

3. Minimize duplication and enhance DoD's information systems to embody reengineered processes.

4. Implement a flexible, world-wide computer and communications infrastructure.

5. Apply Corporate Information Management to integrate Defense enterprise-wide operations.

6. Establish CIM policies and management structure. (ASD C3I, 1994:xiii)

The first four goals relate directly to the pillars of CIM, and the last two relate to the management and integration of the CIM program throughout the DoD. Goal number three is the goal that drives the migration system selection process. Each goal was accompanied by objectives, steps, and performance measures. These steps are discussed below, with special emphasis on goal number three.

The first goal was to, "*Reinvent* and Reengineer DoD Functional Processes to achieve greater mission effectiveness at lower cost" (ASD C3I, 1994:xvi). This first goal is related to the Business Process Improvement pillar of CIM. The six steps to meet these goals involved implementing Business Process Reengineering (BPR) in the DoD. The

performance measures included increased functional performance (e.g., lower response time) and reduced functional costs (ASD, C3I 1994:xv).

The second goal, "Tie DoD together through the use of common, shared data", was linked to the CIM *data* pillar (ASD C3I 1994:xvi). The objectives and steps were aimed at establishing a core of standard data elements for the DoD. This goal called for establishment of a Data Administration Program with procedures for standardizing, communicating and enforcing use of standard data. The results would be improved interoperability and accurate, reliable, available and secure information.

The third goal was linked to the *information systems* pillar of CIM and related directly to the subject of this thesis. It called for the DoD to, "Minimize duplication and enhance DoD's information systems to embody reengineering processes" (ASD C3I, 1994:xviii). It essentially called for selection of a common baseline of *migration* systems that could then be enhanced based upon reengineering. The goal was to be met through the following objectives:

1. Select a minimal set of standard migration systems and implement them to achieve a simplified, common set of functional methods and processes.

2. Implement those enhancements to migration systems that can be accommodated within the initial schedule.

3. Plan for and implement enhancements beyond the initial migration baseline to support reengineered processes and achieve open systems architectural standards.

4. Guide the impacts of information system migration on processes, human and financial assets, organizations, and culture.

The fourth goal relates to the fourth pillar and completes the structure of CIM. The goal aims to implement a computer and communications infrastructure that is transparent to the applications software residing on it and establish technical policies and a standards based open system architecture to guide implementation of the infrastructure (ASD C3I, 1994:xx).

Goals five and six are associated with management and integration of CIM in the DoD. Steps to meet these goals include development and assessment of plans and policies, and establishing a CIM management structure. Achievement of these goals was to be measured in lower costs, improved functional performance and a more integrated defense enterprise. (ASD C3I, 1994:xxii-xxv).

Current Status

Over the life of CIM from 1989 to the present, the focus shifted from a goal to "realize savings in both the $9 billion spent annually on information technology and in the DoD business areas these systems support" (DEPSECDEF, 1989) to a goal of eliminating systems (ASD C3I, 1994:xix). For example, in 1994, the GAO reported that the CIM initiative had little effect on materiel management and depot maintenance business practices. As directed by DoD, the Joint Logistics Systems Center had focused on selecting standard logistics information systems that the services and DLA were to implement by mid-1997 (GAO, 1994:3). The GAO reported again in 1996 that, "DoD changed its implementation focus to what it termed a *migration systems* strategy" (GAO, 1996a:4).

This strategy was geared toward obtaining more short-term budgetary savings. As a result, business process reengineering efforts may be delayed several years.

While the DoD may have been selecting systems for migration, it was not saving money. In an interview for Enterprise Reengineering, former director of defense information and the chief architect of CIM Paul Strassman stated:

> The DoD IT budget is exactly the same today as it was in 1989. We have taken the force down by 35 to 45 percent ... In the last seven years the cost of computing has gone down by about 50 percent. So even without any cutting, the IT budget should be less ... So the whole thing is one failure in management. (Barrett, 1996)

The source of some of the problems may have been caused by the pressure of accelerating migration systems selection. In 1996, a GAO report said:

> To meet the March 1997 deadline mandated in the Deputy Secretary's October 1993 memorandum, Defense selected transportation migration systems based on incomplete, unverified cost data without comparing all the benefits of each system. Consequently, there is little assurance that these selected systems will help contain the cost of performing Defense's transportation missions to any great extent or bring about the benefits envisioned by the migration strategy. (GAO, 1996b:8)

The GAO report also notes that the Joint Transportation CIM Center (JTCC) could provide no documented analysis to support the JTCC's systems selections (GAO, 1996b:7). As a conclusion, GAO noted that the initial approach to migration systems selection was systematic, communicated in a written plan, and agreed to, but DoD deviated from this approach in order to meet deadlines (GAO, 1996b:7).

Systems Selection in Industry

The difficulty in selecting migration systems is not confined to the department of defense. In his article, *Simply Seeking Software*, David Schmaltz describes industry's software selection as "about as effective as eenie meenie miney moe" (Schmaltz, 1990:7). This perception may be a product of the political considerations that go into system investment decisions. In their article *Managing Investment in Information Technology: Mini Case Examples and Implications*, Weill and Olson note:

> Political considerations, important in most of the organizations, significantly impact investment decisions. These considerations sometimes eclipse the technical and economic considerations and generally are perceived as becoming more and more important (Weill, 1989:12).

Another study conducted by Henry Lundsgaarde, an anthropologist at the University of Kansas, indicates that selection and acceptance of systems goes well beyond simple functional measures. He found in his case study that acceptance of systems was particularly difficult for diverse groups of practitioners (Lundsgaarde, 1995:5). In an article in CIO Magazine, Tom Field notes the same forces at work when Chase Manhattan upgraded its customer support system. "As with many IT projects, the interpersonal challenges surpassed the technical ones" (Field,1997). This is similar to the situation in the DoD where a selected system must meet the needs of users in various commands and services. Chase confronted many of the same problems as DoD, including resistance to change from legacy systems, and countered them by creating cross-functional teams that worked on system development (Field, 1997).

In his book Tinkering with the System, Robert K. Yin refers to this resistance in government organizations as *Bureaucratic self-interest* (Yin, 1977:90-91). Bureaucratic self-interest is "based on the premise that public organizations, as opposed to profit-making ones, may pursue goals that do not necessarily coincide solely with the achievement of greater service efficiency or effectiveness" (Yin, 1977:90). Whether an innovation is accepted or not is often based upon the self interest of the organization. Will acceptance lead to organizational growth, an increase in hierarchical status or likelihood of survival? If so, acceptance is more likely (Yin, 1977:90). The principle of self interest applies to the individual level within the organization (Yin, 1977:95). Yin suggests that, among other things, chief executive support, proper resources, proper training, implementation from within and no delay in implementation can overcome resistance and lead to successful implementations (Yin, 1977:103-105).

While industry leaders may not face the same situation as DoD (selecting among multiple stove-piped systems), they often have to make information system investment decisions. If it is assumed that the social and political barriers previously mentioned can be overcome, then the question to be answered is how to measure an automated information system's value so that comparisons can be made that drive proper investment decisions?

A review of literature yielded several different focuses for systems measurement and evaluation. In his article, *Experiences in Strategic Information Systems Planning*, Michael Earl describes five strategic information system (IS) planning approaches: Business-Led, Method-Driven, Administrative, Technological, and Organizational (Earl,

1993:7). Earl's study examined the strategic information systems planning experiences of 27 companies and identified the approaches and their use in several different companies (Earl, 1993:7-11). These approaches and their characteristics are detailed in the table below.

Table 3. Strategic Information Planning Approaches

	Business-Led	**Method-Driven**	**Administrative**	**Technological**	**Organizational**
Emphasis	Business	Technique	Resources	Model	Learning
Basis	Business Plans	Best method	Procedure	Rigor	Partnership
Ends	Plan	Strategy	Portfolio	Architecture	Themes
Methods	Ours	Best	None	Engineering	Any way
Nature	Business	Top-down	Bottom-up	Blueprints	Interactive
Relation to Business Strategy	Fix Points	Derive	Criteria	Objectives	Look at Business
Priority Setting	The board	Method recommends	Central committee	Compromise	Emerge
IS Role	Driver	Initiator	Bureaucrat	Architect	Team member
Metaphor	It's common sense	It's good for you	Survival of the fittest	We nearly aborted	Thinking IS all the time

(Earl, 1993:7)

The business-led approach is built around the assumption that the current business direction or plan is the only basis upon which an IS plan can be built. The emphasis is upon business leading IS and not the other way around. This approach is seen as very *business like*. However, if business strategies are not already clear, it is difficult to build

a clear IS plan. This leads to interpretation from the IS community and tends to leave the users and line managers out of the process (Earl, 1993:8).

The method-driven approach strongly relies upon a formal method or technique. Since a formal method is usually driven by the IS function, it rarely earns the support of other functions within the organization. Often vendors or consultants are employed to apply their *best method.* Businesses that used the method-driven approach tended to change the method with each planning cycle. Earl observes that this method often leaves behind *embryonic* strategies waiting for the right time and are seldom implemented (Earl, 1993:8-9).

The administrative approach has its emphasis in resource planning. Information systems planning is a part of the wider organizational management and budgetary planning. The outcome of this approach is a one or multi-year portfolio of approved IS investments. This method makes use of a steering committee which makes all decisions and approves any changes. An identified down side to this approach is that it tends to be bottom up rather than top down, which can lead to functional stovepipes. It tends to have a business as usual feel and innovative ideas are usually set aside. This approach did, however, show a higher rate of implementation that the previous two methods. Because the process was more visible, users had an opportunity to submit proposals. Since the planning was done along with budgetary planning, the proposals were selected by their perceived viability with resource constraints in mind (Earl, 1993:9).

The technological approach is based on the assumption that an information systems oriented model of the organization is necessary and that analytical modeling is

appropriate. A formal method is rigorously applied based on mapping the activities and processes of the organization. Earl says this approach, "may be the extreme case of how the information technology industry and its professionals tend to apply computer science thinking to planning" (Earl, 1993:13). This approach tends to be demanding in terms of time and resources. Managers and users involved in the process often have trouble committing the time and money involved in the analysis and implementation. The output models are often extremely complex and technical. This often leads to a lack of support from senior management or even user rebellion. Few successes were reported with this approach (Earl, 1993:9-13).

The basic assumption of the Organizational approach is that IS planning is a continuous decision-making activity by the organization and the IS function. The information technology applications selected are multi-dimensional and subtle. There is no single selection method, rather selection methods are employed as required. Selection methods and the selections themselves were focused on implementation (Earl, 1993:10-11).

Earl notes that, "The five approaches appear to be different in scope, character, and outcome" (Earl, 1993:11). The five approaches vary in underpinning assumptions, emphasis of approach and major influence of outcome. Table 4 highlights the characteristics of each approach.

Table 4. Approaches Summarized

	Business-Led	Method-Driven	Administrative	Technological	Organizational
Underpinning Assumption	Business plans and needs should drive IS plans	IS strategies will be enhanced by use of a formal method	Planning should follow and conform with the firm's management planning and control procedures	Planning is an exercise in business and information modeling	Planning is a continuous decision-making activity shared by the business and the IS function
Emphasis of Approach	Business leads IS and not vice-versa	Selection of the best method	Identification & allocation of IS resources to meet agreed needs	Production of models and blueprints	Organizational learning about business problems and opportunities and the IT contribution
Major Influence of Outcomes	IS planners	Practitioners of the best method	Resource planning and steering committees	Modeling method employed	Permanent and ad hoc teams of key managers, including IS

(Earl, 1993:12)

Earl's data indicated that that the Organizational approach is more effective than others (Earl, 1993:17). In the organizational approach, applications are selected with a "soft" methodology, meaning that "methods are employed as required to fit a particular purpose" (Earl, 1993:13). The flexibility and user involvement of this approach were seen as positives throughout the organizations in Earl's study. This approach has less rigor than the other four, but it is associated with a emphasis on implementation (Earl, 1993:13). The strengths and weaknesses of each approach are contained in Table 5.

Table 5. Strengths and Weaknesses of Approaches

	Business-Led	Method-Driven	Administrative	Technological	Organizational
Strengths	Simple	Provides a methodology	System viability	Rigor	Becomes normal
	Business first	Plugs Strategy gaps	System Synergies	Focus on infrastructure	Emphasis on implementation
	Raises IS status	Raises strategy profile	Encourages user input	Favors integrated tools	Promotes IS user partnership
Weaknesses	Ad hoc method	User involvement	Non-strategic	Lacks management support	Generation of new themes
	Lacks Management commitment	Too influence by method	Bureaucratic	Only partial implementation	Soft Methodology
	Depends on quality of business strategy	implementation unlikely	Resource constrained	Complexity	Architecture becomes soft

(Earl, 1993:13)

Summary

This chapter provided an overview of the history of systems in the DoD, CIM, and the current status of systems selection. In addition, it provided background on systems selection and successful implementations in industry. This will be the basis for the current research on migration systems selection.

IV. Data Description and Analysis

Introduction

This chapter will report the findings of the case studies of migration systems selection in three DoD organizations. First, it will provide a brief description of the management process and structure for DoD Enterprise-wide operations. Then it will provide a description of each organization's structure, charter, plans, process, implementation and current status. The chapter will finish with a brief summary of successful systems selections and implementations in industry.

Management Structure

As depicted in Figure 2, the DoD has established a management structure for managing and facilitating CIM and Enterprise Integration.

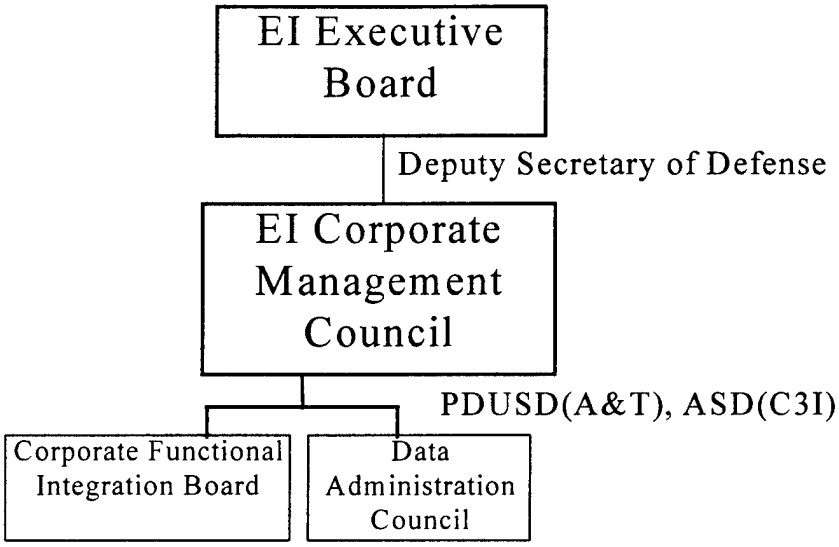

Figure 2. CIM/EI Management Structure

(ASD C3I, 1995)

The Deputy Secretary of Defense chairs the EI Executive Board composed of the PSAs for Information Management, Command and Control, Intelligence, Acquisition and Technology, Economic Security, Environmental Security, Logistics, Procurement, Test and Evaluation, Policy, Finance, Personnel, and Heath. The Enterprise Integration Corporate Management Council, co-chaired by the Deputy Undersecretary for Acquisition and Technology and the Assistant Secretary (C3I), is the working arm of the Board. The Council identifies and resolves cross-functional issues. It will develop cross-functional solutions to enterprise issues arising out of the accelerated implementations of migration systems, data standards, and process improvements. Implementation issues may involve financial assets, human resources, process improvement, management and cultural impacts, and technical infrastructure solutions (ASD C31, 1995).

The management structure involves four levels of integration management: the Enterprise level, the Mission level, the Functional Area level and the Functional Activity

level. The Secretary of Defense is responsible for the Enterprise level integration of the Department. At the Mission level, the PSAs have primary responsibility for the integration of their assigned functional area with other relevant functional areas. At the Functional Area level, Functional Activity Program Managers (FAPM) are appointed by the PSAs to manage Functional Process Improvement (FPI) for designated functional activities. They are responsible for integrating their assigned functional activities with other relevant activities. DoD user organizations are responsible for Functional Activity integration. Enterprise Integrators are used at all levels to coordinate the various functional and technical integration activities. Enterprise Integrators are cross-functional teams which resolve issues and plan common solutions at each level. Within each level, there must be functional and technical integration. Figure 3 illustrates the interaction of functional and technical integration responsibilities at both the Functional Area and the Functional Activity areas. The functional integration is supported by the PSAs, and technical integration is supported by DISA at all levels.

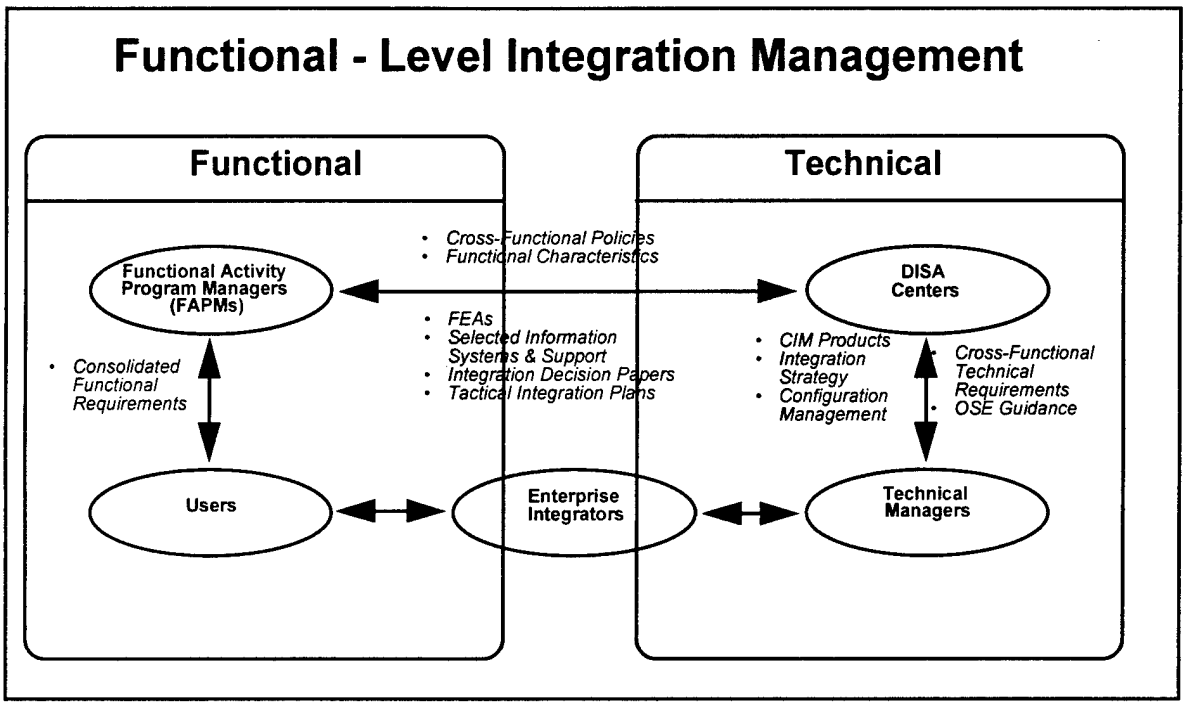

Figure 3. Functional Level Integration Management

(ASD C3I, 1994:21)

The Corporate Functional Integration Board (CFIB) and the Data Administration Council are the day-to-day technical bodies that carry out the decisions of the EI Council, facilitate implementation of CIM, and recommend improvements.

Organizations

The Assistant Secretary of Defense (Command, Control, Communications and Intelligence) established the organizational framework for systems selection in November, 1993 when he stated that:

> Migration system selection shall be made by the Office of the Secretary of Defense (OSD) Principal Staff Assistant(s) (PSAs), or CJCS, having functional responsibility for the missions and functions supported by the system, with the participation of affected DoD Components. (ASD C3I, 1993)

This guidance was supplemented by a general customer oriented structure as shown in Figure 4. This provides the Principal Staff Assistants with a customer-oriented structure to provide help in conducting BPRs, standardizing data, planning for the migration of information systems, using DII services, and finding cross-functional linkages and Enterprise solutions (ASD C3I, 1994:23).

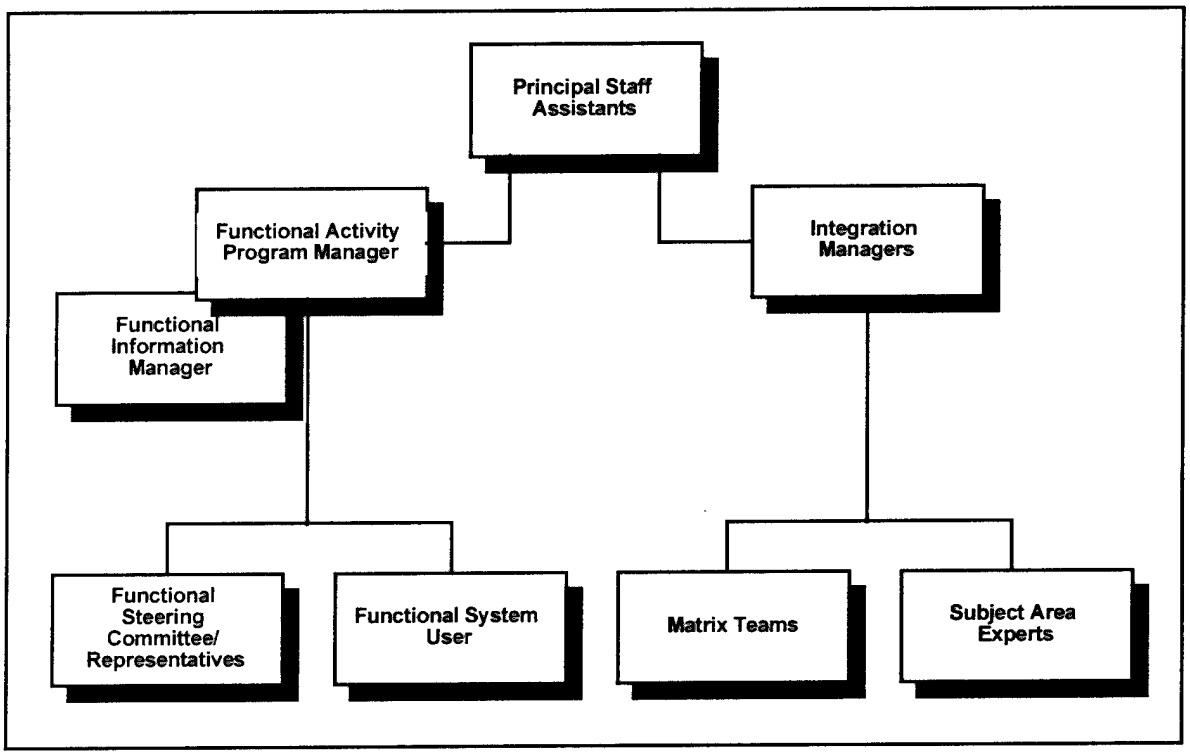

Figure 4. Customer-Oriented Organization for EI

(ASD C3I, 1994:23)

PSAs were given sufficient latitude to arrange their organization as they thought would best fit their particular needs. PSAs established a functional unit in the form suggested in Figure 4. The PSAs have used several options. Organizations chartered to

make system selections in the business areas of Medical, Logistics and Transportation are depicted below.

Medical

The Principal Staff Assistant responsible for medical migration systems selection is the Assistant Secretary of Defense (ASD) for Health Affairs (HA). The Defense Medical Information Management (DMIM) office is the office of primary responsibility for systems selection. The top level HA organization structure is depicted in Figure 5.

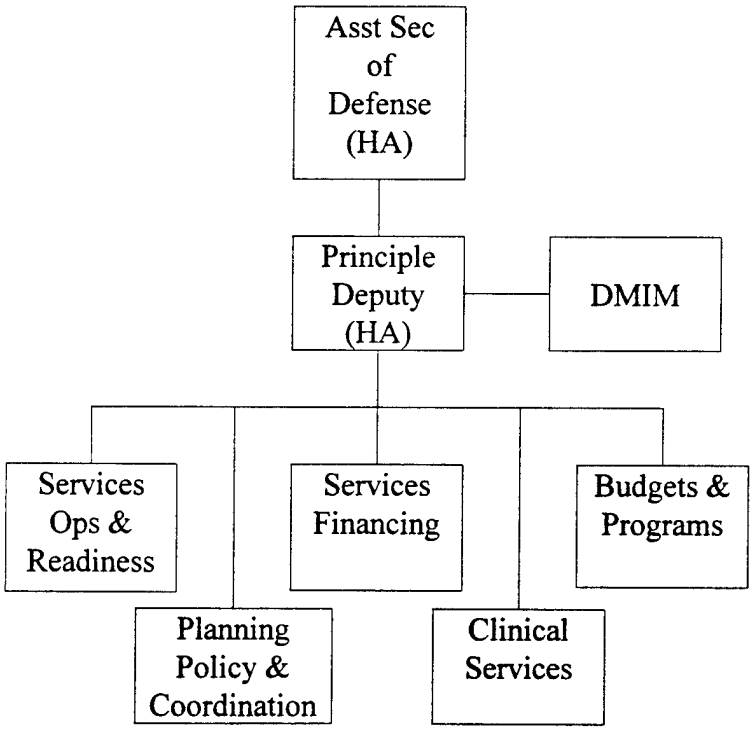

Figure 5. ASD(HA) Organization

(ASD HA, 1997)

The DMIM director serves as the principal advisor to the ASD(HA) and the PDASD(HA) on information management, information technology, architecture, systems migration, standards, and information system policies. The DMIM office also has

responsibility for the Military Health Services System (MHSS) Information Management/Information Technology program for ASD(HA). He directs integration of the program with the DoD Enterprise Model and the Corporate Information Management (CIM) and Enterprise Integration (EI) programs (ASD HA, 1997).

DMIM Organization and Functions. The DMIM office is further divided into eight areas as depicted in Figure 6. The Functional Management & Integration and the Information Systems Planning and Program Oversight offices perform the activities necessary to select migration systems.

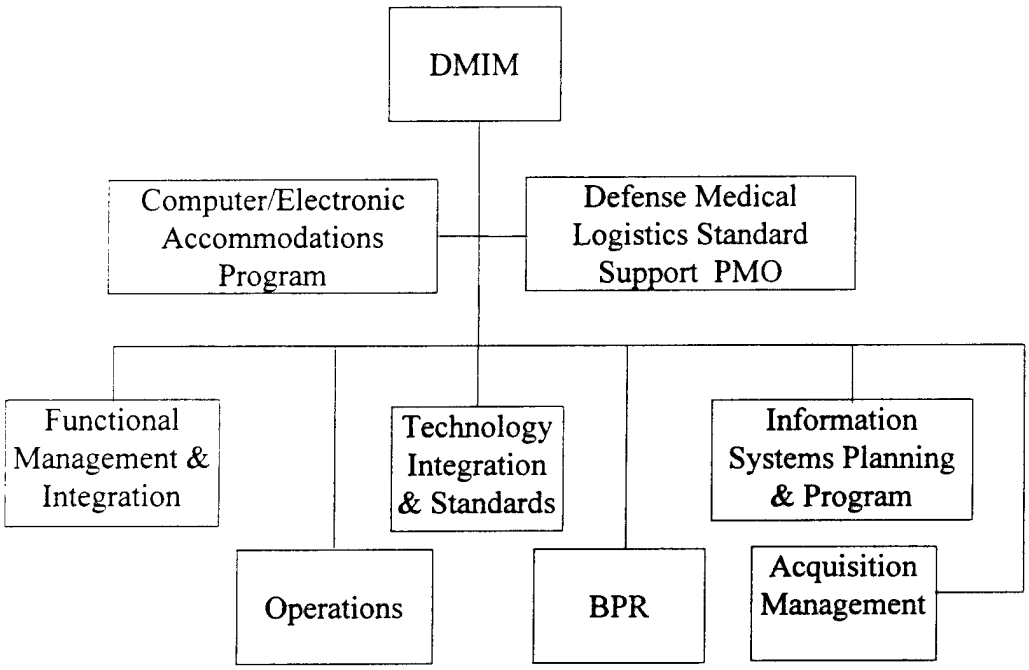

Figure 6. ASD(HA) Organization

(ASD HA, 1997)

The Functional Management and Integration office oversees the business process reengineering/functional process improvement program for the MHSS. They facilitate the application of MHSS and corporate information management principles in the

medical functional enterprise area and establish directives and processes for applying business process redesign to support the medical functional area. They serve as focal points for cross functional integration and represent HA on the Corporate Functional Integration Board (ASD HA, 1997). The board is one of the day-to-day technical bodies that carries out decisions of the EI council. In this sense, it is the link to the DoD Enterprise-wide implementation effort.

The Information Systems Planning and Program Oversight office facilitates the development, coordination and maintenance of the MHSS Information Management Strategic Plan and annually updates an MHSS Automated Information System Plan. It formulates policies and guidelines for migration systems strategies, enterprise integration, and infrastructure management (ASD HA, 1997).

Systems Selection Process. The initial migration system selections for the medical functional area were completed in January of 1994 (ASD HA, 1997). The selection process started with a call to all medical functional areas within DoD to nominate information systems as candidates for migration. This effort identified 141 different AISs. After further review and evaluation by an MHSS working group, the number of AISs to be considered was reduced to 117. An MHSS Information Management Review Board, made up of senior, knowledgeable medical information managers from the Office of the Surgeons General and the Health Affairs staff was created. The board's initial efforts focused on categorizing AIS functionality by functional activity; identifying and eliminating redundancy within the functional

activities; categorizing specific systems as either legacy or migration systems, depending on functionality and open systems compliance; and developing plans to significantly reduce the total number of MHSS AISs (ASD HA, 1997).

The review board categorized the 117 systems by mapping them to functional activities from a prepared list of medical functional activities. The systems were then grouped by sub-functions supported within each functional activity. The group reviewed the functions performed by each system to determine whether they were "functionally exclusive" (were not functionally similar) of the other systems. If they were functionally exclusive, and there was a continuing requirement, they were designated as migration systems (ASD HA, 1994:12).

In instances where systems appeared to be functionally similar, work groups consisting of subject matter experts were convened to assess them and make legacy or migration recommendations. These assessments were completed during facilitated sessions during which the subject matter experts discussed the functionality and data availability in the various systems (ASD HA, 1994:12).

The second assessment type was a detailed functional trade-off analysis, based on data availability in each of the systems currently supporting a functional activity. Data dictionaries for the systems under consideration were provided in electronic form and loaded into an automated tool. Subject matter experts were facilitated through a process to identify essential data requirements. This process took several days, and the resulting data requirements were also loaded into the tool. The tool then compared the essential data requirements with the data dictionaries provided previously to determine which

system contained the greatest number of essential data elements. Analysts reviewed the reports, validated the results, and provided the results to the subject matter experts. In some cases, functional proponents for systems provided briefings to the board. This information formed the basis of their recommendations. The review board then used the analysis to designate 53 AISs as existing or planned migration systems and the remaining 64 as legacy systems (ASD HA, 1994:13).

The board's recommendations were then reviewed by the MHSS Proponent Committee. The Proponent Committee is composed of Health Affairs Deputy Assistant Secretaries of Defense, the Service Deputy Surgeons General, the Medical Officer of the Marine Corps, and the Deputy Director for Medical Readiness from the Joint Staff (ASD HA, 1994:13).

In FY95 the Principal Deputy Assistant Secretary of Defense (Health Affairs) [PDASD(HA)] initiated action to significantly reduce the number of MHSS migration systems. DMIM examined alternatives for MHSS AIS migration. The result of this analysis was a further evolution of the program (ASD HA, 1997).

The new functional architecture groups the health functions into four major business areas: Clinical, Logistics, Resources, and Executive Information/Decision Support. Each of these four business areas will be supported by an information system capability that will be a collection of standards-based and integrated commercial off-the-shelf (COTS), Government-off-the-shelf (GOTS), or, if no alternative exists, MHSS-developed functional applications. These system capabilities include the Composite Health Care System II (CHCS II), Defense Medical Logistics Standard Support II

(DMLSS II), Health Standard Resources System (HSRS), and Corporate Executive Information System (CEIS). A fifth area, Theater, uses functionality from the other areas to support deployed operations. All designated migration systems will now migrate toward these standard systems (ASD HA, 1997).

Logistics

The Principal Staff Assistant responsible for logistics and transportation migration systems selection is the Deputy Under Secretary of Defense (DUSD) for Logistics. The Logistics Business Systems and Technology Development (LBS&TD) office is the office of primary responsibility for management of systems selection. The top level organization structure is depicted in Figure 7.

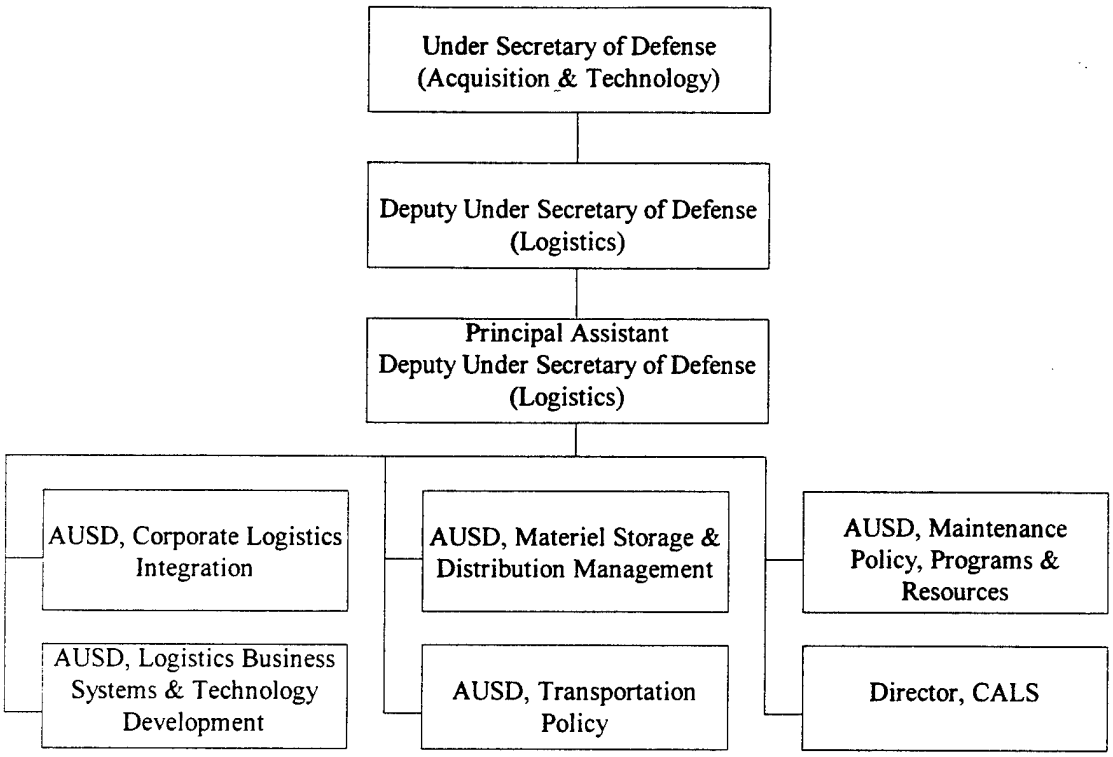

Figure 7. DUSD (L) Organization

The DUSD(L) is responsible for the development of policies that are designed to provide an optimum level of logistics support to meet DoD operational requirements. Accordingly, DUSD(L) is ultimately responsible for the development and implementation of the logistics systems. Several organizational and functional changes have taken place recently. A review of the previous structure and problems associated with it follows.

Early Organization. Results of migration systems selections in the Logistics and Transportation areas to date have been heavily criticized by the General Accounting Office (GAO, 1994, 1995, 1996a, 1996b, 1997). Criticisms were that the CIM program focus shifted and that systems were selected with little or inappropriate analysis.

Logistics systems were selected by the Joint Logistics Systems Center (JLSC). Transportation systems were selected by the Joint Transportation CIM Center (JTCC).

Joint Logistics Systems Center. The JLSC is a joint program including representatives from the five Department of Defense (DoD) Components: Army, Navy, Air Force, Marine Corps, and the Defense Logistics Agency. Its mission is to equip the forces with improved, standardized, and interoperable logistics processes, systems, and information (JLSC, 1997). The JLSC was activated in March 1992 and charged with the implementation of common processes and systems in the logistics functional areas of Depot Maintenance and Materiel Management as part of the Corporate Information Management (CIM) initiative.

The JLSC's primary challenge is to document joint service requirements, and then to select, enhance or develop, and implement standard business processes and information system solutions. The center has oversight of the acquisition, and deployment of Depot Maintenance (DM), Materiel Management (MM), and Ammunition Management (AMMO) AISs. The systems require numerous data interfaces and integration efforts between DM, MM, and AMMO systems; existing legacy systems; and other CIM functional areas. These systems will span the five DoD Components' maintenance depots, Inventory Control Points (ICPs), and Command Level Headquarters. The JLSC organizational structure is detailed in Figure 8 below.

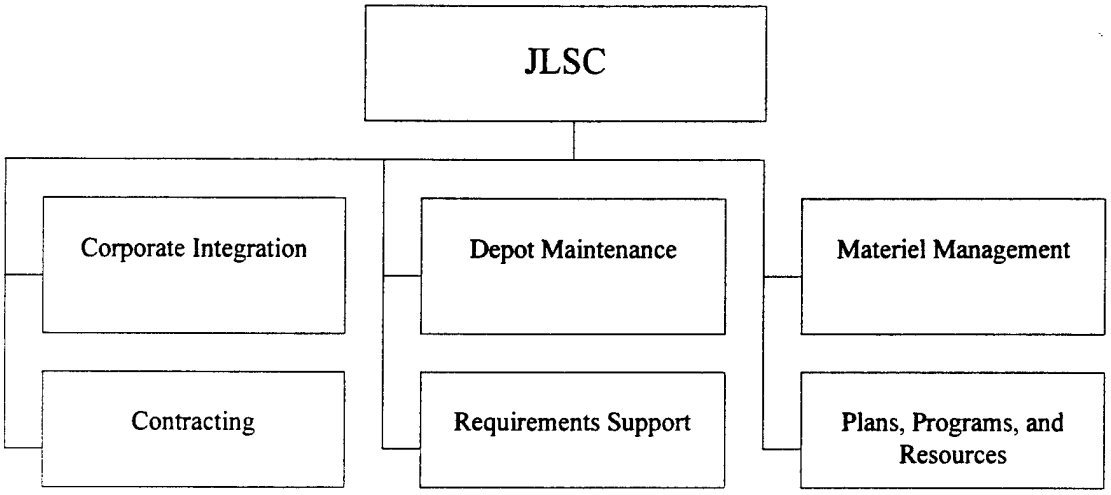

Figure 8. JLSC Organization

The Corporate Integration (CI) Directorate ensures the development of logistics systems are functionally and technically integrated. The principal functions of the CI include:

> Ensuring cross functional integration of the logistics process system throughout DoD; developing and coordinating corporate plans; managing the development and integration of the DoD Logistics Corporate Business Process Model; managing the development and integration of the DoD Logistics Corporate Logical Data Model to support the logistics process system; executing corporate functional configuration management responsibilities and identifying issues to the Corporate Configuration Control Board; directing logistics data standardization and developing the common logistics data dictionary; developing or consolidating functional database requirements for the integrated logistics information system; ensuring integration of all JLSC projects for process design, development, testing and implementation of selected logistics systems; providing the Secretariat and serving as a member of the Corporate Configuration Control Board; and ensuring integration of distribution processes into the integrated logistics information system by working through the Distribution Integration Office to, integrate distribution processes into the DoD Logistics Corporate Business Process Model; integrate distribution data requirements into the DoD Logistics Corporate Logical Data Model; and provide access to the common data dictionary and data repository. (JLSC, 1997)

The functions of CI are similar to those of the Functional Management and Integration office in the Health Affairs organization. CI represents JLSC on the Corporate Functional Integration Board. The Depot Maintenance and Materiel Management divisions make functional migration system selections in conjunction with CI, which are forwarded for approval.

Joint Transportation CIM Center. The Joint Transportation CIM Center is another a joint program manned with representatives from four Department of Defense (DoD) components: Army, Navy, Air Force, and Marine Corps. The JTCC was chartered by the DUSD(L) in August 1993, under the authority of the United States Transportation Command (USTRANSCOM) (GAO, 1996b:5). Its mission is to improve the efficiency and effectiveness of the Defense Transportation System (DTS) through the application of functional process improvement techniques and the central control of transportation-related command, control, communications and computer systems development. The JTCC coordinates directly with DoD components to prioritize the funding allocation for solutions developed through process reengineering and systems migrations (Christian, 1997). The organizational relationship of USTRANSCOM and the JTCC are detailed in Figure 9 below.

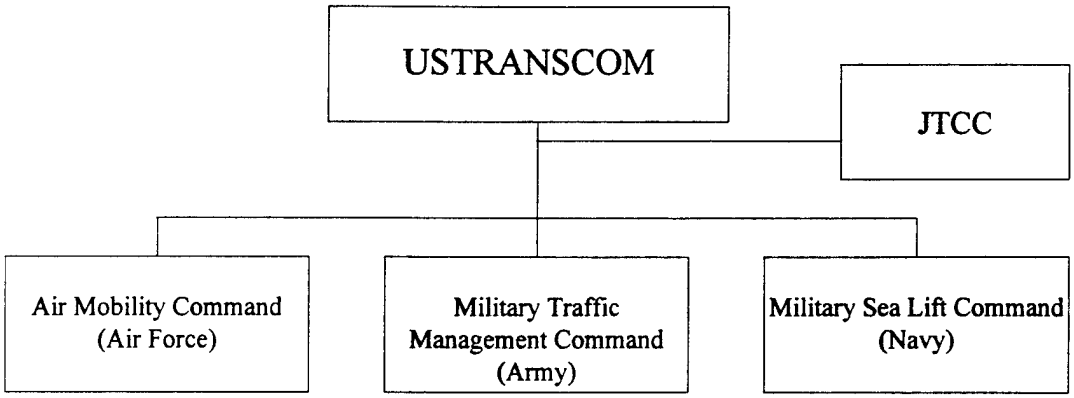

Figure 9. USTRANSCOM/JTCC Organization

Systems Selection Process. The selection processes for logistics and transportation systems have been questioned by the GAO. Both the JLSC and JTCC had written plans for selecting and implementing migration systems. The plans called for consideration of alternatives, including a review of commercially available products, and required that cost-benefit analyses be prepared in support of migration systems selections (GAO, 1996b:5). However, the plans were not followed (GAO In 1995:3.1).

The GAO reported, for instance, that in 1994 the JLSC had selected the Depot Maintenance Resource Planning (DMRP) system as the standard migration systems for depot maintenance. The selection, however, was not made on "convincing analyses of expected development or deployment costs or detailed assessment of DMRP's economic and technical risks." (GAO, 1995a:3.1) Further, the GAO noted, that DoD did not obtain the independent review of the Major Automated Information System Review Council (MAISRC), as required by DoD regulation (GAO, 1995a:3.2)

The transportation systems selection was also criticized by the GAO, for many of the same reasons. They noted that the DoD has little assurance that its transportation

systems selections are cost-effective (GAO, 1996b:1). The JTCC selected 28 systems for migration. Of those, 17 were selected based upon the judgment of transportation experts. The experts believed that these 17 systems supported processes so unique that nothing else could be considered a feasible alternative. JTCC officials could provide no documented analysis to support their conclusions (GAO, 1996b:7). Another seven systems were selected after considering a "narrow range of alternatives" (GAO, 1996b:7). The JTCC determined that of the 700 commercially available software packages that provide some degree of transportation functionality, none could fully support transportation requirements without modifications. Modifications could not be made within the time limits as set by the Secretary of Defense (DEPSECDEF, 1993). However, one of the rejected systems is being modified by a government contractor in its development of TRANSCOM's Global Transportation Network, which provides in-transit asset visibility to DoD users (GAO, 1996b:8).

The GAO noted that many of the problems with systems selection were due to not following established guidelines for functional and economic analyses. They noted that, "To meet the March 1997 deadline mandated by the Deputy Secretary's October 1993 memorandum, Defense selected transportation systems based on incomplete, unverified cost data without comparing all of the benefits of each system" (GAO, 199b:8).

As late as November 1996, the GAO was not satisfied with DoD selections in the logistics functions. They noted that, "DOD's continued deployment of information systems using a migration strategy for the depot maintenance, materiel management, and transportation business areas will not likely produce the significant improvements

originally envisioned" (GAO 1996a:2). Table 5 identifies the costs to date and those expected as reported by DoD in the 1996-1997 budgets.

Table 6. Logistics Migration Systems Budget (in millions of dollars)

Logistic Activity	Migration Systems Application	Costs to date	Costs to Complete	Life Cycle Costs	Completion Date
Depot Maintenance	8	$190.3	$2,616.9	$2,807.2	Late 1998
Materiel Management	9	437.8	3,967.6	4,405.4	None estimated
Defense Transportation	23	587.0	1,122.7	1,709.7	1999
Totals	**40**	**$1,215.1**	**$7,707.2**	**$8,922.3**	

(GAO, 1996a:7)

Revised Logistics Strategy. These criticisms led to the Logistics Business Systems Corporate Strategy. This document, from the Assistant Deputy Under Secretary of Defense for Logistics Business Systems and Technology Development (LBS&TD), outlines the use of a Logistics Information Board (LIB), which will facilitate development and modernization of logistics systems and provide strategy oversight (DUSD L, 1997:4-2).

The Logistics Information Board is the forum for coordinating strategic direction and issue resolution. The LIB will steer requirements and promote inter-Service collaboration. The LIB will make recommendations to DUSD(L) and Service logistic leadership for decisions. The LIB will be chaired by DUSD(L)LBS&TD and is comprised of senior logistics leaders in DoD (DUSD L, 1997:4-2).

According to Ken Glasser, a management analyst at ASD(C3I), the life of JLSC and JTCC may also be in jeopardy. When these centers were chartered, they received funds from all services to select and develop migration systems. However, the services retained their own budgets for information systems operations. In addition to criticisms by the GAO, the JLSC and JTCC have met resistance from the services. Some selections have been made, yet the services continue to fund and even upgrade legacy systems. One concept that is being explored is giving control of all funds to the LIB (Glasser, 1997).

Summary

This chapter reported the findings of the case studies of migration systems selection in three DoD functional areas. The management process and structure for DoD Enterprise-wide operations were described. The organization and process for systems selection in the medical, logistics, and transportation areas were described. GAO reports on the selection process in the logistics and transportation areas highlighted some of the problems in the selection process. The systems are often selected with inadequate analysis and justification.

V. Conclusions and Recommendations

Introduction

The purpose of this research was to explore the migration systems selection process. This chapter will provide answers to the three original investigative questions posed in the first chapter. After the questions are answered, recommendations for improving the systems selection process will be made. Finally, areas for further research will be suggested.

Investigative Question One

How are migration systems currently selected?

All system selections are ultimately approved by the Assistant Secretary of Defense, (Command Control Communications and Intelligence) based upon the selecting official's evaluation of technical, programmatic, and data factors (ASD C3I, 1993). Through the DoD Enterprise Integration Implementing Strategy, the ASD (C3I) has established a functional management structure (ASD C3I, 1995). This structure includes high level involvement and support from the EI Executive board, chaired by the Deputy Secretary of Defense. The working arm of the board is the EI Corporate Management Council, which is co-chaired by ASD (C3I) and PDUSD (A&T) (ASD C3I, 1994:9-13).

Migration systems selections are made by the OSD PSAs having functional responsibility over the missions and functions of the system. The choice of organizations and processes that go into the selection are left up to the each PSA (ASC C3I, 1993). The actual activities vary according to the agency carrying out the process.

As outlined in chapter four, medical systems were selected through a process of mapping functionality and functional trade off analyses. An MHSS Information Management Review Board, made up of senior, knowledgeable medical information managers from the Office of the Surgeons General and the Health Affairs staff was created. The board's initial efforts focused on categorizing AIS functionality by functional activity; identifying and eliminating redundancy within the functional activities; categorizing specific systems as either legacy or migration systems, depending on functionality and open systems compliance; and developing plans to significantly reduce the total number of MHSS AISs (ASD HA, 1997).

The review board categorized systems by mapping them to functional activities from a prepared list of medical functional activities. The systems were then grouped by sub-functions supported within each functional activity. The group reviewed the functions performed by each system to determine whether they were "functionally exclusive" (were not functionally similar) of the other systems. If they were functionally exclusive, and there was a continuing requirement, they were designated as migration systems (ASD HA, 1994:12).

This method of migration systems planning is best represented by Earl's Technological approach, as discussed in chapter three. In the Technological approach, a

formal method is rigorously applied based on mapping the activities and processes of the organization (Earl, 1993:13). Earl suggests that this approach's weakness is that it results in only partial implementation (Earl, 1993:13). In the case of medical systems this may or may not be true, as time will tell. However, the process did allow for systems to be selected within the six-month time frame set by the Deputy Secretary of Defense. The analysis was completed with rigor and documents were available to justify the selections.

The lack of documentation may have complicated the selections in the logistics and transportation areas. The GAO observed in several reports that the selections were made with incomplete information. Some selections were made on expert opinion alone. The GAO was concerned that the selection processes were spelled out, but were not followed, perhaps in reaction to the selection schedule acceleration (GAO 1996b:8).

Another aspect that may have worked against efficient selections in the logistics and transportation areas was the fact that organizations were chartered for the sole purpose of selecting and implementing systems. The JLSC and JTCC were charted to manage CIM responsibilities for their functional area. There is resistance to selections that may bring about change in organizations. This resistance is due to Bureaucratic self-interest, as discussed in chapter three (Yin, 1977:90-91). The organizations are likely to make decisions that will increase both the hierarchical status and the likelihood of survival of the organization.

Investigative Question Two

How can selections be made which will facilitate implementation of the selected system?

Earl also found in his research that user involvement was a positive influence when planning for information systems. His Organizational approach emphasizes IS and user partnerships in the planning process (Earl, 1993:13). The DoD has used a hybrid of the Administrative and Technological approaches. The transition may require less emphasis on business modeling and resource constraints. The LIB structure for logistics is a step towards an Organizational approach.

Another way to emphasize implementation is to put control of systems operation funds in the hands of those that make the selections. The Health Affairs staff controls both the systems selection and operations budgets. If a system is selected as a legacy system, then the operations budget is pulled for that system. When a logistics system is selected as a legacy system, the functional user may continue to fund operations for that system (Glasser, 1997). This is contrary to the goals of the CIM effort.

Investigative Question Three

What steps should be taken to implement a better model?

The GAO suggested that many of the problems found in their reviews of logistics systems may have been prevented if the DoD had used strategic information planning. They note that studies of private sector organizations show that strategic planning is

fundamental in making any important performance improvements. They stressed the importance of strategic information systems planning when they said:

> Private industry and our studies of public and private organizations have identified that cohesive plans resulting from strategic information management--managing information and information technology to maximize improvements in business performance—are crucial for developing information systems that support substantial business improvement. (GAO, 1996a:15)

The GAO goes on to suggest that the planning process be integrated with the processes for making budget, financial, and program management decisions ((GAO, 1996a:15). This method is analogous to Earl's Administrative approach where information systems planning is a part of the wider organizational management and budgetary planning (Earl, 1993:9-13). Earl notes that this approach can lead to functional stovepipes and tends to have more of a business as usual feel. Innovation may be set aside. The method does, however, show a fairly high rate of implementations because plans are made with resource constraints in mind (Earl, 1993:9).

Earl's suggestion is that the Organizational approach to strategic information systems planning is more effective (Earl, 1993:13). It is clear, however, that *some* approach to strategic information systems planning needs to be taken.

Suggestions

Based upon the case studies and Earls' organizational approach, several common themes lend themselves to suggestions for improving the systems selection process. The suggestions are as follows:

1. Institute a strategic information systems planning method.

Earl described five strategic information systems planning approaches. Each had strengths and weaknesses as detailed in Table 5. Earl chose the organizational approach as most effective. The strength of this approach is that the emphasis is on implementation. One of the weaknesses of this approach is that the methodology and architecture are "soft". Because of the lack of rigor, the organizational approach may not stand up well to external audits. The DoD needs a planning system that provides a clear vision and plan for information systems that can be implemented. A hybrid of Earl's methods may be possible.

2. Solicit user involvement in the planning, system development and system selection processes.

Earl also found that user involvement had a positive effect on implementation in the organizations he studied. User involvement in the planning, development, and selection process may decrease the resistance noted by Yin, Weill, and Lundsgaarde. At the very least, an understanding of the process and an opportunity to provide input may make users more accepting of decisions.

3. Perform selections through ad hoc and temporary groups, rather than standing up new organizations.

Earl's organizational approach used ad hoc and temporary groups for information systems planning. He found that this also helped make the organizational approach a strong method. In the DoD the logistics and transportation functional areas created

organizations to perform selections, but the medical functional area used selection groups. The logistics and transportation selections are now under heavy scrutiny and the organizations chartered to make selections may be disbanded. The medical selections, on the other hand, were made in a timely manner and have led to implementations.

Further Research

This thesis focused on a relatively small part of the CIM process: migration systems selection. All four pillars may be investigated further. In particular, the implementation of business process reengineering is ripe with opportunity to study cases and apply lessons learned to other cases. Further studies of logistics systems selections after implementation of the new Logistics Business Systems Corporate Strategy are also warranted. A comparison of selections prior to the new strategy with those made after may highlight strengths and weaknesses of the strategy and provided ideas for further improvement.

Conclusion

The purpose of this research was to investigate the migration systems selection process. After review of cases in DoD, suggestions were made for improvement of the process. The process, however, is not static. Constant attention is required in order to provide DoD systems users with high quality information systems.

Appendix A: Glossary of Terms

1. Ada: High-level computer programming language developed by the Department of Defense (DoD). Ada is used as the standard programming language for DoD. It is used for real-time processing, is modular in nature, and includes object-oriented features. (DISA, 1997:1)

2. Application: The use of capabilities (services and facilities) provided by an information system specific to the satisfaction of a set of user requirements. (DISA, 1997:1)

3. Automated information system (AIS): A combination of information, computer, and telecommunications resources, and other information technology and personnel resources that collect, record, process, store, communicate, retrieve, and display information. (NAPA, 1996:34)

4. Baseline: A quantifiable point at which an effort began, and from which change can be measured and documented. (NAPA, 1996:33)

5. Business process reengineering (BPR): A methodology that examines, rethinks, and redesigns mission, products, and services within the political, social, and economic environment of the organization. It seeks to achieve dramatic mission performance gains from multiple perspectives. It is a key part of a process management approach for optimal performance that continually evaluates, adjusts, or removes processes. (NAPA, 1996:33)

6. Case Study: A case study examines a phenomenon in its natural setting, emptying multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations). The boundaries of the phenomenon are not clearly evident at the outset of research and no experimental control is used. (Benbasat and others, 1987:370)

7. Corporate Information Management (CIM): A set of department-wide management initiatives aimed at improving the operations and reducing the costs of DoD-wide information management. (NAPA, 1996:34)

8. Data standards: Initiatives to establish consistent criteria for collecting and reporting data to provide standardized data elements meeting both functional and technical requirements for use throughout the organization in accordance with approved technical information architectures and functional processes. (NAPA, 1996:34)

9. Defense Information Infrastructure (DII): A seamless web of communications networks, computers, software, databases, applications, and other capabilities that meets the information processing and transport needs of DoD users in peace and in all crises, conflict, humanitarian support, and wartime roles. (DISA, 1997:1)

10. Enterprise Integration (EI): The functional and technical integration of an organization's information systems along with: shared strategic direction for the organization itself, consistently deployed at all levels; the integration of both internal functional organizations and external partners and suppliers; the integration of "end-to-end" processes that cross functional and organizational boundaries; the establishment of a

cooperative culture throughout the organization and the empowerment of people; integration of financial assets and human resources; the standardization of data and the sharing of corporate information through a common information infrastructure; and the integration of an organization's physical assets to ensure a flexible and adaptive physical infrastructure. (ASD C3I, 1994:23)

11. Legacy Systems: Systems that are candidates for phase-out, upgrade, or replacement. Generally legacy systems are in this category because they do not comply with data standards or other standards. Legacy system workloads must be converted, transitioned, or phased out (eliminated). (DISA, 1997:1)

12. Migration Systems: An existing AIS, or a planned and approved AIS, that has been officially designated to support common processes for a functional activity applicable to use DoD-wide or DoD Component-wide. Systems in this category, even though fully deployed and operational, have been determined to accommodate a continuing and foreseeable future requirement and, consequently, have been identified for transitioning to a new environment or infrastructure. A migration system may need to undergo transition to the standard technical environment and standard data definitions being established through the Defense IM Program, and must "migrate" toward that standard. In that process it must become compliant with the Reference Model and the Standards Profile. A system in this category may require detailed analysis that involves a total redesign, reprogramming, testing, and implementation because of a new environment and how the "users" have changed their work methods and processes. The

detailed analysis may identify the difference between the "as is" and the "to be" system. (DISA, 1997:1)

13. Principal Staff Assistants (PSA): The Under Secretaries of Defense; the Assistant Secretaries of Defense; the General Counsel of the Department of Defense; the Inspector General of the Department of Defense; the Comptroller of the Department of Defense; the Assistants to the Secretary of Defense; and the OSD Directors, or equivalents, who report directly to the Secretary or the Deputy Secretary of Defense. (NAPA, 1996:35)

14. Reference Model: A generally accepted representation that allows people to agree on definitions, build common understanding, and identify issues for resolution. A technical reference model is necessary to establish a context for understanding how the disparate technologies required to implement information management relate to each other. The model also provides a mechanism for identifying the key issues associated with applications portability, scalability, and interoperability. The Technical Reference Model is not a specific system design. Rather it establishes a common vocabulary and defines a set of services and interfaces common to DoD information systems. (DISA, 1994:2.1)

15. Standards Profile: Identifies standards and guidelines in terms of the reference model services and interfaces. These standards and guidelines can be applied and tailored to meet specific mission area requirements. (DISA, 1994:2.1)

16. Stovepipe System: A system, often dedicated or proprietary, that operates independently of other systems. The stovepipe system often has unique, nonstandard characteristics. (DISA, 1997:1)

Appendix B: Glossary of Acronyms

A&T - Acquisition and Technology

AIS - Automated Information System

ASD - Assistant Secretary of Defense

ASD(C3I) - Assistance Secretary of Defense for Command, Control, Communications and Intelligence

ASD(HA) - Assistance Secretary of Defense for Health Affairs

ATSD(NCB) - Assistance to the Secretary of Defense for Nuclear, Chemical and Biological Defense

AUSD - Assistant Under Secretary of Defense

BPR - Business Process Reengineering

C3I - Command Control Communications and Intelligence

CCB - Configuration Control Board

CFIB - Corporate Functional Integration Board

CHCS - Composite Health Care System

CI - Corporate Integration

CIM - Corporate Information Management

CJCS - Chairman of the Joint Chiefs of Staff

COTS - Commercial-off-the-shelf

DASD(C3) - Deputy Under Secretary of Defense for Command, Control, and Communications

DASD(I&S) - Deputy Assistant Secretary of Defense for Intelligence and Security

DASD(R&R) - Deputy Assistant Secretary of Defense for Readiness and Resources

DII - Defense Information Infrastructure

DISA - Defense Information Systems Agency

DM - Depot Maintenance

DMIM - Defense Medical Information Management

DMLSS - Defense Medical Logistics Standard Support

DMRP - Depot Maintenance Resource Planning

DoD - Department of Defense

DTS - Defense Transportation System

DUSD - Deputy Under Secretary of Defense

DUSD(EnvSec) - Deputy Under Secretary of Defense for Environmental Security

DUSD(L) - Deputy Under Secretary of Defense for Logistics

EI - Enterprise Integration

FAPM - Functional Area Program Manager

GAO - Government Accounting Office

GOTS - Government-off-the-shelf

HA - Health Affairs

HSRS - Health Standard Resources System

ICP - Inventory Control Point

IG - Inspector General

IS - Information Systems

JLSC - Joint Logistic Systems Center

JTCC - Joint Transportation CIM Center

LAN - Local Area Network

LBS&TD - Logistics Business Systems and Technology Development

LIB - Logistics Information Board

MAISRC - Major Automated Information System Review Council

MHSS - Military Health Services System

MM - Material Management

OSD - Office of the Secretary of Defense

OSD(IG) - Inspector General

PC - Personal Computer

PDASD - Principle Deputy to the Assistant Secretary of Defense

PMO - Program Management Office

PSA - Principle Staff Assistant

USD - Under Secretary of Defense

USD(A&T) - Under Secretary of Defense for Acquisition and Technology

USD(C) - Under Secretary of Defense Comptroller

USD(P) - Under Secretary of Defense for Policy

USOC - Universal Service Order Code

USTRANSCOM - United States Transportation Command

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Vita

Captain Paul E. Boley, II was born on 18 June 1963 in Lynwood, California. He graduated from Vista High School in Vista, California. He entered the Air Force in June 1981, and was assigned to the 97th Avionics Maintenance Squadron, Blytheville Air Force Base, Arkansas. In 1985, Captain Boley was transferred to the 22nd Avionics Maintenance Squadron, March Air Force Base, California. He later moved to the 452nd Consolidated Aircraft Maintenance Squadron in the Air Force Reserve. While in the Air Force Reserves, he also was Lead Avionics Technician for General Dynamics Services Company at Miramar Naval Air Station, San Diego, California. He earned a Bachelor of Science degree in aviation science from National University, San Diego, California in December 1990.

Captain Boley was commissioned in the Air Force through Officer's Training School in June of 1991. He was assigned to the 14th Flying Training Wing, Columbus Air Force Base, Mississippi. While stationed at Columbus, he served as the Installation Mobility Officer and War Readiness Materiel Officer. In 1993, Captain Boley was assigned to Headquarters, Air Mobility Command at Scott Air Force Base, Illinois. At Scott he was Chief, Mobility Standard Systems for the Logistics Directorate. Captain Boley graduated from Squadron Officer's School in 1995. Upon graduation from AFIT, he will be a project manager for the Logistics Plans Division, Air Force Logistics Management Agency at Maxwell Air Force Base, Gunter Annex, Alabama.

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One of the focuses of Corporate Information Management (CIM) initiative in the Department of Defense is the elimination of duplicate automated information systems. This thesis is a case study examination of the selection process in the logistics, transportation, and health functional areas. The case studies were performed through a one time review of documents relating to system selections in each functional area. A review of strategic information systems planning and systems implementation literature is used to examine the results in the three areas. The thesis concludes with three suggestions for improving the selection process with a emphasis on systems implementation.

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