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Positioning the Reserve Headquarters Support (RHS) System for Multi-layered Enterprise Use

05 September 2009

by

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Abstract

Currently, the Navy stores and retains data in multiple data warehouses, in various formats, in numerous legacy systems. The Navy's Bureau of Personnel is responsible for four distinct data stores that house unique data for: Active Duty Officers, Active Duty Enlisted, Drilling Reserve Officers and Enlisted, and all Inactive Service members. Decision-makers within the Navy have proposed combining the data into one cleansed, metadata-tagged, indexable and searchable enterprise data environment. This environment will resolve redundant storage issues, as well as eliminate outdated, end-of-lifecycle equipment and legacy infrastructure. This research will focus on the following: first, this research will focus on the current state of IT systems from the Department of Defense (DoD) level through the Department of the Navy (DoN) level to the focal system—the Reserve Headquarters Support (RHS) system. Second, the researcher will conduct and summarize research of current departmental guidance as to the desired state of these systems. Third, economic, technical, and strategic management theories will be studied and applied in order to conduct an economic analysis of the possibility of migrating the RHS application to a more modern IT solution. In the final chapter, conclusions and recommendations are provided concerning the most attractive way to proceed with the RHS application. Finally, possibilities for follow-on work are discussed.

Keywords: Data stores, combining data, enterprise data environment, redundant storage issues, modern IT solution

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My family, wife, Kim and daughters Sabrina, Samantha, and Sarah, deserve high recognition and praise as they supported me through this process with tireless devotion, support, and inspiration. I love you all!

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Table of Contents

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List of Acronyms and Abbreviations

AC	Active Component
ADS	Authoritative Data Source
ASN	Assistant Secretary of the Navy
AV	Acquisition Visibility
BEA	*Business Enterprise Architecture*
BMNP	Business Management Modernization Program
BTA	Business Transformation Agency
BUPERS	Bureau of Personnel
CBM	Core Business Mission
CEO	Chief Executive Officer
CIO	Chief Information Officer
CNP	Chief of Navy Personnel
CNRF	Commander, Navy Reserve Forces
CNRFC	Commander, Navy Reserve Forces Command
COCOM	Combatant Commander
CSE	Common Supplier Engagement
CTO	Chief Technology Officer
DIMHRS	Defense Integrated Military Human Resource System
DMI	Data Management and Integration
DoD	Department of Defense
DoDAF	Department of Defense Architecture Framework
DoN	Department of the Navy
EA	Enterprise Architecture
EDE	Enterprise Data Environment
EIM	Enterprise Information Management
EIS	Enterprise Information Systems
ERP	Enterprise Resource Planning
ETP	*Enterprise Transition Plan*
FMOC	Force Management Oversight Council
FV	Financial Visibility
FY	Fiscal Year
FYDP	Fiscal Year Defense Plan
GFM	Global Force Management
HCS	Human Capital Strategy
HR	Human Resources
HRM	Human Resource Management
IA	Information Assurance

IMAPMIS	Inactive Manpower and Personnel Management Information System
IRB	Investment Review Board
IT	Information Technology
M&RA	Manpower and Reserve Affairs
MNS	Mission Need Statement
MPTE	Manpower, Personnel, Training and Education
MV	Materiel Visibility
NES	Navy Enlisted System
NETWARCOM	Naval Network Warfare Command
NMPDS	Navy Military Personnel Data System
NOSC	Navy Operational Support Center
NPDB	Navy Personnel Database
NPRST	Navy Personnel Research, Studies, and Technology
NRA	Navy Reserve Activity
NSIPS	Navy Standard Integrated Personnel System
NTF	Navy Total Force
OMB	Office of Management and Budget
OMN	Operations and Maintenance, Navy
OPINS	Officer Personnel Information System
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
OUSD	Office of the Under Secretary of Defense
OV	Operational Vision
P&R	Personnel and Readiness
PEO	Program Executive Office
PERSYS	Personnel Systems
POR	Program of Record
PV	Personnel Visibility
RC	Reserve Component
RDT&E	Research Development Training and Education
RHS	Reserve Headquarters Support
RPA	Real Property Accountability
RSTARS-HP	Reserve Standard Training Administration and Readiness Support for Health Professions
SECNAV	Secretary of the Navy
SELRES	Selected Reserve
SOA	Service-oriented Architecture
SSAA	Systems Security Authorization Agreement
SSC NOLA	Space and Naval Warfare Systems Center, New

	Orleans
TFMMS	Total Force Manpower Management System
TWM	Total Workforce Management
US	United States
USACEAC	United States Army Cost and Economic Analysis Center
USJFCOM	United States Joint Forces Command

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I. Introduction

A. Purpose

Research for this thesis will focus on conducting technical, economic and personnel implication studies to determine whether the Navy should focus on upgrading the current data-management function for the Reserve Headquarters Support (RHS) Information Technology (IT) application. It will examine the current and desired state of information systems—from the Department of Defense (DoD) organization level down to the RHS system level. The research will then explore methodologies—including technical and managerial methods—best suited to a possible migration of RHS to more modern business architecture. Finally, if applicable, the researcher will present alternative solutions to meet this objective and will conduct an economic analysis to identify the most qualified solution.

B. Background

Currently, the Navy stores and retains personnel data in multiple databases supporting multiple, separate functions in geographically dispersed locations. Potentially, the facilities and the data they store could be combined in fewer facilities. This study will research whether the current system architecture leads to logistical issues associated with such storage and if problems exist due to the age of the systems that currently perform these functions. Other areas of research include potential sources of inefficiencies and unnecessary system redundancies. Further examination of these data-storage facilities will be conducted to determine if business best practices—such as sharing or combining similar functions between organizational entities or throughout the enterprise—are leveraged.

Recently, problems have surfaced as the Navy shifts towards integration of both active and reserve components (AC/RC). These problems have created personnel management difficulties not only from an external DoD organization level, but also from an internal Department of the Navy (DoN) level. This paper will research whether these problems are caused by, or could be diminished by the application of IT solutions and what these solutions might entail. In addition to the potential issues previously mentioned (disparate systems, lack of sharing/combining), the component information technology infrastructures rely upon antiquated database technologies that were put into production in the 1970s and 1980s. Issues associated with systems this old will also be examined.

Policy and operational considerations for both AC and RC organizations must be researched to identify common ground, as well as disparate factors concerning both of these organizations' policies and operations. The implications of the research within these constraints is that combining the organizations' data solutions may or may not be feasible for reasons other than those strictly technical or economic.

The framework under which this research will be completed will identify current operations, procedures, business rules and economics of the existing systems at all levels of the DoD. Once the research of the current information systems and desired states has been discussed, comparable organizations—either internal or external to the government and that have completed projects of a similar size and scope—will be identified for benchmarking purposes. In addition, the researcher will review the most current research in the field of enterprise architecture to identify common themes that exist in organizations that have successfully transitioned their IT systems. These lessons learned will be applied to this research, acting as a roadmap for similar DoD and subsidiary IT systems and their own efforts for transition. Ultimately, after the research materials are examined, the researcher will make recommendations about the future direction of the RHS system.

C. Scope

One of the goals in conducting this study is to determine if the migration of the Reserve Headquarters Support application and its associated data is warranted. One potential alternative solution is the Defense Integrated Military Human

Resource System (DIMHRS), which is supported by the DoD through the Business Transformation Agency (BTA). Another potential alternative is for migration to the Enterprise Data Environment (EDE)—which is currently under development at Space and Naval Warfare Systems Command (SPAWAR) Systems Command, New Orleans (SSC NOLA). To reach conclusions and formulate recommendations, the researcher will conduct an economic analysis comparing the three alternatives (current system, DIMHRS, and EDE) from both a cost and benefit perspective, including quantitative and qualitative measures.

A portion of this paper will be technical in nature. However, this study will not render specific technical solutions to the owners of RHS. Instead, if and when warranted, it will offer general guidelines for the successful future positioning of the RHS. From an economic standpoint, this study will present research to determine the current costs of doing business and what the proposed solutions' costs would be. These costs will include investment as well as sustainment costs. Additionally, the expected benefits provided by each of the alternatives will be examined. The cost estimates of proposed solutions within this paper are not meant to be exact, but they are provided in order to make a comparison possible by using best estimates based on current information. In addition, the research conducted will break down the technical and economic aspects of the focus system (RHS) to a level that would ensure reasonable projections for future development efforts and costs.

Additional value of this study exists in the possibility that other military organizations looking to do similar work might leverage the work completed in this thesis. This research will not aim to provide actual technical solutions; it will, however, render a high-level assessment of the technical feasibility necessary to meet the stated requirements. Further, this assessment could provide a starting point for further research into technology-specific solutions for migrating RHS from its current state to a desired state. Economically, an analysis of current costs to operate and maintain the RHS application can provide a reasonable representation of the current state (as this is a known quantity and a matter of accounting).

However, the forecasting of costs will be limited to those factors that can be estimated without a specific technology solution in mind.

D. Methodology

The research methods used in this paper consisted of interviewing system owners and stakeholders, reading topic-related literature (both academic and professional), and applying concepts the author has learned through formal education and industry-related experience. A preponderance of the data enabling the research for Chapters II and III of this thesis was collected from SSC NOLA, Commander Navy Reserve Forces Command (CNRFC), the Navy Program Executive Office for Enterprise Information Systems (PEO EIS), and the Navy Manpower Personnel Training and Education (MPTE) organizations. Chapter IV references material that was more scholarly and guidance-oriented—including works by industry experts and academics working in the area of software and enterprise architectures. Other useful resources for this research included: lectures attended at the Naval Postgraduate School, various Internet sites, and discussions held with professors and the researcher's Thesis Team. Finally, additional data was gathered from multiple other resources relevant to the focal organizations and subject at a level appropriate to the scope of this thesis.

The researcher used multiple research methods to collect data for this study—including interviews with the CNRFC and SSC NOLA staff. Additionally, interviews and one-on-one discussions with professors were used to gain direction as to where data pertinent to this topic could be attained. Once these sources of data were discovered, the researcher accumulated and researched all the available secondary data regarding the support of RHS. Thus, the research conducted in the completion of this thesis was secondary in nature. All sources cited in the study were analyzed for validity and accuracy before being cited.

This remainder of this paper is organized as follows. First, in Chapter II, the current state of IT systems at all levels of the DoD is examined down to the RHS level. Second, based upon a study of the existing literature, Chapter III examines the desired state of these same systems. Chapter IV investigates methods for bridging the gap between the current state and the desired end-state, including a relevant economic analysis. Finally, based upon the preceding chapters, conclusions, recommendations and answers to the primary and secondary questions posed by this research are given. These research questions are as follows.

Primary research question:

- What are the implications of migrating from the Navy's current disparate data warehousing architecture to an integrated solution with a focus on the Reserve Headquarters Support (RHS)?

Subsidiary research questions:

- What is the cost of the current data warehouse solution? How much would it cost to upgrade, and what cost model can be used to appropriately forecast the cost the upgrade?
- What is the current technical architecture that supports data warehousing of the Navy's data, and is it appropriate?
- How would migration of the RHS be carried out from a technical standpoint?

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II. Current State of Information Systems

A. Department of Defense (DoD)

The Department of Defense (DoD) is a massive organization that has operated in a highly dynamic environment for many years; one bi-product of that situation is that the DoD's financial and manpower information stores are highly partitioned or siloed along Military Active Component (AC) and Reserve Component (RC) lines, as well as between military and civilian government organizations. This structure has forced the separate organizations to create infrastructure to support themselves separately. This separation has made it difficult to share information among the components of the DoD—a problem glaringly evident in issues with personnel assignment during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). Additionally, separate staffs and facilities have been created and continue to operate in their component-specific environments.

The creation of the Business Transformation Agency (BTA) in 2006 was the DoD's response to remedy this situation. The BTA has mandated that all organizations within the DoD work toward the creation and sustainment of an enterprise architecture. Of particular interest to this study is the development and deployment of the Defense Integrated Military Human Resource System (DIMHRS), which is to replace all of the personnel systems currently in use within the DoD (military and civilian). Of course, this will be phased into production over a period of several years—with the Army scheduled to be the first organization to go live with the DIMHRS. Per the Army DIMHRS website, the implementation date of March 1, 2009, was postponed. In fact, the whole program has been suspended until further notice (US Army PEO EIS, 2009).However, the fact remains that the DoD is moving towards integration of its IT systems; what form that transformation takes remains to be seen. What is important to this study is the fact that support exists at the highest levels of our government to ensure the technology it possesses within its organizations is capable of meeting the missions of the future.

B. Department of the Navy (DoN)

The Navy currently stores and retains its data in multiple data warehouses, in various data element formats, in many disparate legacy systems. The Navy's Bureau of Personnel is responsible for five distinct applications that track, store and manipulate data for Active Duty Officers, Active Duty Enlisted, Drilling Reserve Officers and Enlisted, and all Inactive Service members. These applications are authoritative data sources (ADS), which are "a designated, or agreed upon, trusted source of information" (US Army CIO, 2009). These applications support and interface with several organizations' systems—both internal (such as recruiting systems) and external to the Navy (such as the Defense Finance and Accounting System (DFAS), which, among other services, is the military pay system). "Per the DIMHRS Milestone B Operational Requirements Document, there are five Navy personnel systems that are subsumed by DIMHRS" (ASN (M&RA), 2009, p. 7).

- Navy Enlisted System (NES)
- Officer Personnel Information System (OPINS)
- Navy Standard Integrated Personnel System (NSIPS)
- Reserve Headquarters Support (RHS)
- Inactive Manpower and Personnel Management Information System (IMAPMIS)

The DIMHRS only covers personnel- and pay-related functionality. Therefore, although the bulk of these systems' functionality will be covered by the DIMHRS, they do have some non-personnel-related functions that will be maintained separately. In the next section, we examine the specific interfaces these five applications have within the Navy Manpower, Personnel, Training and Education (MPTE) environment.

1. Manpower, Personnel Training & Education (MPTE) IT

According to the Navy Total Force (NTF) team, "The MPTE domain was officially created in July 2005 by the merger of the Manpower and Personnel with

Training and Education commands" (NTF, 2009, p.1). This move was made in an effort to ensure that operations undertaken by the Navy are supported in the most efficient manner possible utilizing the Total Force (all personnel in either active or reserve status). Due to this organizational restructuring, all of the IT assets of the merging entities have been placed under the purview of the Deputy Chief of Naval Operations (Manpower, Personnel, Training & Education). With this combination, the IT system has become more complex due to the greater size and increased functionality housed within one system. However, this combination places all of the authoritative data sources of the Navy under the direct control of one organization, which should aid the DoD and the DoN in achieving the goals of enterprise alignment of IT systems.

a. Issues in the Environment

The focus system of this study, RHS, lies within the MPTE IT domain, which is predominately concerned with the management of all Navy personnel and all functions associated with human resource management. As discussed previously, five separate systems make up the personnel authoritative sources portion of the MPTE IT System: NES, OPINS, NSIPS, RHS, and IMAPMIS. Actually, NSIPS is a record-entry application used to interface with the other four systems; thus, the remaining four systems comprise the entire authoritative data sources concerning personnel, as depicted in Figure 1.

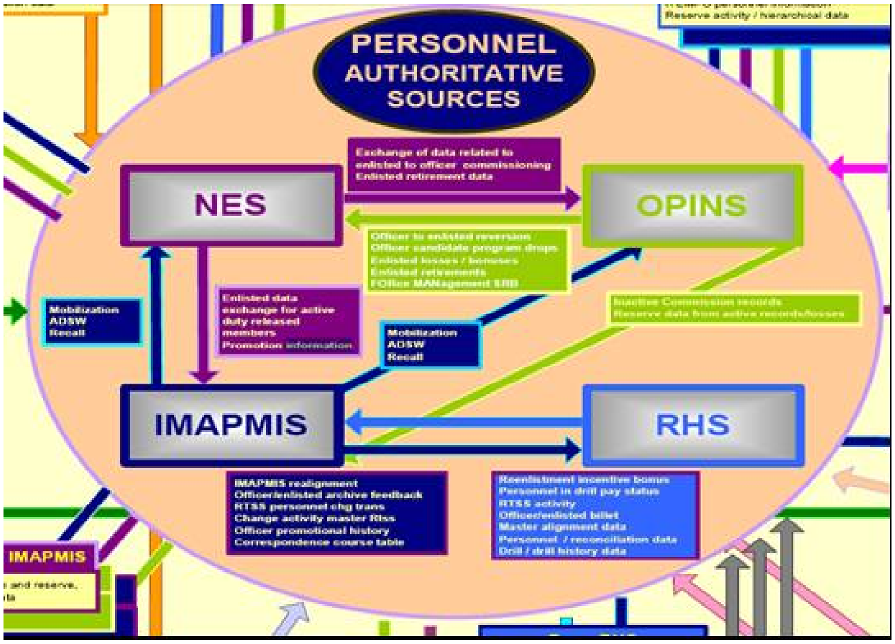

Figure 1. Navy Authoritative Data Sources for Personnel
(Aries Systems International, Inc., 2005, p.1)

In this section, we will focus on some of the issues associated with the MPTE system environment, in particular:

- Age of the technology (both hardware and software),
- Number of associated interfaces with these systems,
- System maintenance, and
- System complexity.

(1) Age of the Technology. A document retrieved from the DoN website entitled "Draft DON DIMHRS Concurrent Review" concerning the age of the MPTE system components states, "All of these systems, except NSIPS, have been in sustainment mode since mid-1970. Only congressionally mandated improvements and functional maintenance have been done on the systems" (ASN (M&RA), 2009, p. 7). This fact presents myriad associated problems, including dated hardware, dated software, overburdened and inefficient architecture, lack of qualified technicians, and necessarily inefficient procedures.

If Moore's Law is applied—which states that the number of transistors that can be placed on a chip doubles roughly every two years—and assuming an average in-service system date of 1979, then the four authoritative data source systems are about fifteen generations behind the latest technology. Further, according to Kanellos (2005), this trend "will continue for at least a decade" (p. 1). Thus, if not changed prior to 2015, these systems will be eighteen full generations behind the latest technology. Given the pace with which the DIMHRS has progressed, this possibility seems to be highly likely. This scenario—combined with the issues associated with the DoD acquisition process of large-scale IT systems—does not bode well for the replacement of these systems anytime in the very near future.

(2) Number of Interfaces. According to the DoN Program Executive Office (PEO) Enterprise Information Systems (EIS), there are hundreds of interfaces among the systems highlighted in this paper, with many of them sharing multiple files. These files are shown in the following figure (Murphy, 2007). As one can see from the graph, the RHS alone has over 75 interface files, which we will inspect in the following section.

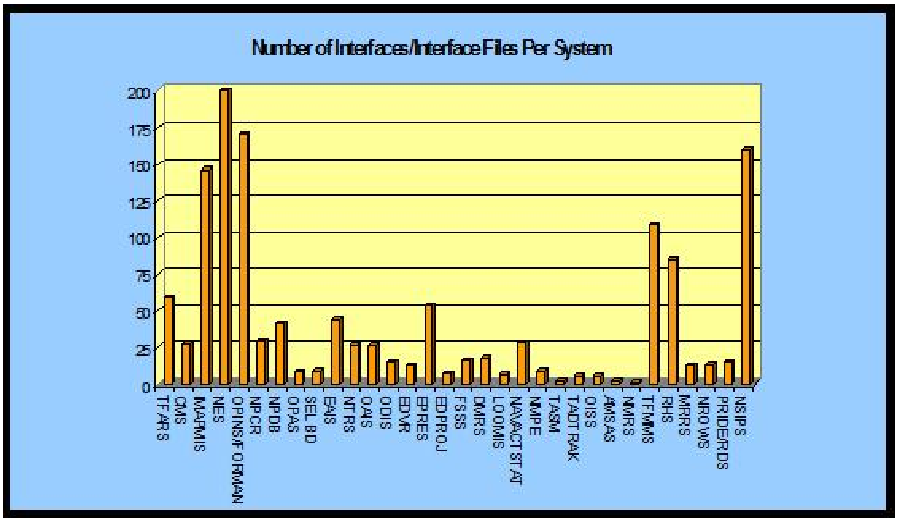

Figure 2. Number of Interfaces/Interface Files per System
(Murphy, 2007, Slide 47)

Over the years, the number of interfaces has continued to grow as new systems are added within the enterprise, which in turn require connections to the MPTE domain. This trend will likely continue. As the number of system interfaces increases, the performance of a system is degraded. This is due to several factors, including:

- The overall system complexity increases as more systems are added.
- Each interface requires system hand-offs at the software level, necessitating communication between systems via protocols, thus taking processor time.
- Hardware components are constrained, as they are utilized more heavily and frequently.

In addition to these issues, advances in hardware have outpaced those made in software. This can be attributed to many factors—including the fact that software is more complex, as it is based upon logical properties rather than physical factors that dictate hardware development (Osmundson, 2009).

(3) System Maintenance (Ad-hoc Fixes to Interface Issues). The issues just discussed of old technology and multiple interfaces greatly increase the complexities of system maintenance. Aside from the purely technical issues, the personnel problems associated with these older systems are complex. Most IT professionals trained today are not being trained in the technologies used in the 1970s. Additionally, the aging information systems are mirrored by an aging workforce who are not trained in the latest technologies and have a high attrition rate. Finally, many people have moved on to different careers, to different parts of the organization, or have simply retired—creating a serious threat of not having enough qualified people to work on these systems.

(4) Data Issues (Quality, Synchronization, Maintenance). Within the MPTE IT domain, there are several issues related to the data that it uses, owns, and creates. Of these issues, those associated with quality, synchronization, and maintenance are focused on here. Each of these issues is distinct in the problems it presents; however, each issue is intertwined and cannot be separated and fixed in isolation. If data quality and synchronization issues are addressed, it logically follows that maintenance problems will be diminished.

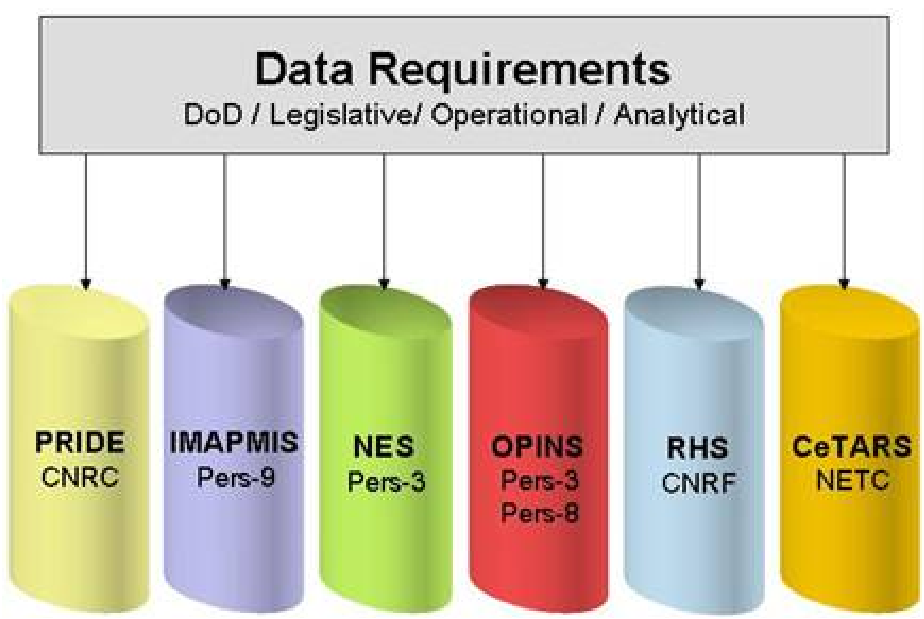

Figure 3. Current MPTE Data Management Environment
(Pavelec, 2008, p. 3)

Figure 3 illustrates some of the issues associated with the current data architecture of the MPTE domain. Per the *Data Management and Integration (DMI) Roadmap*:

> [T]he MPTE enterprise currently relies on "siloed" systems within fragmented organizations. Because of the isolation of data within outdated architecture, there are inconsistent data standardization and formatting, inconsistencies with data quality, multiple costly interfaces, and nonexistent overarching enterprise data governance. (Pavelec, 2008, p. 3)

If we examine the issue another way, we see the following data-related issues within the current environment:

- Poor data quality—inconsistencies exist in the current environment related to data availability, relevance, action-ability, consistency, validity, and trustworthiness.
- Poor data interoperability—this exists between the multiple system interfaces; data re-use is difficult due to a lack of common standards.
- Difficult maintenance of data—this is related to the previously described issues with quality and maintenance and is exacerbated by the lack of enterprise data governance.

(5) System Complexity. Figure 4 portrays the complexity of the MPTE IT environment. In this diagram, a picture is painted of many of the problems highlighted in this paper: siloed databases/functionality, too many interfaces, and complexity, to name a few. What this picture does not capture is the actual complexity of the system, as it is a great simplification of the MPTE IT environment. The actual real complexities and problems stem from such things as system reach-backs (which allow necessary system interfaces to be maintained that are not included in new development efforts), poor system documentation, and an overall lack of understanding of and about the system. It is probable that no one person fully understands the entire system or what it does. Each person associated with it may understand his or her own small piece, but may have little appreciation for how the entire system works.

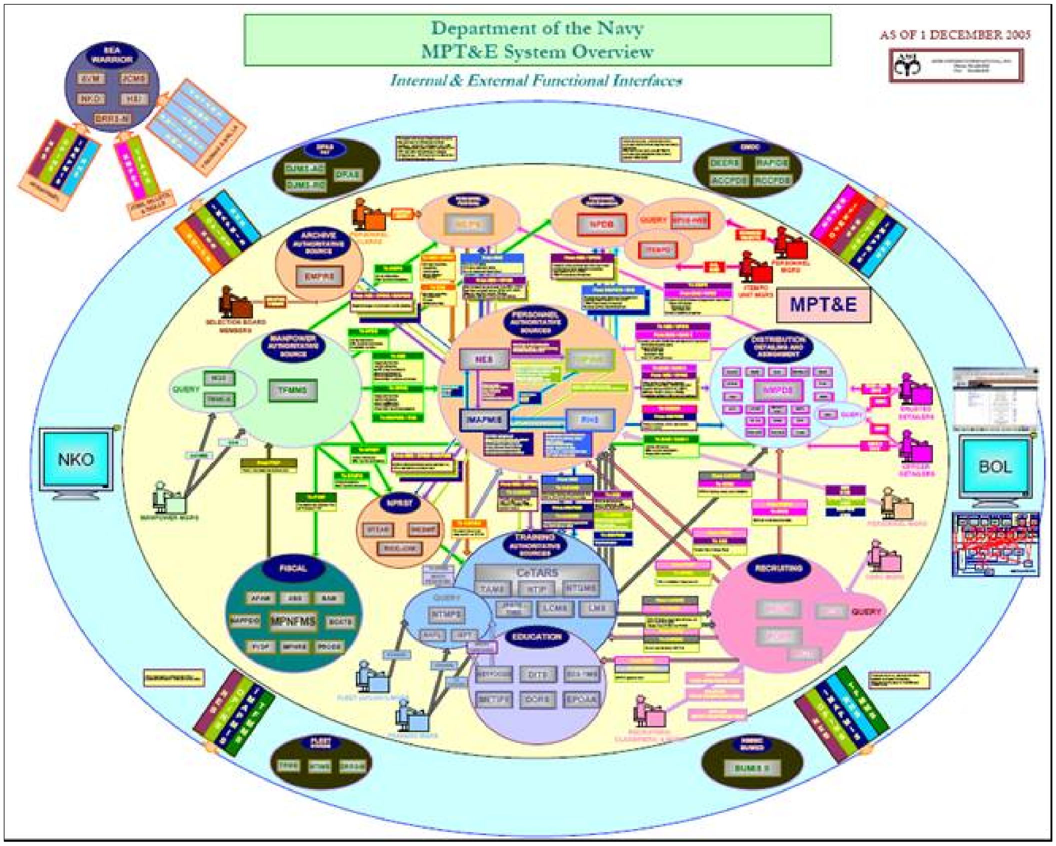

Figure 4. MPTE System Overview
(Aries Systems International, Inc., 2005)

No one could understand such a complex system. This lack of understanding leads to problems—downstream issues are created when an upstream system changes. Often, the upstream system can adversely affect the downstream system without knowing it; the upstream personnel might not even know that the downstream system exists. This type of problem can even create an environment in which easy changes can become highly complex and may even be avoided so as to not cause problems for other systems. Decision-makers may implement critical changes without notifying interfaced systems, thus creating a ripple effect of errors. If policy-makers do not address these issues, the associated system problems will continue to grow and will eventually create serious trouble.

2. Map of Current Environment

The next section examines the components of Figure 4. This diagram displays several shapes, lines, arrows, colors, and actors, as well as a large, light blue oval that surrounds a tan oval. Anything inside the tan oval describes or depicts the components that make up the MPTE environment (many of which have been discussed in this project). The light blue oval surrounding the tan represents systems that are direct external interfaces to the MPTE system. Outside of that are systems with which the MPTE system interfaces through its direct external links.

The basic scheme of this picture inside the large, tan oval is that the different-colored ovals depict the functional domains within the overall system. Functional domains are closely related to business functions; each domain performs a function related to its pertinent business or operational function. In fact, there may be more than one oval of the same color that is intertwined. In either case, the name of the functional domain is contained within one of the imbedded blue ovals. Each of the multi-colored domain ovals (or clusters of ovals) contains one and only one blue oval. Therefore, we can breakdown the MPTE system into its functional areas as follows:

- Archives—This system stores official Navy personnel files electronically.
- Personnel (Field Entry)—These systems are used by authorized users to edit, update, and delete information pertaining to Navy personnel.
- Personnel (Data Repository)—This system stores personnel information/data so it can be maintained, retrieved from, and written to.
- Distribution (Detailing and Assignment)—This domain enables authorized users to manage human resource assets in regards to duty assignments.
- Recruiting—This system tracks applicants who are in the process of joining the Navy. Once affiliated, these records form the base of Navy personnel records.
- Education—This system tracks scheduled, formal education and other educational pursuits completed by Navy personnel.

- Training (Authoritative Sources)—This system tracks scheduled and completed training by Navy personnel at the individual and unit level.
- Fiscal—This system tracks all budget-related items for the Navy.
- Manpower (Authoritative Source)—This system is supported by the Total Force Manpower Management System (TFMMS) that "provides capabilities for storage and retrieval of historical, current, budget, and out-year manpower data. It also provides access to current manpower data for resource sponsors, claimant, etc." (CNP, 2009, p. 1)
- Navy Personnel Research, Studies, and Technology (NPRST)—this system conducts research and studies and applies technology to solve Human Resource (HR)-related problems. (NPRST, 2009)
- Personnel (Authoritative Sources)—This system provides manpower, and personnel and pay management support.

This breakdown is further illustrated in Figure 5.

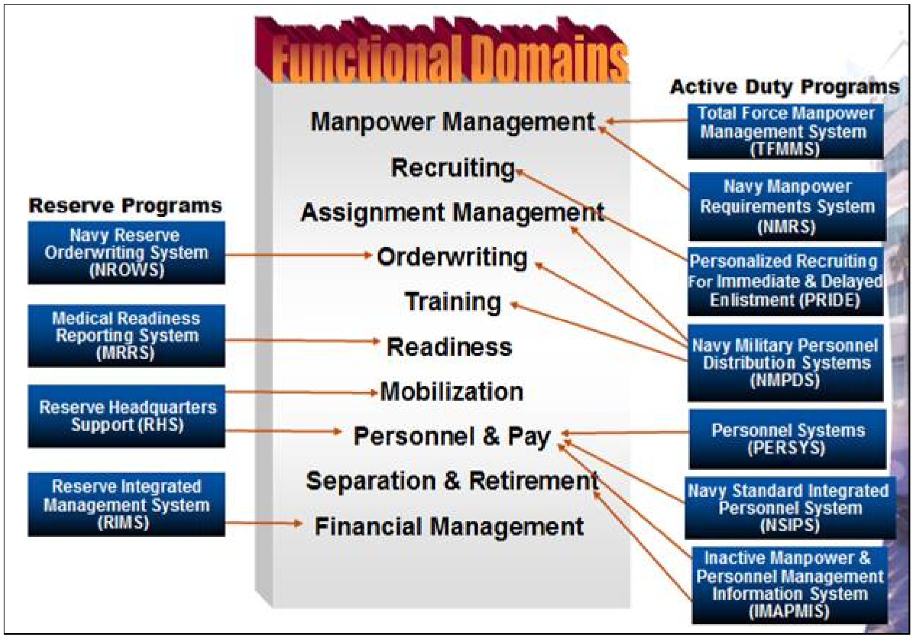

Figure 5. Navy Functional Business Domains
(SSC NOLA, 2008, Slide 4)

Within each of the functional areas (depicted in Figure 5) are silver rectangles containing acronyms. These are the applications that support the parent function. Many of these applications are represented in Figure 5 as they relate to their functional domains. Additionally, arrows extend from and point to the different functional domains, representing the interface relationships. These arrows may have boxes on them that describe the basic types of information flowing over these interfaces. Finally, actors (in the shape of people at their desks in Figure 4) represent the users of the system.

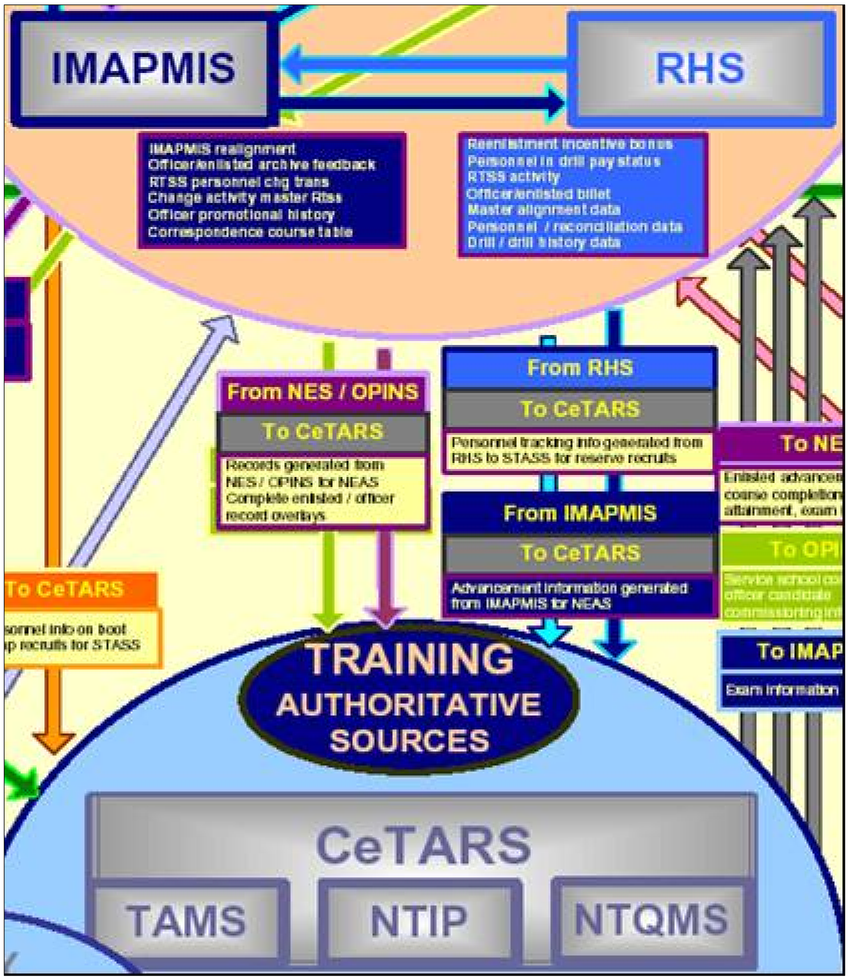

Figure 6. Navy Authoritative Data Sources for Training
(Aries Systems International, Inc., 2005)

The preceding figure is used to illustrate a small portion of the system flow. The two functional domains depicted are the Navy Personnel–Authoritative Sources and Navy Training–Authoritative Sources. One key point is illustrated by the two blue arrows pointing from the Personnel domain to the Training domain and the boxes superimposed over them. Here, there are two different-colored arrows. These arrow colors match the application rectangles borders from which they are coming. In this example, information from both the IMAPMIS application and the RHS application (both in the Personnel domain) is being transferred to the CeTARS application within the Training domain.

The basic symbols in the illustration above depict what types of information flow through the MPTE system as well as the complexity of the environment.

Now, armed with a general understanding of the MPTE IT environment, we will focus our attention on one of the applications within the Personnel–Authoritative Sources functional domain, the Reserve Headquarters Support (RHS).

C. Reserve Headquarters Support (RHS)

Per the Department of the Navy (DoN) Program Executive Office (PEO)–Enterprise Information Systems (EIS), the "Reserve Headquarters Support (RHS) is a CNRFC mission-critical system used in the data collection and dissemination process necessary for command and control of SELRES Mobilization" (as cited in Murphy, 2007, Slide 30).

Although the above definition gives an idea about what RHS does, it does not explain the system's mission completely. This section will take an in-depth look at the RHS application by describing its functionality, environment, interfaces, and architecture. After the system has been described, this project will examine the issues the system faces in regards to the aforementioned features.

1. Functionality

At a high level, the RHS "provides automated storage, maintenance/update, reporting (e.g., accounting, management, and strength), distribution of manpower and personnel information, recall/mobilization status, and drill pay on all drilling reserve Navy personnel" (JR&IO, 2004, p. 10). As described earlier in the discussion of the MPTE environment, the RHS lies within the functional domain of Personnel–

Authoritative source. This means that the RHS, from the Navy perspective, is the one-stop shop for all Reserve personnel-related information. Therefore, any other system—internal or external to the MPTE IT environment—that requires information on Navy Reserve personnel needs to interface with the RHS to obtain such information. This access is critical to the military, especially as the trend towards joint military operations continues. In the future, the RHS needs to be open to not only Navy systems, but to all Department of Defense systems that need information concerning Navy Reserve personnel. The challenge here lies in the fact that the current RHS architecture is not set up to serve this purpose, but will need to change to serve this function.

2. Whom It Supports

As previously stated, the RHS is the authoritative data source for the Navy Reserve Force; as such, it is "the central data processing point between 265 Navy Reserve field activities and all Navy and DoD pay/personnel systems" (Murphy, 2007, slide 30). Further, the application "supports 57,000 Selected Reservists" (2007, slide 30). The implications of these facts is that to leverage the personnel assets of the Navy Reserve, outside systems must interface with the RHS, and the RHS must be set up to reciprocate. Although today, the active duty Navy personnel, as well as the other Services, are utilizing Navy Reserve personnel assets as tracked by the RHS. This is not due to the functionality of the RHS. Many times these assets are utilized in spite of or without the use of the RHS. What has been discovered is that even within the Navy, it is not possible for applications to leverage the information of other applications within the MPTE environment due to incompatible architectures and data structures, as well as other problems. In the future, the RHS needs the functionality to not only seamlessly interface with internal MPTE applications, but to also interact with other organizations external to MPTE. This will allow, for instance, an undermanned US Army unit that is conducting a critical operation to access the description of a Navy Reserve person that may be a match for its needs. However, the RHS as it exists today does not contain this type of functionality. In the next section, we will explore the current RHS architecture, its environment and the interfaces that the system maintains.

3. Map of the Technical Environment/Architecture

Figure 7 depicts the RHS operational environment. It gives a breakdown at a more granular level than the MPTE system overview described in the MPTE section. Additionally, it filters out any of the functional areas and interfaces that do not directly affect the RHS. What is shown in Figure 7 is that the RHS interfaces directly with 15 other applications—either providing information to them, extracting information from them, or both. A detailed breakdown of these interfaces follows this section. Here, the figure is given to create a visual representation of the RHS to enhance the readers' understanding of the application. In conjunction with Figure 4, Figure 7 allows one to visually investigate the RHS application level while keeping in mind the overall system picture.

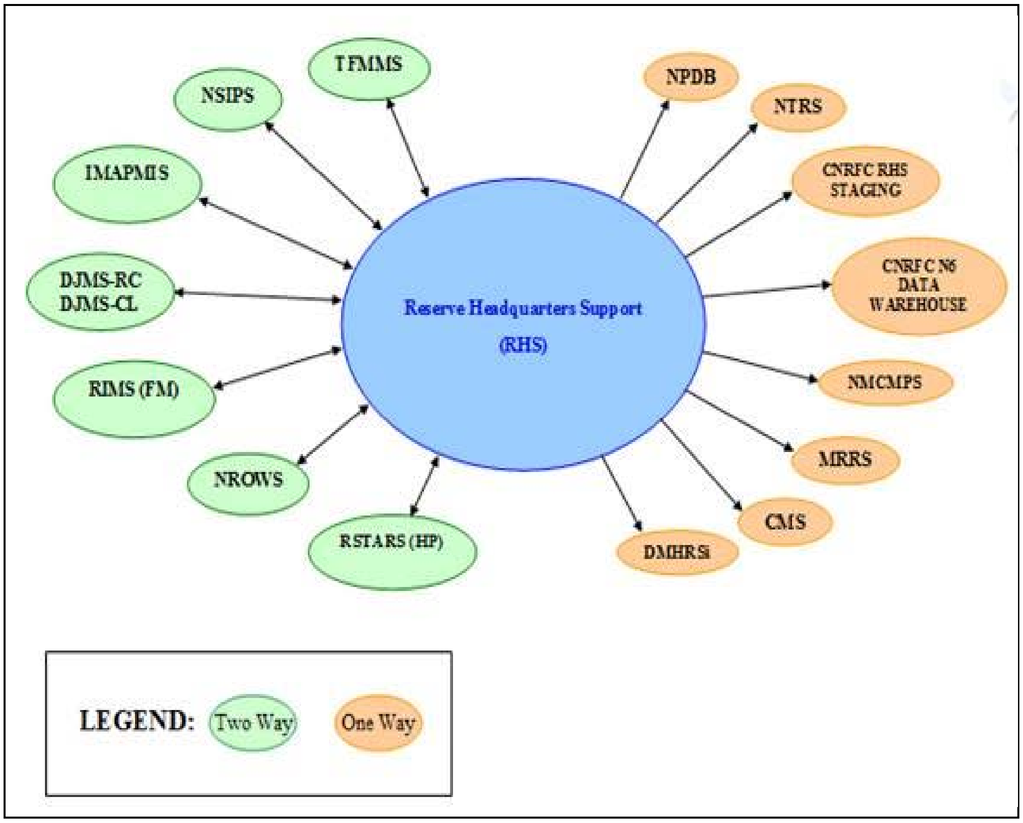

Figure 7. The Reserve Headquarters Support System
(Bergeron, 2008, slide 5)

Based upon information gathered from the RHS system owners at SSC NOLA and the RHS System Overview presentation given by the Program Manager, Mr. Kelly Bergeron (2008), the RHS application leverages the following hardware and software:

Platform: HP AlphaServer ES40 Cluster

Operating System: Open VMS

Application S/W: VAX BASIC, SmartStar, SQL, DCL

Database Management System: Oracle 9.2.0.8.0

The physical location for these assets is currently the SPAWAR Systems Center, New Orleans (SSC NOLA), with a co-operating site in San Diego, CA.

Combined, these assets support roughly 290 interactive users and 400-plus Navy Echelon-five-level batch accounts through the Navy Standard Integrated Personnel System (NSIPS). Echelon five refers to the level in the Navy organization at which these transactions take place; i.e., they take place five layers down from the top. In total, 69 million transactions are conducted and handled per month on the RHS application.

As stated above, the RHS application hardware and software is physically located and maintained in New Orleans, LA, at SSC NOLA. Figure 8 gives a view of the logical flow of data from the RHS to the Navy Personnel database (NPDB), which is located in Mechanicsburg, PA.

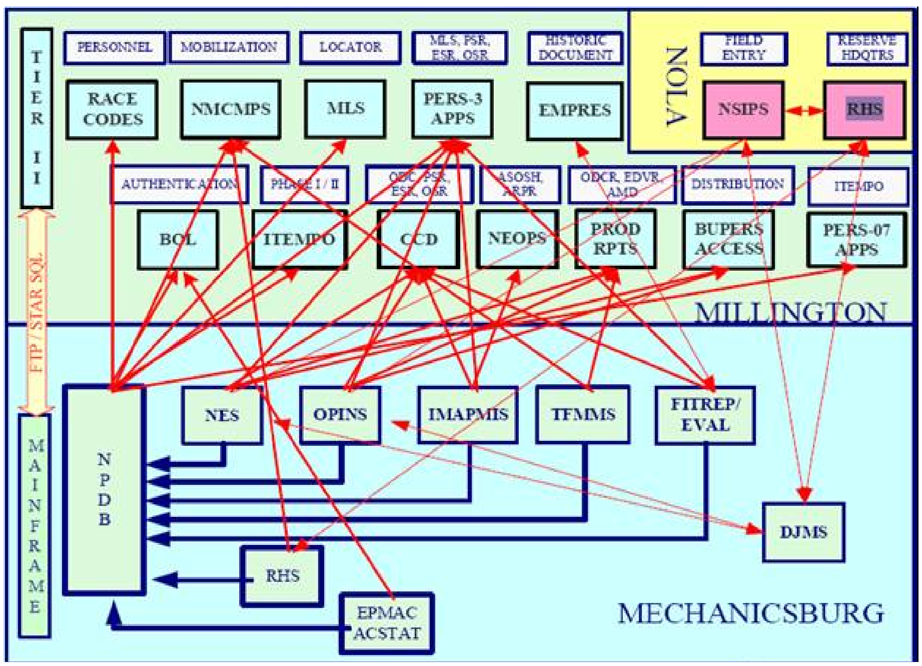

Figure 8. Data Flow between Navy Systems
(Murphy, 2007, slide 47)

As depicted in the NOLA box in Figure 8, NSIPS (which is a PeopleSoft-based application) provides both database functionality and serves as the front-end interface for data input. Through its interface to the RHS, it is used to conduct pay and personnel actions for Navy Reserve personnel (JR&IO, 2004). NSIPS is used in the field by personnel professionals at Navy Reserve Activities (NRA) and Navy

Operational Support Centers (NOSC)/formerly Naval Reserve Centers. Additionally, "At the corporate level, Navy Personnel Data Base (NPDB), OPINS, NES, IMAPMIS, RHS, and Navy Military Personnel Data System (NMPDS) provide manpower, personnel and pay management support" (JR&IO, 2004, p. 9). NPDB is the integrator database for all Navy personnel (active and inactive); however, the data stored in NPDB is limited and does not contain exhaustive personnel information for each personnel account. Finally, as the process exists today, "Reserve management information is provided via data transfer or hard copy reports to Reserve field activities, Reserve Headquarters, BUPERS, Chief of Naval Personnel, Secretary of the Navy (SECNAV), OSD, and other DoD activities" (JR&IO, 2004, p. 10).

4. RHS Interfaces

The RHS contains 15 interfaces and processes over 750,000 transactions per month from Navy Reserve field activities—including over 300,000 pay transactions that provide $35 million a month in reserve pay (Murphy, 2007).

The following list highlights a few of the more important system interfaces and their functions:

- NSIPS, IMAPMIS and DJMS-RC—personnel and pay
- TFMMS—manpower requirements data, reserve billet data, and headquarters-level support for force billet and mobilization management
- NSIPS—Three daily transmissions and feedback
- DJMS-RC—Daily transmissions of direct pay data
- IMAPMIS—Daily pay and personnel data that require Navy corporate system interface affecting transmissions being fed back to the RHS and on to DJMS-RC.
- RSTARS-HP—Supports DJMS-RC pay processing interfaces for Health Professions Scholarship participants via Reserve Standard Training Administration and Readiness Support for Health Professions (RSTARS-HP) (JR&IO, 2004, p. 11).

Finally, Table 1 provides an exhaustive list of RHS interfaces, including data flow direction, interface type, and purpose of the interface.

Table 1. RHS Interfaces
(After Bergeron, 2008, slide 3)

INTERFACES:			
SSC NOLA SYSTEMS			
Data flow	**System Name**	**Interface Type**	**Purpose**
To	OPAS	FTP Batch	Reserve Officer data
To	NTRS	FTP Batch	Reserve Personnel data
To/From	TFMMS	FTP Batch	Billet requirements
To/From	RSTARS (HP)	FTP Batch	Student PERS/PAY data
To	MRRS	SQLNET	Reserve Personnel data
To/From	RIMS (FM)	FTP Batch	Reserve Bonus data
To/From	NROWS	SQLNET and FTP	Reserve Pers and Order data
To/From	IMAPMIS	FTP Batch	Reserve Pers and Pay data (inc. IRR)
To	CMS	FTP Batch	Reserve Personnel data
External Systems			
Data flow	**System Name**	**Purpose**	
To/From	DJMS-RC	FTP Batch	Reserve Pers and Pay data
From	DJMS-CL	FTP Batch	Reserve Pers and Pay data
To/From	NSIPS	SQLNET and FTP	Reserve Pers and Pay data
To	NMCMPS	FTP File Batch	Reserve Pers and Mob data
To	CNRF Staging	FTP	Pers/Billet/Mob/Unit data
To	CNRF N6 Data Warehouse	FTP	Pers/Billet/Mob/Unit data

For more details on the RHS application, including system statistics, interface statistics, and interface descriptions, see Appendix A.

5. Issues with the Current System

When the Cost Governance Model was completed by SSC NOLA staff in February of 2008, an ominous tone was set concerning the RHS application. According to the study, the RHS is at risk of being shutdown due to non-compliance with DoD and DoN Information Assurance requirements; a technical re-engineering must be completed within the next couple of years. Additionally, this study asserted that the RHS system is in jeopardy of a complete system failure due to age-related issues—such as the inability to get replacement hardware parts, the aging of the software, and the lack of experienced people to work on it (Robertson, 2008). The issues facing the RHS are complex. Thus, the focus of this section will be on issues concerning the system's underlying technology (including interfaces and processes), system support, architecture, and budgetary constraints.

6. Technology

In a Statement of Objectives document completed by the MPTE code N16 (Chief Information Officer), an Enterprise Data Environment (EDE) proof of concept pilot program was proposed (Navy MPTE, 2008). Within that document, requirements were described that must be met to ensure that migration to an EDE can be accomplished. These system requirements bring to light some deficiencies within the current MPTE environment that create issues for such a migration. In particular, some of these deficiencies can be attributed to the RHS itself. Some of these issues or deficiencies include:

- Identification of authoritative data has not been completed. This issue needs to be addressed regardless of whether the RHS application is re-written.
- Non-authoritative data has not been eliminated. This issue is related to the prior issue in that, once authoritative data is identified, by default, non-authoritative data is also identified. This issue is critical to address so that unnecessary data is not included in restructuring efforts and so that inefficiencies associated with storing, maintaining, and processing such data are eliminated.
- System documentation has not been kept up-to-date. This leads to several issues, including a lack of understanding of the current environment and an inability to trace its structure and functionality.
- Domain mission-critical processes have not been identified. Just as with the lack-of-documentation issue, without clear delineation of what the critical system functions are, change potential is limited.
- Data dictionary artifacts have not been identified. To understand how to improve the system, system owners must understand what the critical processes are and then identify the critical data that supports these processes. At the time of this writing, the author had made unsuccessful attempts to acquire a copy of system data dictionaries from the RHS system owners.
- Supporting system data elements have not been identified. This issue is associated with the multiple system interfaces that are maintained within the RHS. If system owners do not have a clear understanding and documentation of

system-to-system dependencies, data errors will continue when changes are made to either the RHS or interfaced systems.

- A defined change process has not been designed. As system owners do not clearly understand system dependencies, at present it is difficult (at best) for system designers to put in place any process that will coordinate changes among interfacing systems. This limitation creates an environment in which changes are made and placed into production. When problems arise, there are several possible courses of action: a successful firefight ensues that either repairs the interface, or the change is required to be backed out, or the system is reverted to its original state.

As discussed so far, the issues pointed out are of both a technical and procedural nature. Now, we will examine some of the specific technical challenges the RHS faces.

7. Interfaces

As with many major systems, the RHS system is composed of interfaces between systems that have different data structures. This complexity allows for mutually beneficial relationships for the associated business system owners and is necessary to conduct business and to comply with applicable regulations, among other benefits. The issue at hand is not in removing interfaces, which would have the effect of removing functionality and/or putting the system in a state of non-compliance; instead, the issue is that the RHS does not have the basic building blocks in place for it to continue conducting business long into the future. Many of the above-discussed problems are impacted by or impact the RHS. Namely, the data quality within the RHS is not as high it needs to be, nor are the processes and procedures for interfacing with other systems clean and clear enough.

8. Work-around Processing

Over the years, complex work-around logic has been built into the RHS so it can continue conducting business as usual. These business continuation processes have been necessitated by changes to the RHS and changes to the systems with which it interfaces. These changes include things such as the ability to accept new file formats from other systems, to create custom files that will be useable by receiving systems, and to deal with new security requirements. Much of the logic built into the application is complex and poorly documented. This poor documentation creates enormous risk for the health of the system going forward. If the programmers associated with many of these changes were to leave, support of the as-is system would become more complex. This problem is compounded by the fact that documentation is inadequate to be of use to any new programmers. However, since the RHS is confined to the constructs under which it was initially built, the problem of work-around process will be with the system until major re-engineering efforts begin.

9. Support

Production support for the RHS is becoming increasingly complex for many of the reasons already stated. Most of these support issues are due to the age of the system, the structure (architecture), the number of interfaces, and poor documentation. According to Captain Bill Carney, Commander Navy Reserve Forces Command (CNRFC) Deputy Chief Information Officer (N6a) (B. Carney, personal communication, December 17, 2008), and Kelly Bergeron, SSC NOLA RHS Technical Lead (K. Bergeron, personal communication, December 18, 2008), the key areas of concern regarding the support of the RHS are: maintenance, upgradability and system performance. These are common difficulties in systems as old as RHS. These experts further described how, over its lifetime, the application has incurred several modifications that have adversely affected performance, reliability, and accuracy. Additionally, the architecture is cluttered with excessive interfaces to other systems (each requiring code to be written and maintained) that have created difficulties in documenting the current state of the system. Adding to the system difficulties is the fact that many changes have been made hastily without proper documentation by the technicians who maintain them. Therefore, in the future, changes to the system will require extensive system experience due to its complexity and lack of documentation. This leads to another problem: a lack of trained professionals (both at SSC NOLA and in the IT industry at large) familiar with the older technologies upon which the RHS is built. In addition to the aforementioned support issues, the RHS suffers from funding issues that we will investigate next.

10. Cost/Funding/Acquisition Issues

One of the central issues concerning funding is that the RHS has only been funded at the Operations and Maintenance (OM&N) level for the past several years. The application has received no Research and Development (R&D) funding with which to improve its underlying architecture and explore feasible long-term solutions. Additionally, RDT&E funding has been put on hold until decision-makers resolve the Defense Integrated Military Human Resource System (DIMHRS). Also, OM&N funds have been at the minimum level to run the business for the past several years; only mission-critical functions are being supported. The following table—taken from the POM 10 PEO EIS briefing (Murphy, 2007)—shows the funding status of the RHS. Interestingly, for FY08 and FY09, only OM&N funding was approved for system support. However, this problem has been addressed in that for FY10 through FY13, both OM&N and RDT&E funding have been proposed for budget approval. The addition of RDT&E funding is to position RHS to be ready for migration to the DIMHRS. Tying the RDT&E funds to the migration effort creates an issue if the DIMHRS is not successful. These funds need to be approved regardless of what platform the RHS will eventually migrate to because if they are not, the problems that we have described in this chapter will only get worse.

Table 2. Funding for the RHS
(Murphy, 2007, slide 30)

APPN/LI/PE	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FYDP
PR-09 Baseline									
OMN	812	1000	0	0	0	0	0	0	1812
RDTE	0	0	0	0	0	0	0	0	0
OPN									
POM-10 Proposed									
OMN	874	998	1033	1069	1106	1145	611	632	7468
RDTE	0	0	1000	1250	1250	1000	0	0	4500
OPN									
Delta									
OMN	(62)	2	(1033)	(1069)	(1106)	(1145)	(611)	(632)	(5656)
RDTE	0	0	(1000)	(1250)	(1250)	(1000)	0	0	(4500)
OPN									

RHS is not the only system that is experiencing accelerating problems. We will now turn our attention to some of the other systems facing similar issues that need to be fixed for an eventual move to a more seamless Navy enterprise IT environment.

11. Other Systems to Keep in Mind

If changes to the RHS are to be successful, at minimum those applications within its functional area (Personnel-Authoritative Forces) must be studied to ensure that they will not only continue to operate together, but also will offer more robust functionality going forward. Agreed-upon standards will need to be communicated and met so the RHS will be able to seamlessly transition to the new state without disrupting its interfaces. Ultimately, the other applications within this functional domain—Navy Enlisted System (NES), Officer Personnel Information System (OPINS), Navy Standard Integrated Personnel System (NSIPS), and Inactive Manpower and Personnel Management Information System (IMAPMIS)—will need to undergo changes similar to the RHS to ensure future compatibility and greater functionality.

The following points taken directly from the POM 10 PEO EIS briefing (Murphy, 2007) highlight some of the issues facing the aforementioned systems and the associated consequences of not proactively addressing them. For clarity, PERSYS is comprised of NES, OPINS and NSIPS, as well as other smaller systems.

- Operational Risk (High): PERSYS has NO “in-Core” funding in FY10 and beyond. If the systems are shut down because of a lack of funding, Active Duty Navy personnel pay will be severely impacted, and the Navy will not be able to effectively manage its personnel.
- Future Challenges (High): Given the precarious state of readiness and the unparalleled efforts of the Navy in retaining more capable, more experienced, more technical workforce, reductions to PERSYS now or in the future across the FYDP will lead to critical failure. The resources allocated to PERSYS in future FYs must be restored. [R]ecent cuts will not only impair readiness and retention, but will impact the ability to support migration to the DIMHRS and to develop Navy-unique functionality that will not exist in the DIMHRS.
- Cons: If PERSYS is not funded, the systems will be shut down, and the Navy will be unable to pay, promote, and retire sailors. (Murphy, 2007)

This chapter has indicated that the RHS is not alone in the issues it faces. What is clear, however, is that any efforts to make the RHS better must be conducted in concert with other initiatives taking place within the Navy enterprise. Now that the current states of the IT systems relative to this study have been examined, the next chapter will address the proposed state of these systems, with particular emphasis on the RHS.

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III. Desired State of Information Systems

A. Department of Defense (DoD) Vision

> *Some believe that with the United States in the midst of a dangerous war on terrorism, now is not the time to transform our armed forces. I believe that the opposite is true. Now is precisely the time to make changes. The war on terrorism is a transformational event that cries out for us to rethink our activities, and to put that new thinking into action.*
>
> Secretary of Defense Donald H. Rumsfeld
> *Transformation Planning Guidance*, April 2003

The DoD is continuing with many facets of organizational transformation that the former Secretary of Defense described. This change is far reaching—to include operations related to conducting warfare, acquiring weapon systems, resourcing force structure, and designing business processes. In this chapter, the focus is on business processes and force structure as related specifically to Human Resources Management (HRM). It begins by examining the vision of the DoD in relation to HRM, followed by a discussion of how this vision is to be carried out within the Department of the Navy (DoN), and finally concludes with a discussion of how this vision will be carried out in relation to the Commander Navy Reserve Forces (CNRF) HRM system Reserve Headquarters Support (RHS).

1. Force Integration

Ultimately, the goal of the DoD—the defense of our nation—has remained constant over time. However, the nature of the environment has changed, necessitating a shift in culture and practice from a Cold War-oriented force to one that can better deal with the complexities of the current post-Cold War era. The Cold War organizational force structure can be described as a machine bureaucracy—an organizational configuration described by Henry Mintzberg. Machine bureaucracies are structured in a highly hierarchical fashion, as is the DoD. In the Post-Cold War environment, the effectiveness of this structure is questionable.

The nature of our nation's defense has changed due to the changing face of our real and potential adversaries. This shift has required that DoD components adopt more flexible structures that will enable stronger relationships between the DoD components. In relation to HRM, this shift can be seen in the following passage from an article concerning Global Force Management (GFM). "USJFCOM relies heavily on its Service components to coordinate with the Service headquarters and other combatant command Service components to track capabilities and forces in order to assess operational readiness, availability, commitment, and capability substitution options" (Ferriter & Burdon, 2007, p. 46). To enable this type of coordination efficiency, the DoD must transform the way it conducts its business. A large part of this transformation will be enabled by a re-tooling of its business processes. To this end, the DoD established the Business Transformation Agency (BTA) in October 2005 and announced its organizational structure in February 2006.

2. Business Applications and the Business Transformation Agency (BTA)

a. Defense Integrated Military Human Resource System (DIMHRS)

The BTA is tasked with transforming the business operations of an organization that employs three million personnel (uniformed and civilian) throughout the world into an organization that can meet the complex requirements of the current environment (OMB, 2009). As per the official BTA website (BTA, 2009c), the Transformation Priorities and Requirements–HRM Directorate serves as the primary link to the Office of the Undersecretary of Defense (Personnel and Readiness) (OUSD (P&R)). The primary products and guidelines produced by the BTA enabling HRM are the focus of the next section of this paper.

b. Business Transformation Agency Products

The DoD expects that ultimately, under the direction of the BTA, personnel-related IT-system issues will be resolved by implementing the Defense Integrated Military Human Resource System (DIMHRS). This solution will be phased in starting with the uniformed Armed Services, and will ultimately be utilized by all of the organizational components within the DoD. The military implementation is expected to benefit Service members and their families by "Integrating personnel and pay for all service members into a single system [that] will ensure they are paid accurately and on time" (ROA of the US, 2009). Further, "With a single record of service and integration across all uniformed services and Active, Reserve, and Guard Components, transfers between components and across the services will be seamless. The DIMHRS also will allow commanders to track personnel regardless of location or branch of service and ensure the right people are in the right place at the right time" (ROA of the US, 2009, p. 1). Finally, as the DIMHRS is a Web-based application, it follows that, "essential personnel records will be instantly available to human resources specialists, commanders, personnel and pay managers, and other authorized users" (ROA of the US, 2009, p. 1). This assertion assumes that connectivity issues will be mitigated.

3. Guidelines and Enablers to Achieve

Whether or not the DIMHRS is successfully completed and installed, the direction from the DoD remains the same: that its personnel systems must be upgraded to keep pace with changing operational requirements and technology. To meet these more general requirements as they relate specifically to HRM, the BTA (through the Transformation Priorities and Requirements–HRM Directorate) "ensures that the functional priorities and requirements of the client organizations, as well as those of the Services and Agencies, are accurately reflected in both the *Business Enterprise Architecture* (*BEA*), the *Enterprise Transition Plan* (*ETP*) and the guidance provided for business system investment review" (BTA, 2009c, p. 1). A short discussion of these elements follows.

a. *Business Enterprise Architecture* (*BEA*)

In March of 2009, the BTA released Version 6.0 of the *BEA*, which is a comprehensive guide for transforming the business practices of the DoD. The *BEA* provides high-level documentation and guidance for the enterprise on the theories and methodologies that are to be applied to ensure a successful transition. The *BEA* website contains, "a virtual 'Center of Excellence' and is a useful resource for people interested in developing architecture or understanding Service Oriented Architecture (SOA) and federation concepts" (BTA, 2009a, p. 1). For components and organizations that require transformation, such as the OUSD (P&R) and the Navy, the *BEA* is the ultimate source for the definition of requirements, guidelines, and procedures to which DoD agencies must adhere. Finally, "The *BEA* consists of a set of integrated architecture framework products that define operational activities, process data, information exchanges, business rules, system functions, system data exchanges, terms and linkages to laws, regulations and policies associated with the Department's business operations" (BTA, 2009a, p. 1).

b. *Enterprise Transition Plan* (*ETP*)

In conjunction with the *BEA*, the *ETP* provides greater granularity and guidance for the DoD and is the roadmap to be followed concerning the business enterprise architecture. According to the *ETP* website (BTA, 2009b), the following list defines the scope of this plan:

- The acquisition strategy for new systems that make up the target enterprise architecture,
- A listing of defense business legacy systems not expected to be part of the target environment (as of 2002),
- A list of the defense business legacy expected to be part of the target environment, and
- Time-phased milestones, performance metrics and a statement of the financial and non-financial resource needs. (2009b, p. 1)

The DIMHRS fits under the first bullet, while the next three bullets directly relate to the focus system of this paper, the Reserve Headquarters Support (RHS). In the ultimate vision of the future business enterprise, the RHS will not be included, as it will be subsumed by the DIMHRS. However, prior to meeting this goal, it will be important for the RHS owners to position the application for such a transition by modernizing. Therefore, it will be prudent and necessary for the RHS to follow the roadmap provided by the *ETP* to ensure a smooth transition. Figure 9 from the *ETP* gives a concise representation of how the DoD components are integrated within the enterprise. The RHS fits within the Navy component.

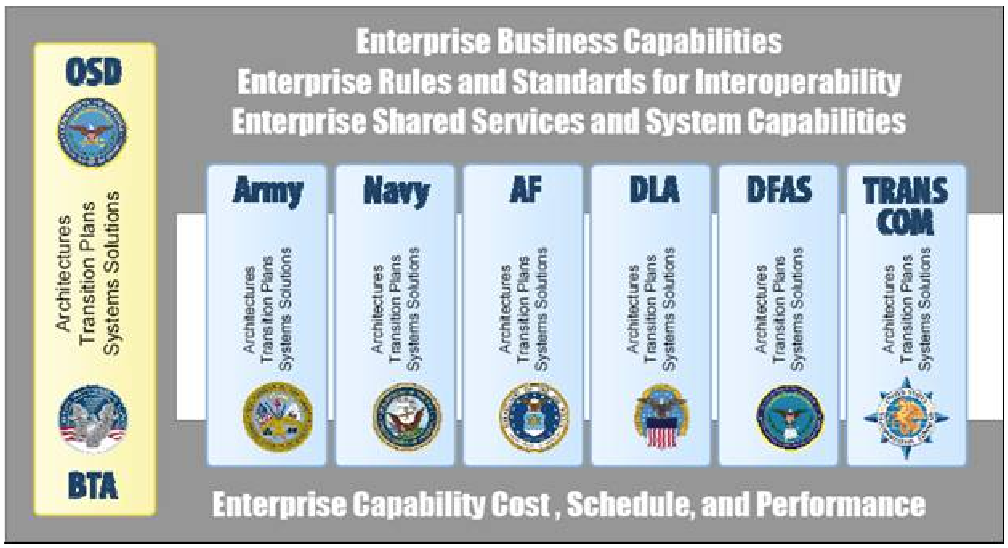

Figure 9. DoD Enterprise Capabilities by Component
(BTA, 2009e, p. 4)

Finally, the *ETP* is focusing on six business priorities to guide the DoD enterprise transformation—including Personnel Visibility (PV), Acquisition Visibility (AV), Common Supplier Engagement (CSE), Materiel Visibility (MV), Real Property Accountability (RPA), and Financial Visibility (FV). The focus of this paper is on PV—which, in the latest version of the *ETP* (September 2008), is described as "the fusion of accurate human resources (HR) information and secure, interoperable technology within the Human Resources Management (HRM) Core Business

Mission (CBM)" (BTA, 2009e, p. 35). As such, the DIMHRS falls under PV, and by default, so does the RHS.

c. Business System Investment Review Guidance

The final guidance from the BTA that this paper will explore is the Investment Review Board (IRB) Process. "The process is guided by the *BEA* and the *Enterprise Transition Plan* (*ETP*), which, along with related Component architectures and transition plans, provide an integrated view of business functions and a roadmap for more robust business capabilities" (BTA, 2009d, p. 1). Important to the transition of RHS is the fact that once the transition process is underway, it will be monitored for progress and compliance via an annual review. This review is applied to business systems that have no dedicated modernization funding. The RHS falls into this category because funding for modernization is being directed to the DIMHRS and not to systems that the DIMHRS will subsume. Figure 10 shows how the concepts described in this section (PV, the *BEA*, the *ETP*, and Business Investment Review) fit into the overall DoD enterprise plan.

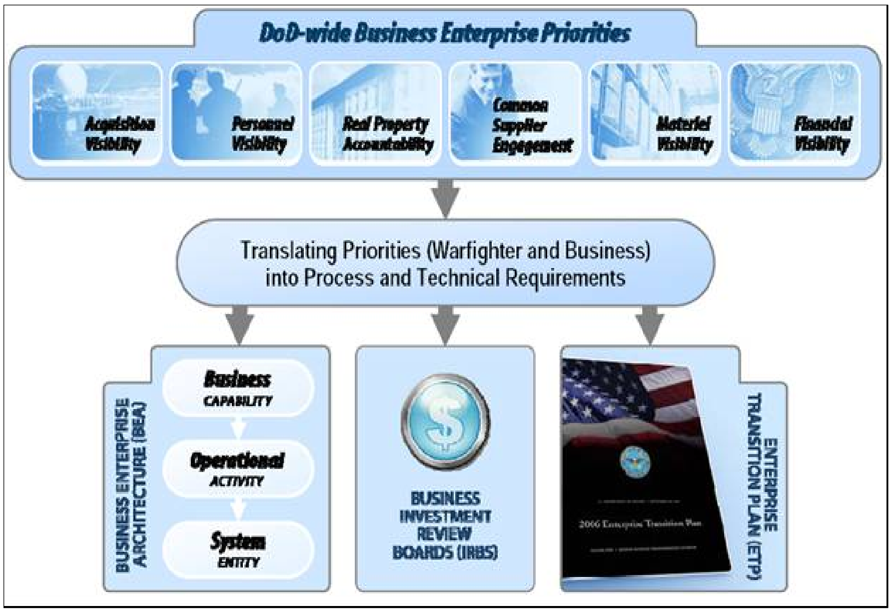

Figure 10. The Path to DoD-wide Business Agility and Information Visibility
(BTA, 2009d, p. 3)

Next, we will examine the OUSD (P&R) in relation to the initiatives it is working on in order to meet the goals of the BTA and the DoD.

4. Office of the Under Secretary of Defense—Personnel and Readiness (OUSD (P&R))

Within the OUSD (P&R), the Human Resource Management Enterprise Architecture (HRM EA) Division "coordinates the implementation of Department of Defense Architecture Framework (DoDAF) architecture methodologies to develop HRM business area architecture" (P&R IM, 2009, p. 1). Implementation efforts are conducted in concert with BTA efforts, and both efforts support one another. More precisely, the efforts of the OUSD (P&R) directly support the enterprise transformation efforts of the BTA described above. The following description from the OUSD (P&R) website further illustrates the ties between the BTA and the OUSD (P&R): the "HRM EA Division Chief acts as the advisor for HRM business architecture and the liaison for HRM Lines of Business capabilities and architecture efforts within DoD, coordinating the development of HRM architecture for the *Business Enterprise Architecture* (*BEA*)." Further, the "HRM Enterprise Architecture Division Chief provides authoritative interpretations of HRM federation and architecture integration issues within the DoD HRM community" (P&R IM, 2009, p. 1). This direction comes from the DoD level to the component level, and ultimately will drive and govern the re-engineering efforts of the RHS.

The Operational Vision (OV) of the HRM EA is depicted in Figure 11. This graphic gives a visual representation of the functions that are to be encompassed in any Human Resource IT application development. Specifically, these are the functions the DIMHRS must cover. As such, any development efforts short of or in support of the DIMHRS must be built with these functions or include a pertinent subset of them.

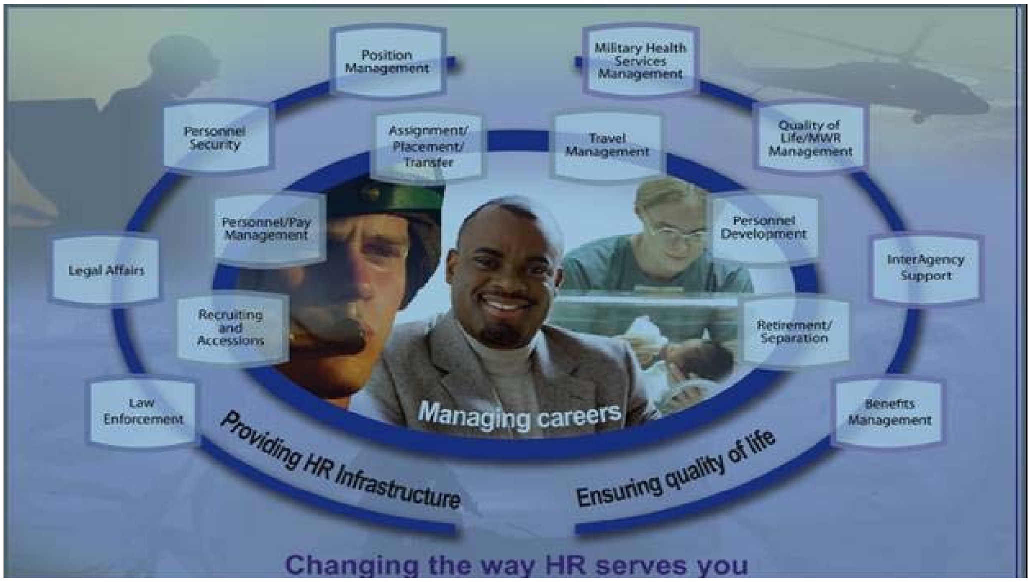

Figure 11. OV-1: DoD Personnel and Pay:
High-level Operational Concept Description
(DoN HCS, 2009a, p. 1)

B. Department of the Navy (DoN)

In line with the DoD strategy to implement the DIMHRS as the sole personnel and pay system used by the Department, the DoN has agreed to migrate to this solution in the future. The *Federal Computer Week* website summed up the progress for the migration as follows, “The Navy and Marine Corps will move to the Defense Integrated Military Human Resources Systems (DIMHRS) after all—but no one is sure when” (Miller, 2007, p. 1). Regardless of the outcome of DIMHRS implementation efforts, the “DoN is rapidly moving away from a vertical (command and control) model to a horizontal (connect and collaborate) model” (ASN (M&RA), 2009, p. 4). In regards to the complexities of transitioning from a vertical to a horizontal model, the following assessment was made in the DoN DIMHRS Concurrent Review:

> [T]here is still a long way to go. Our family of systems must be opened so as to include both DON civilian employees and contractors into our workforce planning processes. Many of our civilian employees and

> contractors are also reservists. The DON can no longer afford to maintain this data in stand-alone systems. To solve this problem, the department is establishing standards for content, accuracy, and interchangeability. These same standards are the method by which DON systems will become an integral part of a new *Defense Integrated Human Resource Management Information System*—all while meeting the objective of the Business Management Modernization Program (BMMP) to gain efficiency along the way. (ASN (M&RA), 2009, p. 4, emphasis in original)

The review further asserts that successful modernization will be enabled by "pursuing open system standards and data warehouse technology," with which the "DON will not only be able to meet the current joint and COCOM needs, but quickly adapt to future requirements as well" (ASN (M&RA, 2009, p. 4).

From the PEO EIS, Figure 12 depicts the DoN corollary to the DoD OV-1 shown in the prior section concerning the OUSD (P&R). It is shown here to logically illustrate the flow of requirements at the various levels within the DoD. The *Department of the Navy Human Capital Strategy* articulates the components of this high-level model as four Systems-focused Strategic Goals: Recruit/Access, Manage, Force Shaping, and Separate/Retire. Further, it explains, "All DoN activities involving people will be linked and aligned. The system must be transparent and permit people to move back and forth between components and workforce categories. Authority and accountability for the performance of the process will be vested in a process owner" (ASN (M&RA), 2004, p. 15).

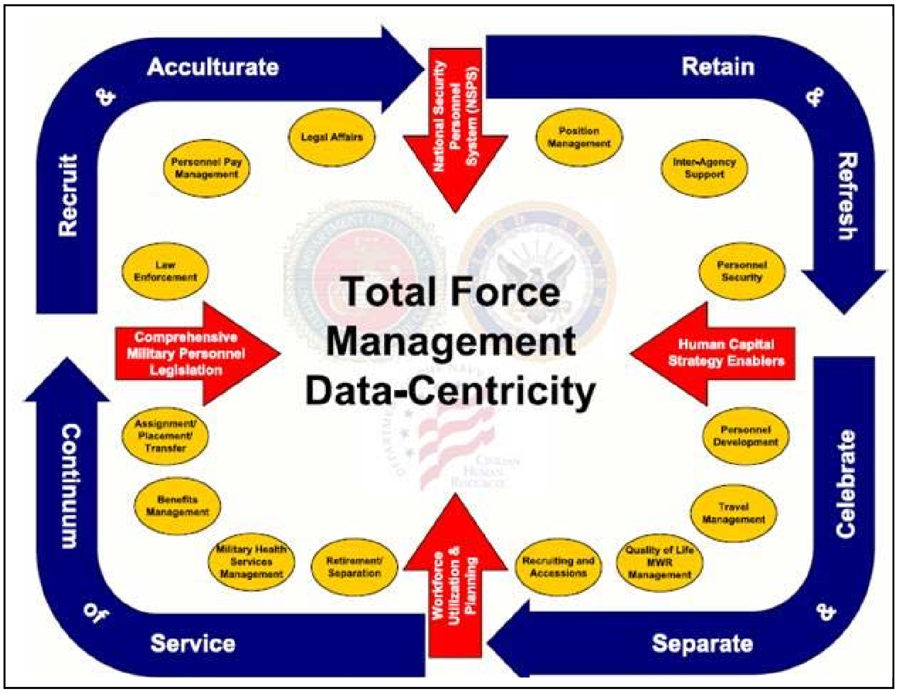

Figure 12. DoN HRM OV-1 in Support of DoD OV-1
(DoN HCS, 2009b)

Additional guidance is provided by the Force Management Oversight Council (FMOC) and is reflected in the *Department of the Navy Human Capital Strategy* of June 2004. In this document, the ASN (M&RA) describes the FMOC's requirement to create a Total Workforce Management (TWM) solution. TWM will "achieve an integrated personnel system of active and reserve military, civilians, contractors, and volunteers, and also [explain] how to provide portability and flexibility in utilization of all workforce members, as well as flexible career lengths and patterns of service for the military" (ASN (M&RA), 2004, p. 16). In addition to these DoN goals, Joint Force Management will also need to be met in the future, providing the same set of functions in a joint environment. All of these functions will need to be provided in a secure, Web-based, global environment—one that adheres to sound data standards to reduce redundancy and to leverage transparency and interoperability (DoN, 2005, May 3).

Going forward, DoN information systems—including those related to Human Resource Management (HRM)—are required to be fully integrated solutions within an open, Services-oriented Architecture (DoN FMOC, 2006). In addition to the aforementioned requirements, there has been a proposal by the Manpower, Personnel, Training and Education (MPTE) Chief Information Officer (CIO) code N16, to combine the data into one cleansed, metadata tagged, indexable and searchable Enterprise Data Environment (EDE) (Navy MPTE, 2008). This environment will resolve redundant storage issues, as well as eliminate outdated, end-of-lifecycle equipment and legacy infrastructure. Figure 13 depicts the vision of the Navy Program Executive Office (PEO) for Enterprise Information Systems (EIS) of how data from the current MPTE system will be mapped to the proposed future state of DoN HRM information systems.

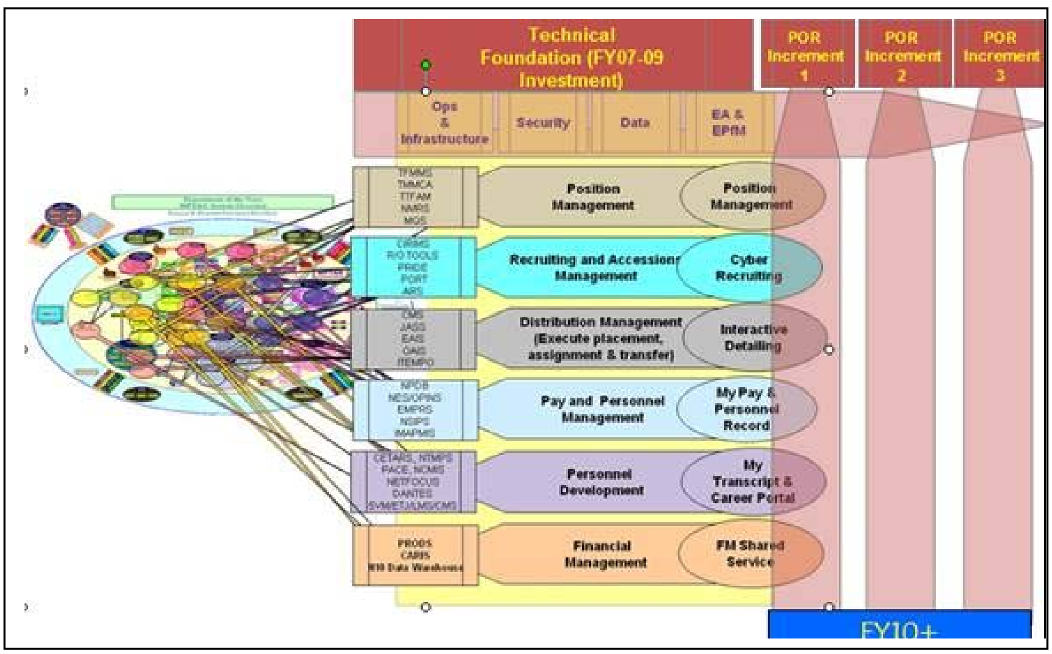

Figure 13. Future MPTE Information Technology System Structure
(Murphy, 2007, slide 10)

The vision painted in Figure 13 fits into the overall Chief of Navy Personnel (CNP) vision of the future enterprise, which is shown in Figure 14. Figure 14 illustrates the Data Management and Integration (DMI) matrix model. The DMI approach provides necessary control, information exchange, and efficiency of data operations. “To achieve this, data governance, data architecture, and data sharing—the ‘Three Pillars’ of data management—provide the framework for the operational focus of the DMI Roadmap” (Pavelec, 2008, p. 2). Within the matrix, the MPTE databases are represented in the orange cubes as the basis for the Enterprise Data Environment (EDE). It is to this new model that the RHS will be required to migrate.

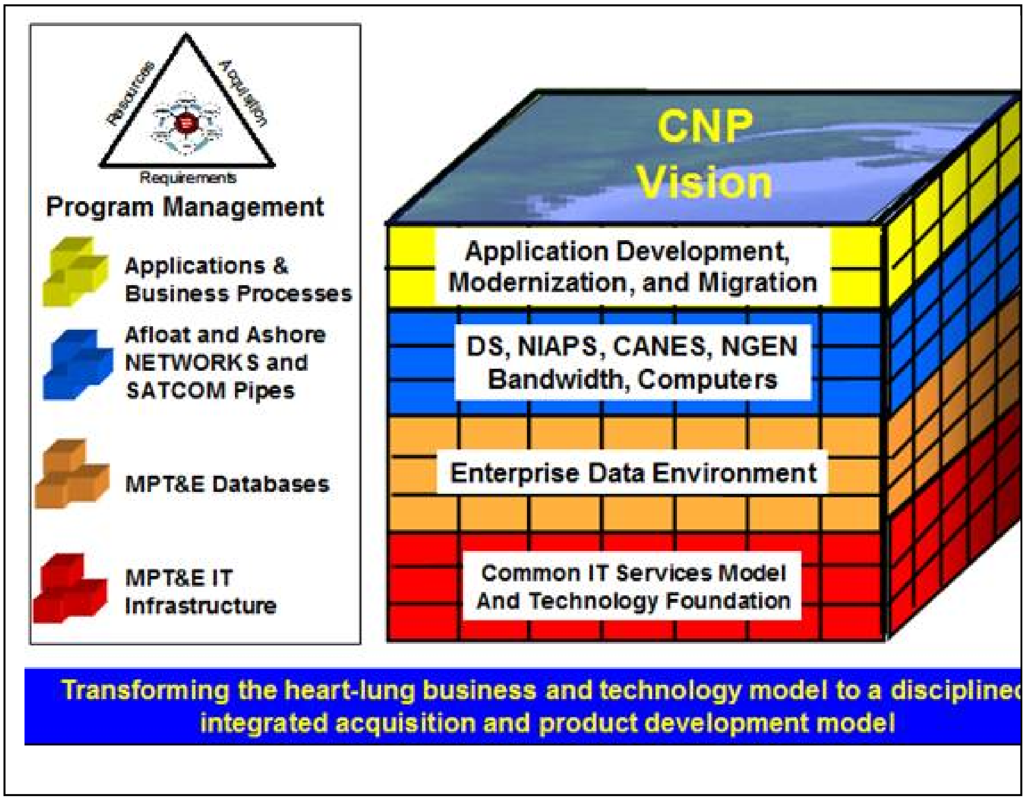

Figure 14. Chief of Navy Personnel (CNP) IT Vision
(Murphy, 2007, slide 10)

1. Enterprise Data Environment

In 2008, the MPTE CIO directed that an Enterprise Data Environment (EDE) proof-of-concept pilot project be executed by the Space and Naval Warfare Systems Command, New Orleans (SSC NOLA). In the Statement of Objectives, the PM for the project described the SSC NOLA’s objective this way: “an agile and trusted, fully integrated data environment that is built on a Services Oriented Architecture (SOA) to provide the foundation for net-centric data services to the enterprise” (Navy

MPTE, 2008, p. 1). Six specific objectives from the Statement of Objective relating to the EDE follow:

1. Develop an N1 (Navy Personnel) Enterprise Information Management (EIM) framework detailing management practices, governance, accountability, and metrics to drive data-quality improvement;
2. Facilitate the validation of the N1 EIM framework to determine if it is executable and repeatable;
3. Prove the adaptability and scalability of the SSC NOLA EDE;
4. Meet the OPNAV N6 (Deputy Chief of Navy Operations (CNO) Communication Networks) goals and objectives described below;
5. Integrate N1 data from legacy systems to a modern SOA-capable data store—providing a single source of clean, integrated, active and reserve manpower and personnel data;
6. Determine whether the EDE is a viable source for clean, authoritative data to support DIMHRS data migration. (2008, p. 1)

As of June of 2008, SSC NOLA staff assigned to the pilot project had successfully migrated MPTE data from the Navy Enlisted System (NES) and the Officer Personnel Information System (OPINS) to the EDE. Some benefits from the project are listed below. Their corresponding objective numbers from the Statement of Objectives are captured in parentheses:

- Successfully developed and implemented a data-integration strategy (2, 3, 4, 5),
- Defined data logic and business processes (1, 2, 3, 4), and
- Created authoritative documentation (1).

Successful completion of the EDE pilot project marked the first time that the Navy data environment demonstrated the use of "modern data engineering methods (e.g., SOA, metadata) to implement a system that satisfies the major challenges" of data management and migration (SSC NOLA, 2008, slide 18). In addition, the pilot data that was migrated was "clean, useable, authoritative, and up to date" (slide 18).

These results are in accord with the Navy's plan regarding its data management and the technologies used; these results also met with the objectives the MPTE CIO defined for the EDE pilot project.

Subsequent to the EDE pilot project and in support of the CNP Vision, SSC NOLA has been directed by the MPTE CIO to support the "migration of the Navy's legacy manpower and personnel information systems data and functionality into an EDE that offers secure, accurate, authoritative information" (SSC NOLA, 2009, p. 1). Additionally, SSC NOLA has proposed that the EDE solution be used as a way to position MPTE information systems for eventual migration to the DIMHRS, and that Navy-unique data (non-DIMHRS) be transferred as well. Further, SSC NOLA has proposed that the EDE be used as "the foundation for N1 IT legacy modernization—even if DIMHRS fails" (SSC NOLA, 2008, slide 16). Figures 15 and 16 depict the DIMHRS-alternative migration strategies designed by SSC NOLA. Figure 15 (direct solution) shows the direct transition of N1 (MPTE) legacy systems to the DIMHRS, while Figure 16 (EDE solution) depicts a transition to an EDE prior to migration to the DIMHRS. The direct solution would require "investment to develop and implement a data integration strategy, with solution architecture, to deliver capability," and both "Technical and functional governance risks apply" (SSC NOLA, 2008, slide 20). On the other hand, the EDE solution would benefit from the work completed and lessons learned on the EDE pilot project; in addition, the "Remaining N1 portfolio leverages component SOA architecture" (2008, slide 20). In this scenario, the technical risks of migrating directly to the DIMHRS would (according to SSC NOLA) be "dramatically mitigated" (2008, slide 20), while functional governance risks would still apply.

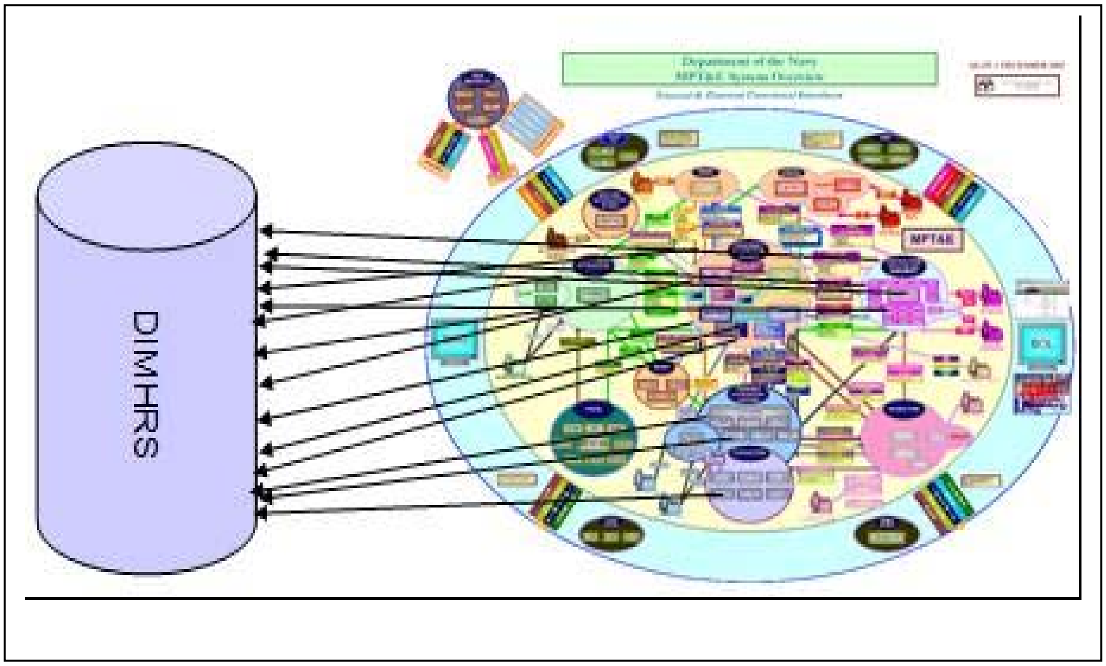

Figure 15. MPTE Transition Options—Move Directly to the DIMHRS
(After SSC NOLA, 2008, slide 20)

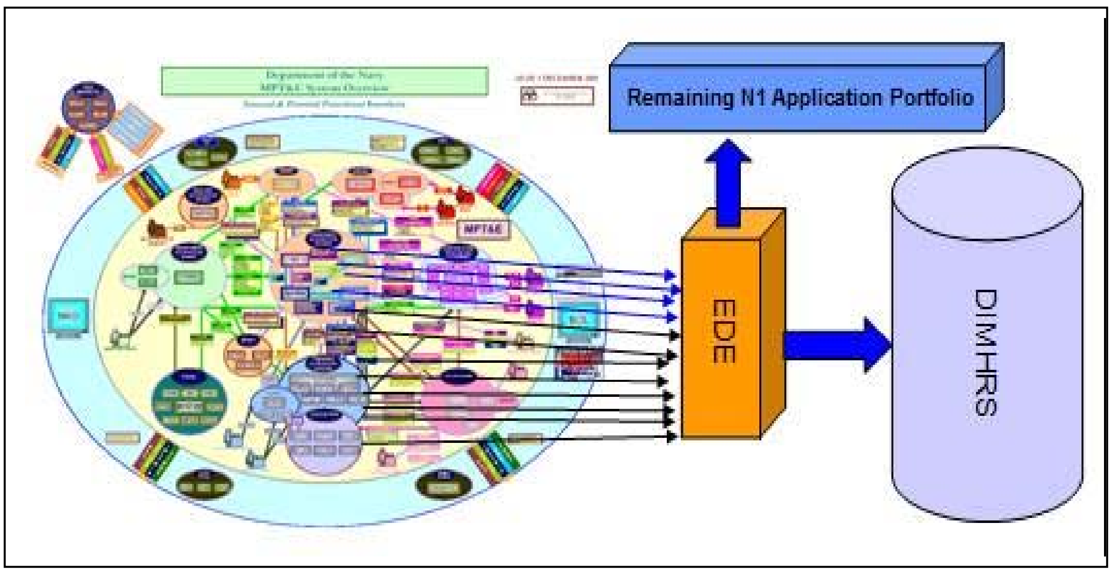

Figure 16. MPTE Transition Options—Move an EDE First
(After SSC NOLA, 2008, slide 20)

The resulting MPTE system diagram seen in Figure 16 would be significantly cleaner than the current state shown in Chapter I, Figure 1.

Finally, according to SSC NOLA, the EDE offers cost reductions of 30-50% below current systems costs in development and operating and maintenance (O&M) and also provides a more flexible system for less expensive and more efficient changes in the future. Currently, it appears that the SSC NOLA EDE is the most likely solution for RHS migration. The next section focuses on the desired state of the RHS.

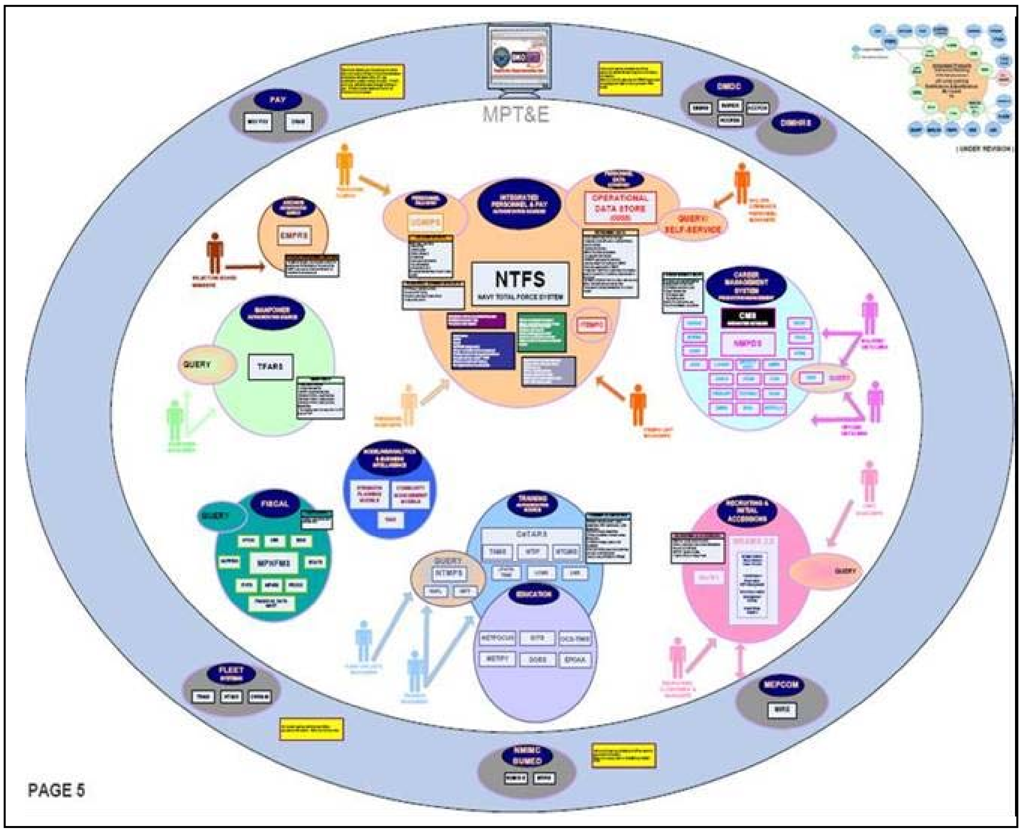

Figure 17. Desired/Future MPTE System Overview
(Murphy, 2007, slide 8)

C. Reserve Headquarters Support (RHS)—Desired State

In this section, we turn our attention to the focus system of this paper: the Reserve Headquarters Support (RHS). Here, the desired state of the RHS is defined from the perspective of the system owners, the Commander Navy Reserve Force Command (CNRFC) N1–Chief of Personnel, and the N6–Chief Information

Officer (CIO); however, we still recognize the desired IT system state of those higher Echelons discussed previously. CNRFC is fully aware of the shortcomings of the RHS as it exists today and is committed to creating a system that is modern, compliant and flexible. To this end, CNRFC (business owner of the RHS) requested that SSC NOLA (technical owner of the RHS) conduct a RHS technical re-engineering study in February of 2008. The primary objective of this study was to assess the cost to "Migrate the current RHS Application to a more modern technology and architecture. This includes hardware and software upgrades that are Navy and DoD Information Assurance Compliant. The cost proposal includes all of the work necessary to accomplish this objective" (Robertson, 2008, p. 11).

The study specified the following services, deliverables, and assumptions:

Services: (to be provided by SSC NOLA)

- Migrate the RHS application to a multi-tiered Java/Web-based architecture,
- Upgrade current database software,
- Re-write the current application, and
- Train personnel on the new system.

Deliverables:

- Completed set (baseline) of functional requirements implemented in the RHS application,
- Upgraded and re-designed set of software components,
- Upgraded database,
- Systems Security Authorization Agreement (SSAA), and
- Modernized development, test, and production environments—including hardware, software, and infrastructure.

Assumptions:

- No additional hardware, software, or licensing will need to be purchased beyond that already identified in this IPE.
- The new application will only contain existing system functionality.
- CNRFC will designate and assure availability of responsible and knowledgeable personnel, as scheduled in the project plan, to:
  - Review and approve system requirements,
  - Perform beta testing for each build,
  - Perform user acceptance testing, and
  - Support the production environment transition activities.
  - Implementation Training will be conducted by SSC NOLA personnel at SSC NOLA. (Robertson, 2008, p. 12)

Together, these services, deliverables and assumptions combine to create a list of requirements that will help CNRFC reach its desired state pertinent to the RHS. They define "what" the future system must do without dictating "how" to do it. This distinction is important, as it leaves the architectural possibilities wide open in regards to the system's eventual re-engineering. Also important to note is that only existing functionality is to be migrated to the new solution; such specificity may help to control the possible problems associated with migration. CNRFC desires that the technology underlying the RHS be updated so that it will work more efficiently, be compliant with DoD instructions, be interoperable with other DoD systems, and be readily upgradeable to meet future requirements.

1. How to Get to the Desired State

Figure 17 shows the MPTE CIO's perspective in regards to how the MPTE organization will look from a data-management standpoint. Of particular interest in this section is the role the RHS plays in this environment. It will be expected to be capable of fitting into the Shared Services portion of the Navy enterprise architecture by being accessible to other applications within the enterprise. As such, it will need to be compliant with the strategy, policies, data-management standards, reconciliation, and quality-assurance aspects of the Enterprise Information Management (EIM) strategy.

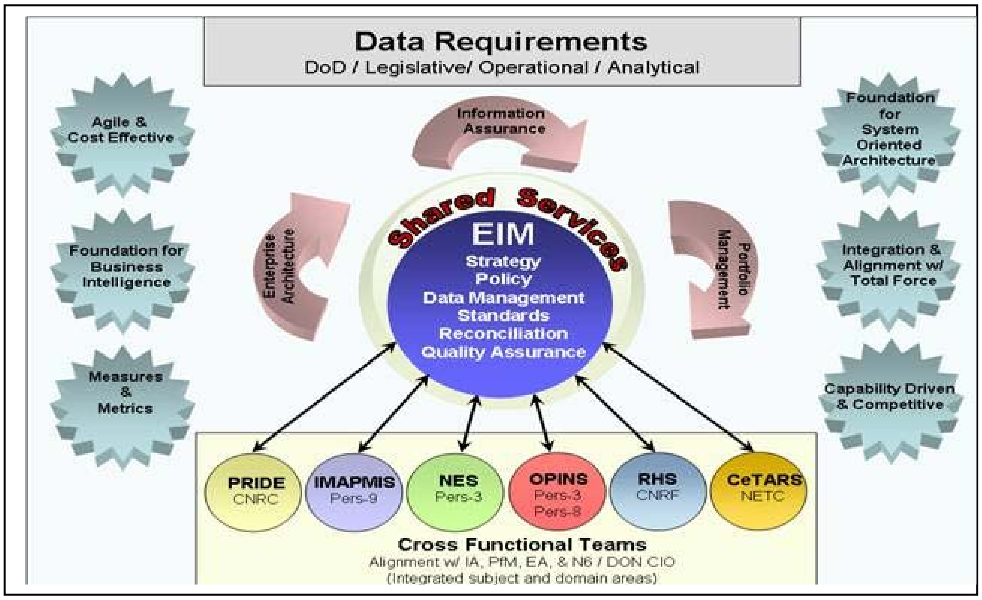

Figure 18. To-be MPTE Data Management Environment
(Pavelec, 2008, p. 4)

2. Architecture Possibilities

To reach this state, the Navy has decided to implement a Service-oriented Architecture (SOA), which is an architecture that is based upon a meshing of software services provided by different system owners. This type of architecture does not rely on hard-coded calls to other systems; instead, the services offered by an organization are published, and organizations seeking the kind of service offered can pull the information from the published services they desire. The following description of an SOA provided by the Naval Network Warfare Command is instructive.

> FORCEnet requires a service-oriented architecture based on several principles. First, any node can establish a presence on the network through which it can post the nature and location of its services and information. Second, others can easily find that node through

> accessible addressing. Third, others can then access the information and services they require, subject to necessary restrictions. Nodes will generally gain access to information and services by subscribing to them. In this way, decision makers choose, or "pull," the information they need for their decision-making. This general "pull" approach should be balanced by intelligent "push," whereby decision makers receive exceptional information they have not requested but which is deemed by some authority to be important to them. (2009a, p. 11)

From the RHS re-engineering project discussed previously, CNRFC proposes to meet this state by making the RHS a Web-based application. By doing so, the RHS will be accessible to other enterprise applications that are also Web-based—thereby making itself accessible within an enterprise SOA. Figure 18 depicts the organization of the MPTE EIM concept, wherein the RHS would reside in Echelon III as part of the Pay & Personnel service governed by Echelons I and II.

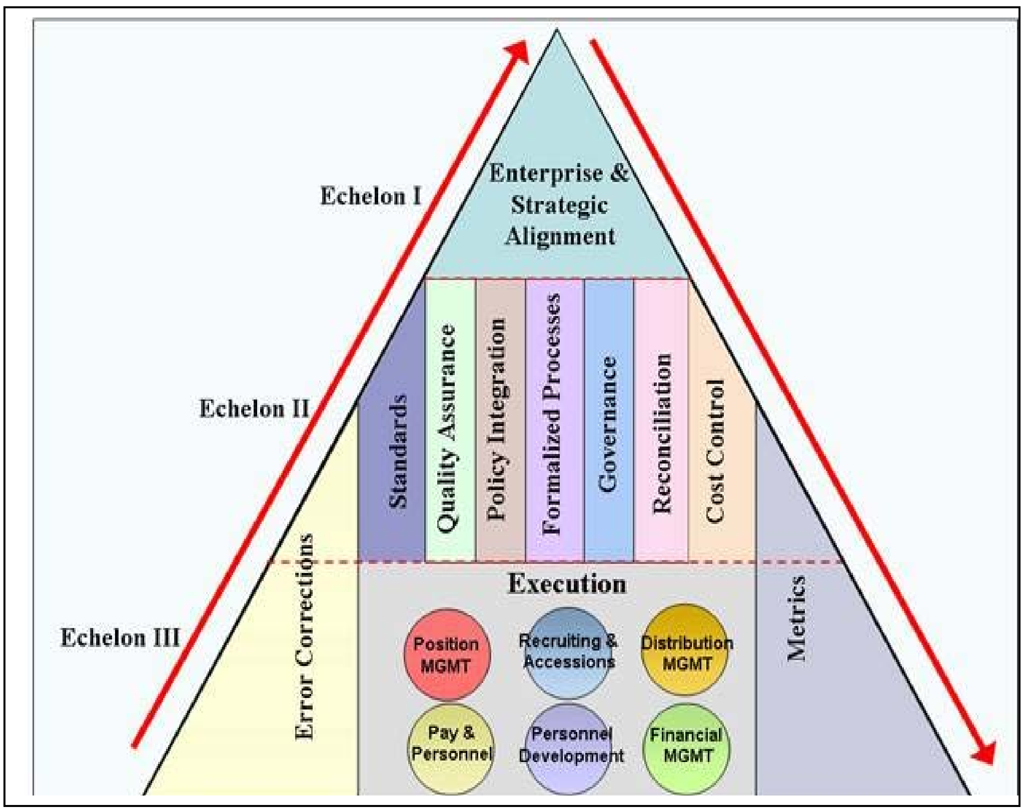

Figure 19. Enterprise Information Management (EIM) Organization for MPTE
(Pavelec, n.d., slide 8)

In conjunction with the above-stated services, deliverables, and assumptions defined by CNRFC, the following guidance from the MPTE CIO further defines the requirements for which the RHS will be responsible:

- Integration with cross-functional domain areas,
- Data, metadata management and semantic reconciliation,
- Data integration across the IT portfolio, including:
  - Systems/Apps (SOA)
  - IA
- Provision of unify-able and converge-able content, and
- Ability to meet with governance:
  - Standards
  - Cost control
  - Enterprise and strategic alignment.

Combining all of the elements of the re-engineering project and the above guidance from the MPTE CIO, a workable list of requirements can be pieced together that defines the desired state of the RHS. This requirements list will be in accordance with the direction set forth by the DoD and further refined by the DoN; it will also ensure that the RHS becomes a more useable application both now and into the future.

3. Acquisition/Development Method

Table 3, taken from the PEO EIS (Murphy, 2007, slide 30), shows the current funding level (baseline) and the proposed funding level of the RHS. Currently, only the system's Operation Maintenance Navy (OMN) is funded. Clearly, CNRFC cannot provide the desired level of service with the current level of funding. Even the proposed funding level—which shows OMN continuation, along with proposed Research Development Training and Education (RDT&E) funding—by itself is inadequate to meet the envisioned future state of the RHS.

Table 3. Reserve Headquarters Support (RHS) Funding and Proposed Changes
(Murphy, 2007, slide 30)
(*figures in thousands)

APPN/LI/PE	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FYDP
PR-09 Baseline									
OMN	812	1000	0	0	0	0	0	0	1812
RDTE	0	0	0	0	0	0	0	0	0
OPN									
POM-10 Proposed									
OMN	874	998	1033	1069	1106	1145	611	632	7468
RDTE	0	0	1000	1250	1250	1000	0	0	4500
OPN									
Delta									
OMN	(62)	2	(1033)	(1069)	(1106)	(1145)	(611)	(632)	(5656)
RDTE	0	0	(1000)	(1250)	(1250)	(1000)	0	0	(4500)
OPN									

Funding-level estimates taken from the RHS Cost Governance Model (Robertson, 2008) are shown in Figure 20 and put the cost of the effort at over $13 million in RDT&E funding alone, versus the $4.5 million proposed in the PEO EIS plan.

14. Estimated Cost: The estimated cost for the RHS Technical Re-engineering

Application Software Development	$ 12,922,547
Database & App/Web Server Setup & Config	$ 30,000
Implementation and Training	$ 30,000
Software and Licensing	$ 50,000
Security	$ 54,000
TOTAL RDT&E	**$ 13,086,547**

Figure 20. SSC NOLA Estimate to Re-engineer RHS
(Robertson, 2008, p. 12)

To meet the proposed desired state of the RHS, decision-makers must draft a realistic funding estimate. The estimates of both the PEO EIS and SSC NOLA need to be considered. Thus, possible research could be conducted reconciling these estimates and using them as baselines from which to draft an estimate. The estimate must recognize the requirements for the functionality of the system (described herein), along with the timing of the execution of the proposed funding. Additionally, funding that has been appropriated for the migration of Navy data to the DIMHRS should be studied to determine if any of those funds would be more appropriately directed towards the efforts of re-engineering the RHS. By re-programming the RHS DIMHRS funding to RDT&E and Other Procurement Navy (OPN) for the RHS, CNRFC will assume control over re-engineering efforts. It would then be able to move the RHS to an EDE regardless of the future platform (DIMHRS included). This solution would enable the RHS to attain the desired state and make it possible for the system to be integrated more readily at a later date by the DIMHRS, or by any other SOA-based product.

As discussed earlier, SSC NOLA has demonstrated the ability to transfer application data to an EDE. The next step is to ensure the appropriate stakeholders: 1) create a transfer plan that includes a prioritized list of systems to migrate to the EDE, and then 2) execute the plan. If this happens, programs will be funded for migration based upon their priority level. This process will allow for incremental gains towards an overall enterprise solution.

In this chapter, the desired state of information systems has been described from the DoD organizational level down to the RHS system level. Challenges associated with creating the desired state for the RHS have been described in terms of technical, personnel, and acquisition hurdles. In the next chapter, solutions will be proposed to overcome them.

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IV. Proposed Way Forward and Associated Costs

To this point, this research has focused on describing known or verifiable facts about the information technology systems related to Human Resource Management (HRM) within the Department of Defense (DoD). The current state and desired states of the pertinent IT systems and their associated business processes have been described. In this chapter, focus will shift to examining philosophies, tools, and techniques that can be used to transition current systems to desired end-states. To begin, the DoD will be examined, and essential elements that need to be in place at this level for downstream systems to be successfully implemented will be discussed. Focus will then shift to examining how the Department of the Navy (DoN) can further enable successful transformation of its IT assets in support of the DoD. Next, the Reserve Headquarters Support system (RHS) will be studied to determine the steps that will need to be taken to ensure its future success within the business application portfolio of the Navy and DoD. Finally, costs associated with three alternative states of the RHS will be discussed.

A. Department of Defense

Chapter II described IT systems and business processes within the DoD as being highly partitioned and poorly suited to support cross-organizational business practices and processes. In particular, efficient and effective utilization of human assets has proven to be difficult in a joint organization environment. Chapter III then described the desired state of business process IT applications that would rectify many of the current shortcomings. In fact, much progress has been made to this end. A great deal of guidance has been forwarded to the DoD from Congress describing what DoD-related IT systems must be able to do and, in some cases, the necessary steps to do it. Although this type of guidance has been in place long before 2005, this year is important because it marked the creation of the Business Transformation Agency (BTA). Through the BTA, the guidelines and rules provided by Congress have been codified and institutionalized in the form of the *Business*

Enterprise Architecture (*BEA*), the *Enterprise Transition Plan* (*ETP*), and the Business Investment Review Boards (IRBS). These tools provide a starting point and reference material for all entities that operate within the DoD that are engaged in transition-type projects. In the following paragraphs, some ideas on how to increase the likelihood of successful implementation of the BTA's vision are discussed.

1. Building a Foundation for Execution

In their research, Ross, Weill, and Robertson studied hundreds of companies that have experience in implementing enterprise architectures. They found that the companies that were the most successful in this endeavor followed some common practices. These findings form the basis for their assertion that to successfully execute business strategies through IT solutions, companies must master the three following disciplines.

(1) They must establish and use an operating model. This is highly important to this study, as "it forces a common understanding of data across diverse business units" (Ross, Weill & Robertson, 2006, p. 8). This commonality is ultimately what the RHS, the Navy, and the DoD would like to achieve. The operating model describes the amount of process integration necessary within an organization to successfully deliver services to the customer. (More on this is described in the following section, choosing an operating model.)

(2) Implement and use enterprise architecture. Ross et al. (2006) explain that, "The *enterprise architecture* is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the company's operating model" (p. 9). Further, an enterprise architecture enables individual projects to "build capabilities—not just fill immediate needs" (p. 9). This step ties the operating model to the IT systems of the organization.

(3) Develop and use an IT engagement model. An engagement model presents the rules established by the organization's headquarters that must be followed by subordinate business units. The IT engagement model is where an

organization's internal and external regulations, technical standards, development and implementation standards are addressed.

Why is building a foundation for execution important to the DoD? First, Ross et al. (2006) explain that companies that have a solid foundation have proven to be more efficient and flexible to shifting customer demands—which are common within the DoD. This is followed by the assessment that as a company increases in size and its IT systems become more complex, those systems run the risk of becoming inflexible—thus creating a situation in which changes to the system "becomes a risky, expensive adventure" (p. 11). Examples of this danger are numerous in the DoD; the RHS is one such example. A strong foundation for execution helps to alleviate these negative effects by providing the organization with a scalable foundation. Additionally, a solid foundation leads to more readily shareable data, giving the organization the flexibility needed to adjust to new requirements and regulations. This is one of the primary goals of the BTA, as it works to implement enterprise architecture at the DoD level and to incorporate subordinate organizations' business IT functions. Finally, as the foundation matures, business processes become more efficient, and IT costs are lowered.

2. Choosing an Operating Model and Implementing the IT Engagement Model

In their book, *Enterprise Architecture as Strategy*, Ross et al. (2006) present four possible operating models from which organizations could choose. This decision should be based upon the models' fit to their organization's business model. The models contain four quadrants based upon two axes: vertical axis determines business process integration, and horizontal axis corresponds to business process standardization. Ross et al. describe integration as linking "the organizational units through shared data" (2006, p. 27). Likewise, they identify standardization as "defining exactly how a process will be executed regardless of who is performing the process" (p. 27). The four quadrants are based upon where in the spectrum an organization lies regarding these two metrics—either low or high.

Table 4 shows the four types of operating models and their associated characteristics.

Table 4. Four Operating Models
(After Ross et al., 2006, p. 29)

Integration	Standardization: Low	Standardization: High
High	**Coordination** - Shared customers - Impacts other business unit transactions - Operationally unique business units - Autonomous business management - Bus. unit control over process design - Shared customer data - Consensus processes for IT infrastructure services; IT app. decisions made in Bus. units	**Unification** - Customers and suppliers local or global - Globally integrated business processes - Business units w/ similar or overlapping operations - Centralized management applies functional/process unit matrices - High-level process owners design standard processes - Centrally mandated databases - IT decisions made centrally
Low	**Diversification** - Few shared customers - Independent transactions - Operationally unique business units - Autonomous Bus. Mgmt. - Business unit control over processes - Few data standards - Most IT decisions made w/in business units	**Replication** - Few shared customers - Transactions aggregated at high level - Operationally similar business units - Business unit leaders w/ limited process control - Central control over business process design - Standard data definitions with locally owned data and some aggregation - Centrally mandated IT services

The BTA has somewhat defined the type of operating model for the human resource management (HRM) business function of the DoD as Unification. This is based upon the fact that the DIMHRS is the proposed sole solution for the human resource function of the DoD—incorporating a high degree of both cross-organizational business-process standardization and process integration. Whether this is the appropriate choice or not is debatable and will be revisited later in this study. For now, it will be assumed that the unification operating model is a better option than the current diversification operating model (which is typified by low process standardization and integration), and is the proper choice to enable the transition from the current state of DoD IT-related business systems to the desired end-state. The DoD has focused considerable attention on the development of an IT Engagement Model—a necessary component to creating a foundation for successful execution. As discussed in the opening paragraph of this section, the *BEA*, *ETP*, and the IRB form the library of guidance and standards under which the DoD will continue its IT systems transformation efforts. In the next section, attention is turned to the next step in creating a foundation for execution: implementing the operating model through enterprise architecture.

3. Implementing the Enterprise Architecture

Step two of building a foundation for execution is to implement the enterprise architecture based upon the selected operating model, as the process is different for all four models. As the DoD has adopted the unification operating model, the enterprise architecture diagram would be similar to that depicted in Figure 21.

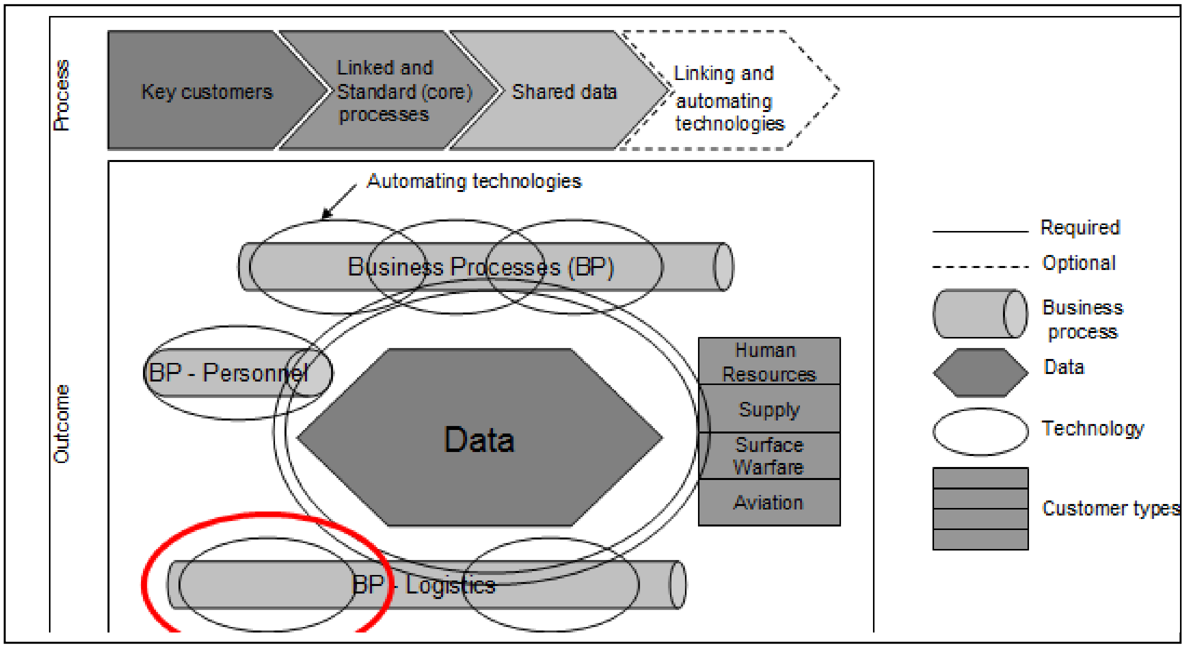

Figure 21. Unification Model EA Diagram
(After Ross et al., 2006)

This diagram represents the structure that a successful implementation of the DoD's chosen operating model could take. In the diagram, there are relatively few business processes shown, reflecting the high standardization associated with the coordination model. For example, the long cylinder (business process) at the bottom of the diagram would be a close approximation of the DIMHRS, in which all DoD personnel and pay systems would be standardized and integrated with organizational data via technology. The diagram also accounts for small amounts of business-unit-specific functionality, as can be seen by the non-enterprise-connected technology loop highlighted in red in the diagram.

4. DoD Stage of EA Maturity

As an organization decides to adopt an enterprise architecture, Ross et al. (2006) explain that it will progress through four stages of maturity. Although it is not necessary to reach level four, it is necessary to proceed from the lower levels of maturity before attaining higher levels. In other words, stages cannot be skipped. Per the Ross et al. text (2006), the four stages of maturity and a brief description of the associated architectures follow.

1. *Business Silos*: Individual business and functional units' needs are maximized.
2. *Standardized Technology*: Technology standardization increases efficiencies, and technology management is generally centralized.
3. *Optimized Core*: An optimized core provides all company business units with organization-wide data and process standardization.
4. *Business Modularity*: Business process components are available for reuse and preserve organizational standards while enabling local differences.

Currently, as described in the previous chapter, the DoD via the BTA is seeking to eventually progress through all of the levels of maturity. It is clear that the BTA has correctly assessed the DoD's current level of maturity as falling within the Business Silo stage. What is not clear is whether the guidance they have issued leads to Stage Two (Standardized Technology) or Three (Optimized Core). In order to be successful in instituting an organization-wide EA to reach the desired state of IT systems, guidance from the BTA must clearly be directed to achieving Stage Two maturities before progressing to Stage Three. This is due to the fact that each stage implements building blocks that will be built upon by successor stages. The progression through the stages is similar to the construction of a building—a roof cannot be applied until after the walls have been erected.

5. Application within the Department of Defense

By incorporating the elements discussed above (the operating model, enterprise architecture, and IT engagement model), the DoD will not only be able to transition its own business processes and supporting IT systems, it will also provide a roadmap for its subordinate organizations to follow. In addition, it will provide concrete direction for subordinate organizations on how to modernize all levels of the organization by codifying the steps to do so. In the research conducted for this paper, the author has found that the BTA has made progress towards mastering, articulating, and implementing these disciplines. In the case of the DIMHRS, an operating model has been chosen (Unification); copious IT engagement guidance has been published, and progress has been made in incorporating an enterprise architecture.

B. Department of the Navy

In this chapter, methodologies to transform the information technology (IT) systems of an organization have been described drawing heavily from the Ross et al. (2006) text. The steps to do so include creating a foundation for execution, selecting an operating model, implementing the operating model via enterprise architecture (EA), and developing an IT engagement model. These steps were then applied to the DoD and to the steps the BTA has taken to proceed from the current state of DoD systems to the desired state of IT systems, with particular emphasis placed on the human resource application, the DIMHRS. In this section, attention turns to the Department of the Navy (DoN) and the steps it must take to reach its desired state of IT systems. Particular attention will be placed on the operating model, enterprise architecture, and the IT engagement model. Finally, an assessment will be made regarding the decisions the DoN must make to be successful in transforming its business IT processes and systems.

1. The DoN Operating and IT Engagement Models

> [I]f all forces and organizations down to the level of individual entities are interconnected in a networked, collaborative command and control environment, then all operations and activities can enjoy the benefits of decentralization—initiative, adaptability and increased tempo—without sacrificing the coordination or unity of effort typically associated with centralization. (NETWARCOM, 2009a, p. 1)

The above passage from the Naval Network Warfare Command's (NETWARCOM) FORCEnet concept paper seems to clearly indicate that the Navy has chosen to implement a coordination operating model. It describes an environment in which IT systems are highly networked and integrated, while business process decision authority is maintained at the sub-organizational level. To help illustrate, the coordination quadrant (Table 5) taken from Table 4 shows operationally unique business units controlling process design while leveraging shared customer data.

Table 5. Coordination Quadrant from the Four Operating Models Table—Table 4

Coordination
- Shared customers - Impacts other business unit transactions - Operationally unique business units - Autonomous business management - Bus. unit control over process design - Shared customer data - Consensus processes for IT infrastructure services; IT app. decisions made in Bus. units

It is interesting to note that this choice of operating model differs from that of the DoD, which has chosen the unification model. This differing choice by a subordinate organization should not cause alarm; the Ross et al. (2006) text explains, “Having different operating models at different organizational levels allows” an organization “to meet the multiple objectives of large, complex companies while keeping organizational design reasonably simple at the individual operating company level” (2006, p. 40). The author would argue that it makes more sense for the DoN to apply the coordination model than the unification model for the following reasons:

- Easier to implement, because it minimizes changes to business applications.

- Allows the organization to focus on increasing IT system integration.
- Enables continued use of legacy business applications that were customized to address the particular needs of the organization and its customers.

These are just a few of many potential examples of why selection of the coordination operating model should enable the DoN to complete the transition from its current state of IT systems to the desired state. The effects of this choice on personnel systems will be examined from a Commander Navy Reserve Forces (CNRF) perspective in a later section.

a. IT Engagement Model

For the Navy, the IT engagement model has been given careful consideration, as is evident from the following passage from the NETWARCOM:

> To support standards and policy compliancy, organizations developing [Department of Defense Architecture Framework] DoDAF architecture products will receive guidance from the FORCEnet Integrated Architecture for development of architectures for their [Program of Record] POR as required to support the Joint Capabilities Integration and Development System (JCIDS) documents or for other purposes. (NETWARCOM, 2009b, p. 1)

Further, Figure 22 illustrates the organizational structure that will be utilized to ensure compliance with the IT engagement model. Combined, this corporate-level guidance, along with supporting guidance from the DoD, should be ample to guide the DoN through the transformation of its business IT systems.

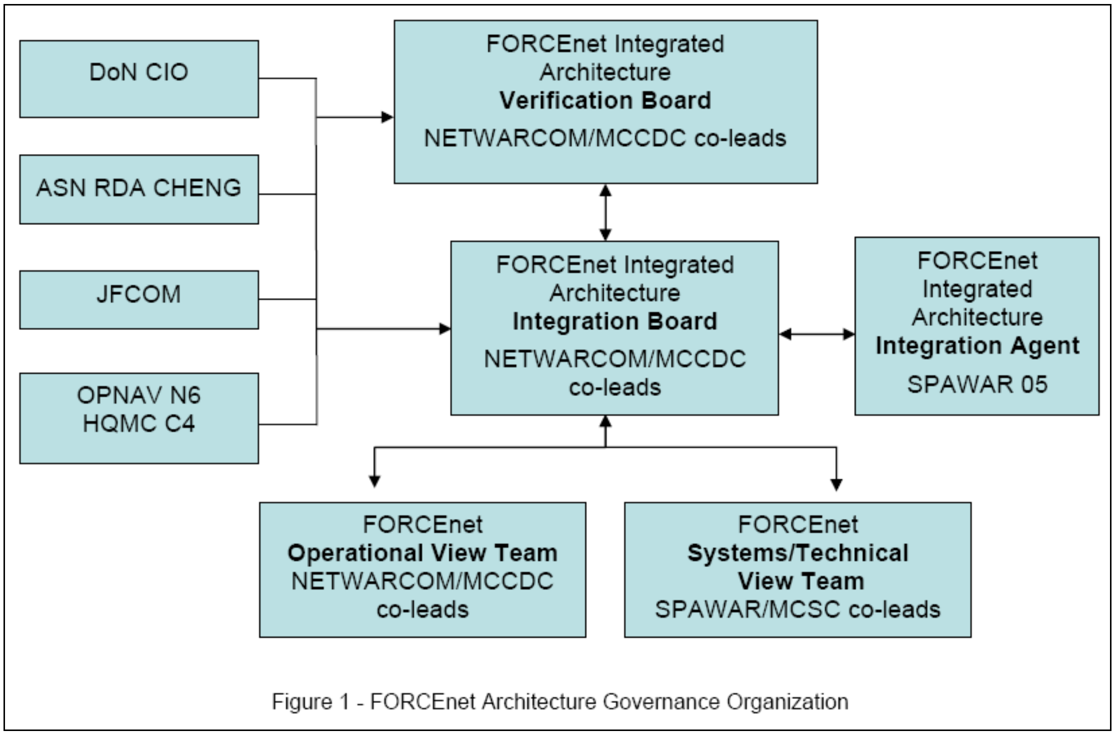

Figure 22. Navy IT Governance
(NETWARCOM, 2009b, p. 2)

2. Implementing the Enterprise Architecture

As discussed, the DoN has chosen to install a coordination operating model; thus, it must build an enterprise architecture (EA) specifically tailored to support this choice. Figure 23 shows the basic design of such an architecture. Notice that the arrows at the top of the diagram focus on shared customers and data, integrated technology and linked processes. This differs from the unification model, most notably in the area of customers (key v. shared) and process standardization. Again, it is not a problem to utilize different operating models at different levels of the organizations, and integration of different operating models is possible. In the case of integrating the DoN operating model into the DoD architecture, the DoN architecture would be treated as a customer within the DoD architecture. This would still allow the DoD to meet its goal of providing department-level data to the entire organization while allowing the DoN to build an EA that meets its individual business needs.

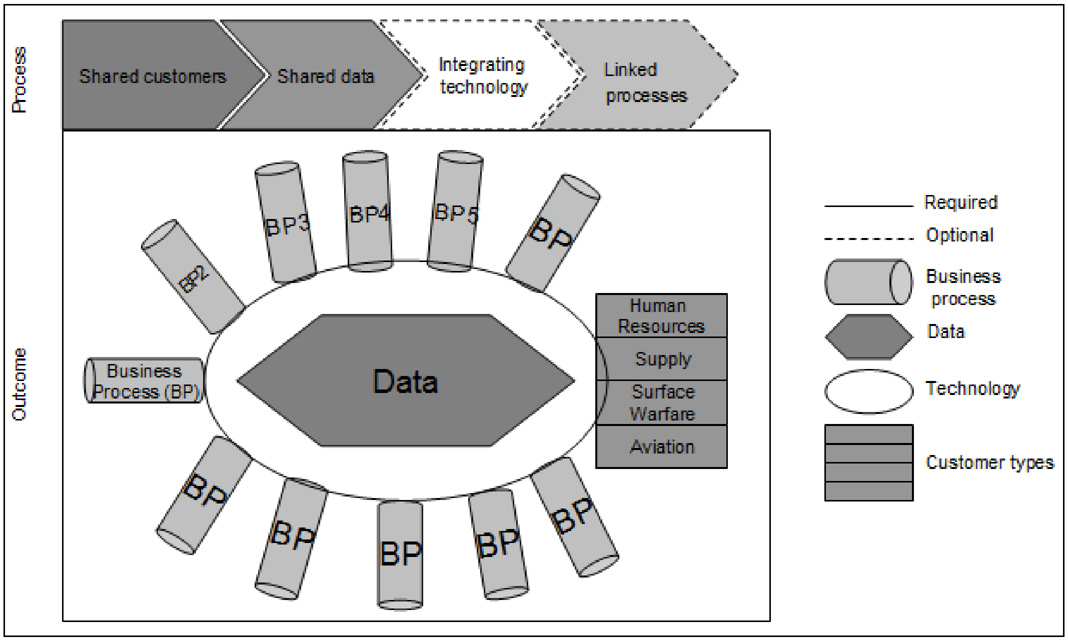

Figure 23. Coordination EA diagram
(After Ross et al., 2006)

3. DoN Stage of EA Maturity

Similar to the DoD, the DoN is currently in the first stage of the maturity model (business silos) and is working towards achieving Stage Two (standardized technology). In the author's view, the Navy has a clear understanding of where it stands in regards to EA maturity. Evidence to support this position includes the realization that it has no existing EA and has addressed the building of one via FORCEnet. "The FORCEnet Integrated Architecture is the first naval enterprise level architecture that will guide multiple programs of record (POR)" (NETWARCOM, 2009a, p. 1). Additionally, the selection of the coordination operating model reflects that the DoN has a keen sense of self-awareness, as this model is a better fit for organizations working to reach the standardized technology stage. Indeed, the coordination operating model by definition assumes that an organization has already met Stage Two maturity because the distinguishing factor of Stage Three (optimized core) is the focus placed upon process standardization. This is not to say that organizations in Stage Two can not position themselves for progression to Stage

Three, but as Ross et al. (2006) tell us, stages in the EA maturity model can't be skipped. "In several of the companies we spoke to, ERP implementations that tried to skip stages had to be halted or scaled back" (Ross et al., 2006, p. 82). Next, we will turn our attention to the CNRF and the Reserve Headquarters Support (RHS) system, and the steps of transitioning it to its desired state.

C. Reserve Headquarters Support (RHS)

In this section, we focus on the Reserve Headquarters Support (RHS) system. As the RHS is a subordinate system, and the CNRFC is a subordinate organization to the DoN and DoD, the latitude in choosing the elements to build a foundation for business execution is constrained by the parent organizations' choices. In other words, the RHS's operating model will either be the coordination model (DoN and the Enterprise Data Environment (EDE)) or the unification model (DoD and the DIMHRS), and the IT Engagement model used will be the FORCEnet Integrated Architecture process described in the previous section. The implementation of the operating model via enterprise architecture would follow the diagram associated with the chosen operating model. In the following evaluation for the RHS transformation, three alternatives will be presented and briefly described. These alternatives will then be evaluated using the *Department of the Army Economic Analysis Manual* as a guide to determine the best choice for the RHS transformation.

1. Economic Analysis of the RHS Alternatives

The overall evaluation process will follow the model depicted in Figure 24. According to the United States Army Cost and Economic Analysis Center (USACEAC) *EA Manual*,

> EAs facilitate the decision process by providing a strong analytical framework for evaluating alternatives, identifying costs and issues, highlighting implications of individual alternatives, identifying variables that drive results, assessing risks, uncertainties, and sensitivities of

> assumptions and costs, and suggesting recommendations. These elements comprise the EA process. (USACEAC, 2001, p. 5)

It should also be noted that per the *EA Manual* (p. 6 and 7): "an EA will not:

- Produce results that are more valid than the data used in the analysis.
- Make final decisions.
- Be applied with cookbook precision; instead it should be tailored to fit the problem.
- Provide relevant solutions to irrelevant questions and problems.
- Predict political and non-economic impacts.
- Substitute for sound judgment, management, or control."

In this paper, a basic analysis will be conducted in lieu of full economic analysis, which would be beyond the scope of the current research. The intent is to provide enough analysis of the alternatives to be able to choose the best from among them. This research could form the basis for a more in-depth study at a later date.

In the following analysis, the Reserve Headquarters Support (RHS) application and potential replacement technologies are examined. The steps will be numbered from 1 to 7, and each step's function (what it is trying to elicit) will be described (*italicized*) based upon the *Department of the Army—Economic Analysis Manual* (USACEAC, 2001), followed by the actual assessment as it relates to this study. Some of the steps will require a discussion and justification of the chosen elements. These discussions will follow the seven steps' EA as they are material to, but not an actual part of the analysis.

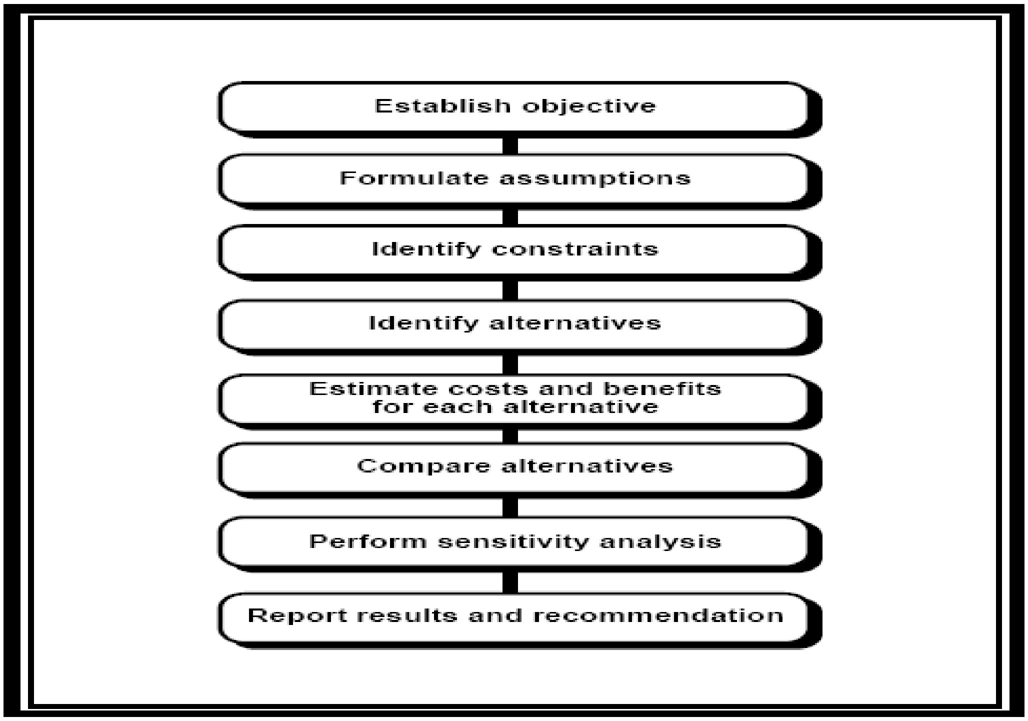

Figure 24. Economic Analysis Process Model
(USACEAC, 2001, p. 7)

(1). *Establish objective. This is a clear identification of the mission-related objective(s) and should be consistent with the existing Mission Need Statement (MNS), the Operational Requirements Document (ORD), or other approved requirements source, as applicable.*

The objective of this project is to "Migrate the current RHS application to a more modern technology and architecture. This includes hardware and software upgrades that are Navy and DoD Information Assurance compliant" (Robertson, 2008, p. 11).

(2). Formulate assumptions. This is the identification of assumptions with underlying rationale explained in the analysis.

- Project Life. The project to implement one of the alternatives to the status quo should not take so long that it creates prohibitive monetary costs or that the benefits of the alternative are diminished to a level below that of the current system.

- Economic Life. The amount of time that this project (as with other large technology projects) is expected to be beneficial is set at 10 years after being put into production.

- Funding will be provided by the DoN or DoD.

(3). *Identify constraints. Identification and full explanation of project constraints: assumed or imposed.*

- The solution that is chosen must fit within the FORCEnet Integrated Architecture framework.

- The solution needs to be Navy and DoD Information Assurance compliant.

- The solution must be funded.

(4). *Identify alternatives. This step includes identification of the status quo and all feasible alternatives. If a candidate alternative is eliminated, specific reasons for dropping that alternative must be documented in the analysis.*

Alternative 1—Do Nothing (maintain status quo)

In this alternative, the RHS application would remain as it exists in production today, with all of its features and inherent flaws as described in Chapter II—Current State of Information Systems, Section C, Reserve Headquarters System (RHS).

Alternative 2—Build to the DIMHRS Standard

This alternative would involve positioning the RHS system for a direct transition to the DIMHRS. This option would be contingent upon definitive direction from the Business Transformation Agency (BTA) and the DoN Chief Information Officer (CIO) that the Navy's personnel and pay IT systems were slated with an actual timeframe to go live with the DIMHRS.

Alternative 3—Build to an EDE

Building to an Enterprise Data Environment (EDE) would follow the solution proposed by SSC NOLA in its *SSC New Orleans Status Brief on N1 Programs and Budget Issues* (SSC NOLA, 2008). This solution proposes that the RHS be migrated to the EDE regardless of the status of the DIMHRS. In other words, this solution would be able to stand on its own, or it could be migrated to DIMHRS at a future date.

(5). Estimate costs and benefits for each alternative. For each alternative, an estimate of all anticipated costs, both direct and indirect, over the economic life of the project is derived. The methodologies of the cost estimates, and their sources, must be clearly identified in the analysis.

Cost Estimates

This portion of the analysis adhered to the following guidance: "Investment costs are normally non-recurring (occurring one time or on an intermittent basis) and include such items as research and development (R&D), equipment purchases, software development, and facilities preparation. Operating and Support (O&S) costs are normally recurring (occur on a continuing annual basis) and include such items as operating personnel and hardware maintenance" (USACEAC, 2001, p. 25). In the following, R&D equates to RDTE, and O&S equates to OMN.

Table 6. POM-10 Proposed Budget
(Murphy, 2007, slide 30)

APPN/LI/PE	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FYDP
PR-09 Baseline									
OMN	812	1000	0	0	0	0	0	0	1812
RDTE	0	0	0	0	0	0	0	0	0
OPN									
POM-10 Proposed									
OMN	874	998	1033	1069	1106	1145	611	632	7468
RDTE	0	0	1000	1250	1250	1000	0	0	4500
OPN									
Delta									
OMN	(62)	2	(1033)	(1069)	(1106)	(1145)	(611)	(632)	(5656)
RDTE	0	0	(1000)	(1250)	(1250)	(1000)	0	0	(4500)
OPN									

Table 6 figures will be used in the cost-estimate portion of this EA. Specifically, the line-item OMN (sustainment) funding will be used as the basis to estimate ongoing funding for the three alternatives. The RDTE line will be used for Alternative 2 for DIMHRS one-time transition costs, while funding for one-time costs (RDTE) for Alternative 3 come from Figure 20. FY10 through FY15 will be used as a baseline to establish future-year estimates for FY16 through FY19 OMN funding. Current dollars adjusted for inflation 3.5% per year will be used for yearly increases in OMN funding. Table 7 shows the total cost by alternative to run each system.

Table 7. Total Projected Costs of Alternatives

FY'	Alternative 1 (Status Quo) OMN	Alternative 1 (Status Quo) RDTE		Alternative 2 (DIMHRS) OMN	Alternative 2 (DIMHRS) RDTE		Alternative 3 (EDE) OMN	Alternative 3 (EDE) RDTE
10	1,033			1,033	1,000		1,033	6,543
11	1,069			1,069	1,250		1,069	6,543
12	1,106			1,106	1,250		611	
13	1,145			1,145	1,000		316	
14	1,185			611			327	
15	1,227			632			339	
16	1,269			654			351	
17	1,314			677			363	
18	1,360			701			376	
19	1,407			725			389	
	12,115		OMN Tot.	8,353	4,500	OMN Tot.	5,173	13,086
			RDTE Tot.	4,500		RDTE Tot.	13,086	
	12,115		**Total Cost**	**12,853**		**Total Cost**	**18,259**	

Cost totals and method of derivation follow.

Alternative 1 (Status Quo) - $12.1 million

For Alternative 1, only sustainment funding (OMN) was estimated, as no development investment would be necessary. FY10 through FY15 dollars come from Table 6, and FY16 through FY19 dollars were estimated by adjusting for inflation and extrapolating FY10 through FY15 dollars.

Alternative 2 (DIMHRS) - $12.9 million

For this alternative, Table 6 dollars were used for both OMN and RDTE funding. FY16 through FY19 funding was calculated using the same method as Alternative 1.

Alternative 3 (EDE) – $18.3 million

This alternative required more estimation than the first two alternatives, due to the lack of proposed budget dollars in Table 6. For OMN dollars, FY10, FY11, and FY12 were taken from Table 6 as follows: FY10 and FY11 used same dollars; FY12 used FY14 dollars because, in this alternative, the EDE project would go live during FY12 (thus reducing costs as reflected in FY14 dollars). For FY13 through FY19, OMN costs would be further reduced, first by 50% in FY13 (which would establish a new reduced OMN baseline) and then by applying the 3.5% inflation rate for years FY14 through FY19. This reduction reflects greater expected savings over Alternative 2 because in this alternative, all application functionality would be accounted for; yet, in the DIMHRS solution, not all functionality would be subsumed.

The author estimated RDTE funding using Robertson's (2008) cost estimate to rewrite the RHS application for migration to the EDE reflected in Table 20. In the estimate, it was assumed that the project would take two years (26 months) to complete. Therefore, the estimate to complete the project of $13.1 million was divided between FY10 and FY11.

Benefit Analysis

This benefit analysis will cover both quantifiable and non-quantifiable benefits that could be expected to accrue to each of the focus alternatives. A full benefit analysis is complex and highly detailed and, therefore, beyond the scope of this research. Thus, this section will attempt to capture the most applicable benefits based upon the available data.

Quantifiable Benefits

Table 8 lists the types of benefits that are quantifiable. There is overlap with the items in this table and those listed in Table 9 (Non-quantifiable benefits) and with quality attributes commonly defined by IT system professionals. For this portion of the benefit analysis, focus is on the cost savings of the systems.

Table 8. Quantifiable Benefits

Quantifiable Benefits
Productivity Improvements
Cost Savings
Improved availability measures showing when a system will be delivered against when it is required
Improved system reliability
Improved maintainability/supportability measures
Improved flexibility and adaptability to various modes of operations
Improved accuracy, timeliness, and completeness of data produced by a system, resulting in efficient utilization of resources through more effective decisions made upon more accurate data

Alternative 1 – ($0)

The cost savings of Alternative 1 are the costs of implementing Alternative 2 (DIMHRS) $4.5 million and Alternative 3 (EDE) $13.1 million. However, OMN costs of Alternative 1 are higher post-implementation than other system alternatives, as will be shown below.

Alternative 2 – ($700,000)

Alternative 2 begins accruing OMN cost savings in the year following projected implementation. Such savings continue through the remainder of the 10-year period covered in this analysis. These annual savings represent a 48% savings versus Alternative 1, and account for a total of $3.8 million over the 10-year period. Notice Alternative 2 is only $.7 million more costly than Alternative 1 ($4.5 million savings in Alternative 1 minus the $3.8 million Alternative 2 savings). The $.7 million dollars equals the difference in total costs, from Table 7, of Alternative 2 minus Alternative 1 ($12.853 million - $12.115 million = $.738 million).

Alternative 3 – ($6.1M)

Similar to Alternative 2, savings for this alternative come from savings in OMN funds. However, these savings begin in the third year for this alternative (FY12) and total $6.9 million over the 10-year period. However, even with these savings, Alternative 3 is still $6.1 million more costly than Alternative 1 over the 10-year period. The $6.1 million dollars equals the difference in total costs, from Table 7, of Alternative 3 minus Alternative 1 ($18.259 million - $12.115 million = $6.144 million).

Non-quantifiable Benefits

Table 9 drawn from the *EA Manual* (USACEAC, 2001) includes a detailed list of the types of non-quantifiable benefits that are important to analyze in an EA.

Table 9. Non-quantifiable Benefits

Non Quantifiable Benefits
Acceptability -- does the alternative contribute to the operation of parallel or higher level organizations? Does it improve the quality of the process?
Accuracy -- does the alternative reduce error rates or improve the accuracy of information?
Adaptability -- is the system/project adaptable to existing DoD, industry, national, or international standards?
Availability -- when can the system/project be delivered or implemented; when is it needed to meet proposed output schedules? What is the mean time between failures?
Compatibility -- how will existing operations, facilities, equipment, data requirements be affected? How much initial training will be required? How will work methods and procedures be altered?
Functionality -- how well does the system perform; how quickly can it process data or calculations, or other functions?
Maintainability -- is the system difficult to repair? Are parts readily available? How much staff will be required to maintain the software/hardware? What is the anticipated down time for maintenance? Is the maintenance downtime longer for any alternative?
Manageability -- will the system/project decrease the involvement/need for supervisors or quality inspections? Will a different type of personnel than currently assigned be required? Are trained personnel available?
Morale - will the system/project contribute to a positive employee attitude towards work?
Production -- will the number of products produced be increased?
Productivity -- will the rate of production increase? Will the system/project decrease the number of staff resources previously needed to produce the same product, or will the system/project allow more items to be produced with existing staff resources?
Quality -- will a better product be produced? Will better service be provided? Will quality of products be more consistent? Is customer satisfaction improved?
Reliability -- how many (how often) system failures will occur over time?
Security -- will more or less precautions be needed?
Service life -- how long will the equipment be able to support the operation? Will the equipment be obsolete before it reaches the end of its useful life?
Upgradeability -- how compatible will additional equipment, such as memory, terminals, workstations, or other equipment, be with existing equipment or users of the system?
Versatility -- will the equipment in any alternative provide additional capacity or capability beyond that required for the system?

Combined with a list of quality attributes drawn from Gorton (2006), the most applicable attributes were distilled down to the 10 beneficial attributes used in this study. Benefit analysis is highly subjective, but, the author has built this list based upon applicability to the current issues of the RHS system identified in Chapter II and the measures ability to position the RHS to assume the desired state described in Chapter III. These metrics are highlighted here again in Table 10.

Table 10. Summary of Current RHS Issues and Desired Future Attributes

Current State Issues:		Desired State Attributes:
• Lack of transparency		• Integrate with cross-functional domain areas
• Excessive interfaces		• Data, metadata management and semantic reconciliation
• Non- compliance with DoD and DoN information assurance requirements		• Data integration across the IT portfolio, including:
• Aging hardware		• Systems/Apps (SOA)
• Lack of experienced technologists		• Informatio Assurance (IA)
• Data definition and reliability issues		• Provide unify-able and converge-able content
• Poor system documentation		• Meet with governance:
• Difficult to support		• Standards
		• Cost control
		• Enterprise and strategic alignment

After the benefit attribute list was complete, each attribute was weighted according to relative importance from 1 to 5, with 5 being the most important. Then, the alternatives were ranked in regards to their ability to satisfy the attribute from 3 to 1. In this case, a ranking of 3 meant that the alternative displayed the highest likelihood of addressing the desired beneficial attribute, and 1 was the least likely to display the attribute. The results of this ranking exercise (shown in Table 11) illustrate that Alternative 3 has a moderate edge over Alternative 2 and a considerable advantage over Alternative 1.

Table 11. Comparison of Benefits

Comparison Of Benefits								
Benefit Attribute	Weight (1 to 5)	Alternative 1 (Status Quo)		Alternative 2 (Migrate to DIMHRS)		Alternative 3 (Migrate to EDE)		
		Rank	Score	Rank	Score	Rank	Score	
Adaptability	5	1	5	2	10	3	15	
Availability	4	3	12	1	4	2	8	
Maintainability	5	1	5	3	15	3	15	
Manageability	5	1	5	2	10	3	15	
Modifiability	4	1	4	2	8	3	12	
Quality	5	1	5	3	15	3	15	
Scalability	4	1	4	2	8	3	12	
Security	5	1	5	3	15	3	15	
Service life	3	1	3	3	9	3	9	
Upgradeability	4	1	4	2	8	3	12	
Total Score			52		102		128	

(6). Compare alternatives. This step includes identification of mission-related benefits for all feasible alternatives. Benefits should be identified and analyzed in sufficient detail to indicate their contribution to mission accomplishment. Benefits should be quantified whenever possible. Non-quantifiable benefits, such as health or safety, should also be identified and explained in the analysis.

In a purely quantitative aspect, Alternative 1 is the least expensive of the alternatives. However, this perspective does not present the whole picture. First, if we extrapolate the numbers out a few more years to 20 total years, our perspective is clearer. First, depicted in Table 12 in bold italic numbers, are the break-even points, after which, the alternatives are actually the less-expensive options. This happens at year 12 in the case of Alternative 2 (DIMHRS) and at year 16 for Alternative 3 (EDE). Although it may seem to be a stretch to extend the analysis to 20 years, given the track record of similar systems within the DoN, it is a distinct possibility that these systems would still be in operation that far in the future.

Table 12. Extended Cost Projections Showing Break-even Points

		Alternative 1 (Status Quo)		Alternative 2 (DIMHRS)		Alternative 3 (EDE)	
Yrs.	FY	OMN	RDTE	OMN	RDTE	OMN	RDTE
1	10	1,033		1,033	1,000	1,033	6,543
2	11	1,069		1,069	1,250	1,069	6,543
3	12	1,106		1,106	1,250	611	13,086
4	13	1,145		1,145	1,000	316	
5	14	1,185		611	4,500	327	
6	15	1,227		632		339	
7	16	1,269		654		351	
8	17	1,314		677		363	
9	18	1,360		701		376	
10	19	1,407		725		389	
11	20	1,457	13,572	751	13,604	402	
12	21	1,508	15,080	777	***14,381***	416	
13	22	1,561		804		431	
14	23	1,615		832		446	
15	24	1,672	19,927	861	16,878	462	20,416
16	25	1,730	21,657	891		478	***20,894***
17	26	1,791		923		495	
18	27	1,853		955		512	
19	28	1,918		988		530	
20	29	1,985		1,023		548	(1,319)

Given the distinct possibility that the chosen system would be in place for longer than the 10 years covered in this analysis, the relative strength of the non-quantitative analysis increases. In this portion of the analysis, the strongest relative system was Alternative 3 (EDE). In the subjective ranking analysis, this system scored higher than the other two alternatives by a fairly substantial margin.

Now that we have reviewed the costs and benefits of the three alternatives, the three most important advantages and disadvantages not yet covered are given consideration.

Alternative 1 –

Advantages

- The system is currently in production (availability).
- Costs are relatively stable and known.
- The system has, to date, been able to perform its mission objective.

Disadvantages

- The system is based on very old technology.
- It is difficult to and expensive to maintain.
- It is not compliant with current DoD and DoN Information Assurance requirements.

Alternative 2 (DIMHRS) –

Advantages

- Projected costs are not much more than the current costs to run the RHS.
- The system leverages state-of-the-art technology that will be used throughout the DoD (possesses many quality attributes).
- The system is compliant with all DoD and DoN IT governance.

Disadvantages

- Program has had numerous delays, as evident from the Army placing its implementation in an on-hold status until further notification (poor availability).
- Not all functionality of the current RHS will be captured (incomplete solution).
- Potential mismatch of operating model to DoN needs (unification versus coordination).

Alternative 3 (EDE) –

Advantages

- The system would be able to leverage modern technology that is DoD and DoN compliant in a relatively short timeframe (24 months); it addresses multiple benefits/quality attributes, including availability.
- The system captures all current functionality (less expensive to support than the other alternatives).

- It has a proven track record of migrating other systems to this solution.

Disadvantages

- This system is the most expensive of the three alternatives, requiring considerable investment in the near future.
- The system would incur additional costs if and when the Navy migrates to the DIMHRS.
- Pilot programs that have migrated to this system were not entire cut-overs; therefore, unforeseen complications may arise, increasing expense and lengthening development time.

(7). Report results and recommendation. Results and recommendations that are fully supported.

Although Alternative 1 is the least expensive option, the recommendation of this analysis would be to implement Alternative 3—the most expensive option. This is due to the fact that Alternative 3 offers the best chance to upgrade the current RHS system in the timeliest manner. Further support for this recommendation is based upon the following:

- Will cover all current functionality,
- Meets all DoD and DoN IT governance,
- EDE has undergone proof-of-concept testing, and
- Will offer considerable benefits in the near future.

V. Conclusions and Recommendations

A. Primary Research Question

What are the implications of migrating from the Navy's current disparate data warehousing architecture to an integrated solution with a focus on the Reserve Headquarters Support (RHS)?

In the course of this research, the author has worked to answer this question. First, this study provided an overview of the current state of Information Technology (IT) systems at all levels of the Department of Defense (DoD), with a particular emphasis on systems that deal with personnel and their associated data. Ultimately, the research examined the systems, their associated architectures, and related IT guidance of the DoD and the Department of the Navy (DoN), and concluded with a detailed examination of the Reserve Headquarters Support (RHS) system. A common theme at all levels of the organization was that the IT environment is highly complex and built upon a technical architecture that is old and not well suited to effectively and efficiently operate in today's environment. Initially, these systems were built to address the specific business functions of their respective agencies, not to inter-operate with other systems within the department. More recently, interoperability has become critical—necessitating changes to these systems to address issues they were not initially intended to address. Finally, these factors have led to the current state of IT personnel systems, which are typified by aging technology, poor data quality, inefficient architectures and non-compliance with current information-assurance guidance.

The current issues described are complex problems that have been recognized at all levels of the DoD. This recognition has leaders within their respective organizations expending a lot of time, energy, and effort to remedy the current issues. To date, most of this effort has come in the form of vast amounts of IT governance driven from strategic organizational guidance. In regards to the

DoD's personnel-related IT systems, perhaps the most important step taken to date has been the creation of the Business Transformation Agency (BTA) in 2005. This organization has been charged by the Secretary of Defense (SECDEF) with providing guidance and leading the development efforts to ensure the interoperability of all personnel systems within the Department via the Defense Integrated Military Human Resource System (DIMHRS). Likewise, the DoN leadership has recognized the same issues and has focused on developing guidance and strategic plans to remedy them. In particular, the MPT&E organization has created a vision and provided direction as to what the future of these systems should ultimately look like. In conjunction, the SSC NOLA team has worked to create an Enterprise Data Environment (EDE) that may be helpful in solving many of the problems associated with the current systems' data. Finally, concerning the RHS system, the leadership has taken steps to transform the system into a modern IT application that is based upon open and interoperable technology and is also compliant with DoD and DoN information assurance guidance.

Finally, in Chapter IV, the researcher introduced methods that present promise in their ability to transform the current state of DoD IT Systems to the described desired state. Throughout the DoD organization, individual agencies are at different stages of transformation. The important thing is that efforts are being made to create IT solutions that will persist into the future at all levels of the organization. Further, these solutions are being approached from an unprecedented level of joint operability. The implication of these factors for the RHS system is that to meet the goals of the DoD and the DoN, decision-makers must begin soon to transform the application from its current state to one that will meet the needs of the future force. A major impact this transition will have is that it will make near-real-time information accessible at all levels of the organization. In addition to enabling key decision-makers to make difficult personnel decisions in a timely manner, it will provide accurate and trustworthy data on which to base such decisions. For example, when a need is determined for a logistician possessing a particular skill set at a forward-deployed Army depot, the transformed RHS system will enable that need to be met by a Naval Supply Corps Reserve officer in a matter of minutes—versus the current scenario, in which this action can take days, weeks, or even months.

All of this will be accomplished using modern technology, which is easier to maintain than legacy systems and which has a greater ability to interface seamlessly with other organizational systems via a service-oriented architecture.

B. Subsidiary Questions

1. W*hat is the cost of the current data warehouse solution; how much would it cost to upgrade, and what cost model can be used to appropriately forecast the cost of the upgrade?*

In Chapter IV, a 10-year projected cost estimate for the current RHS application was estimated to be $12.1 million in operational support funding. Two alternatives were presented as potential replacement solutions. The cost of one alternative, a direct cut-over to the DIMHRS, was projected to cost $4.5 million in investment costs and $8.35 million in 10-year maintenance costs, for a total of $12.85 million in costs. The second alternative, a cut-over to an enterprise data environment (EDE), was projected to cost $18.25 million over the same period, broken down into $5.17 million in maintenance costs and $13.08 million in investment costs.

To appropriately address the question, "Which cost model will more accurately forecast the cost to upgrade?", the author determined that a cost model was not robust enough to capture the pertinent information necessary to make this determination, as it would focus on a comparison of the quantifiable costs of the alternative systems. Instead, the researcher decided it was more appropriate to not only estimate quantifiable costs and benefits, but to measure non-quantifiable, qualitative benefits of the alternatives, as well as to conduct an economic analysis based upon the Department of the Army's *Economic Analysis Model.*

2. What is the current technical architecture that supports data warehousing of the Navy's data, and is it appropriate?

In the course of this research, the author did not find any formal IT architectural standards that were enforced or followed within the DoN that apply its IT systems in general or to the RHS application specifically. The current technical architecture and data structure, as applied specifically to personnel-related systems at all levels of the DoD, is one in which stand-alone applications working in individual business-process-defined silos that meet the specific functional needs of the owning individual agencies prevail. The leadership within the DoD, DoN, and their associated business units have deemed the current data environment as too restrictive and isolated to be effective in the current climate of interagency cooperation and support at all levels of the organization.

3. How would migration of the RHS be carried out from a technical standpoint?

In Chapter IV, it was determined that although there is not a clear-cut answer to this question, proven methodologies do exist that address this issue. The works of Gorton (2006) and Ross, Weill and Robertson (2006) proved valuable in defining, among other things, the underlying theories enabling organizations to successfully implement an enterprise architecture. These works helped the author to define an environment that would be conducive to the migration of the RHS application. Although the actual technical steps of migration are beyond the scope of this research, the methodologies in Chapter IV describe how an organization can increase its chances of successfully transforming itself.

C. Final Thoughts

The state of the DoD and its IT systems are at a critical juncture in their lifecycles. For too long, individual agencies under the Department's purview have been allowed to set their own IT standards and define their own data requirements—leading to an inefficient and expensive way of conducting business. However, at all levels of the DoD, leadership has begun to respond. Leaders are fully supportive and engaged in the creation of an IT environment that breaks down the barriers associated with the current IT systems. Evidence of this is seen in actions like the creation of the BTA in the DoD, and FORCEnet in the DoN. These efforts are in concert with the following statement made by Ross et al. (2006): “The best companies are focused on eliminating those silos that are limiting business efficiency and agility” (2006, p. 88).

To keep this momentum, it will be necessary to begin achieving some victories. From the perspective of the author, the RHS can be one of these victories. The strategy of starting small and having a successful implementation would go a long way towards moving the DoN in the right direction; the RHS would be an example of a successful transformation of an IT system within the DoN portfolio. Additionally, the Navy appears to have acted wisely in choosing a business operating model that is based upon coordination. It shows an understanding that its organization is at Stage One of enterprise architecture maturity, and the only way to proceed through the stages is to progress one stage at a time. Perhaps this is why the DIMHRS is having issues at the time of this writing, because it appears as though it is trying to go directly to Stage Three without going through Stage Two first. As Ross et al. warn, “for large companies each stage is several years” (2006, p. 85). Finally, the DoN direction appears to be in line with the recommendation of building an architecture capability in-house because “an ongoing dialogue about the relationship between IT and business process is essential for effective enterprise architecture” (2006, p. 89).

D. Recommendations for Further Consideration

The recommendation to go with the EDE solution in this research was largely based upon the non-quantifiable benefits this system would provide. There exists vast potential for savings, especially in the element of time, when organizations are empowered and enabled with the ability to find the necessary data when it is needed and its accuracy is assured. Considering the benefits of time and access to the proper data, the author believes that an effort to quantify these savings would provide further evidence that this alternative would more than pay for itself in a relatively short timeframe.

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