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THESIS

LESSONS FROM ENTERPRISE SYSTEM IMPLEMENTATIONS APPLIED TO THE MARINE CORPS TOTAL FORCE ADMINISTRATION SYSTEM

by

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The United States Marine Corps is implementing a new human resource system called the Total Force Administration System (TFAS). Enterprise and Enterprise Resource Planning (ERP) System implementations are reputed to be difficult because of the problems encountered by corporate America in the late 1990's. This thesis conducted a review of corporate enterprise system implementations looking for commonality in two areas: the most frequent problems encountered and key success factors. This thesis provides the TFAS leadership with issues of concern that require greater attention or research and with key success factors for the TFAS implementation. This thesis also reviewed and analyzed the preliminary architecture for the TFAS project. By leveraging the lessons learned from other implementations, it is hoped to increase the chances of success for this project and minimize implementation pain.

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LESSONS FROM ENTERPRISE SYSTEM IMPLEMENTATIONS APPLIED TO THE MARINE CORPS TOTAL FORCE ADMINISTRATION SYSTEM

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ABSTRACT

The United States Marine Corps is implementing a new human resource system called the Total Force Administration System (TFAS). Enterprise and Enterprise Resource Planning (ERP) System implementations are reputed to be difficult because of the problems encountered by corporate America in the late 1990's. This thesis conducted a review of corporate enterprise system implementations looking for commonality in two areas: the most frequent problems encountered and key success factors. This thesis provides the TFAS leadership with issues of concern that require greater attention or research and with key success factors for the TFAS implementation. This thesis also reviewed and analyzed the preliminary architecture for the TFAS project. By leveraging the lessons learned from other implementations, it is hoped to increase the chances of success for this project and minimize implementation pain.

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I. INTRODUCTION

Chapter one discusses the purpose and content of this thesis. It also provides a brief overview of the context, premise, objectives, research questions, methodologies used, scope, limitations, assumptions, and definitions.

A. CONTEXT

This thesis conducts an analysis of the Marine Corps' future human resource enterprise system initiative called the Total Force Administration System or TFAS.

The current system, the Marine Corps Total Force System (MCTFS), is a manpower and paper intensive system. The TFAS is the initiative that has sprouted from a review of the Marine Corps service model for providing pay and administrative support to individual Marines and to their commands. The result of this initial review has been the Marine Corps attempt to modify its current administrative (human resource) system by adding a self-service capability. Adding this capability will allow the Marine Corps to reengineer its business processes and eliminate the middleperson, the administrative clerk, between the individual Marine and his or her personal file. This self-service capability will streamline the data flow into the current backend system. This self-service capability is envisioned to include a Web portal and a call-center with interactive voice response (IVR). The Web portal and IVR will be the front end of a call center. The call center will be tied to the Marine Corps Total Force System

(MCTFS), the backend system for Marine Corps administration since the early 1980s. Administration capabilities will be spread over five levels vice the three levels currently used. The five levels will be: the individual Marine, small unit leadership, the command, Personnel Administration Centers (PACs), and higher headquarters/disbursing.

The vision for TFAS as stated by Lieutenant Colonel (LtCOl) J.M. Peterson is "to markedly improve and modernize pay and administrative support while significantly reducing the number of Marines needed to provide that support." [Ref. 1] The individual Marine will be given more responsibility and the means for maintaining his own record.

> The TFAS must leverage existing and emerging technologies, reengineer administrative processes, conserve precious manpower resources and markedly improve the quality of administrative support. In the short term, the TFAS is designed to provide all Marines immediate access via multiple avenues to their personal administrative data. In the long run, TFAS is to become the enterprise system for conducting all personnel administrative business within the Marine Corps. The TFAS should improve the quality of administrative support provided to Marines throughout the wide spectrum of environments that we work in. [Ref. 1]

Additionally, the TFAS must free up limited manpower, and provide a reach-back capability that makes personnel administration compatible with our doctrine of Operational Maneuver from the Sea (OMFTS), thus reducing the footprint physically required on the battlefield. This must be done while simultaneously keeping the Marine Corps on track for

compatibility with future Department of Defense (DoD) initiatives such as the Defense Integrated Military Human Resources System (DIHMRS).

The 15 major requirements for the TFAS are outlined in the preliminary assessment [Ref. 2] as:

- Commanders, small unit leaders, and training managers must be able to collect, pass, and report pay and personnel information from the point of action
- Commanders, small unit leaders, and training managers must be able to authenticate and upload selected transactions reflecting captured pay and personnel information directly into MCTFS without additional, intermediate-level processing.
- Commanders, small unit leaders and training managers must have electronic download access to pay and personnel information.
- Marines must be able to review pay and administrative information and to conduct associated transactions without having to be physically co-located with the service provider (administration unit). The importance of the geographic locations of the Marine needing support and the service provider must be eliminated.
- The system must authenticate users' identities.
- The system must allow users to sign documents in a paperless environment.
- Marines must receive verification of their completed transaction with an estimated date on which that transaction will affect the Marines pay or other records.
- Commanders must be informed of those transactions that are submitted through a self-service or Call Center capability.
- Commanders must be able to collect, quality control (QC), and forward pay and personnel information to a regional Personnel

Administration Center (PAC) for final review, certification and processing.

- Pay and personnel information forwarded from commanders must not require re-keying or manipulation once it arrives at the regional PAC.
- The regional PAC must be able to receive and process transactions from the commanders they support and any commander in the Corps in case of contingencies.
- The regional PAC must provide supported commanders with feedback reports that alert them to various information or action required relative to their Marines.
- The paper service record book and officer qualification record must be eliminated. All pay and personnel information must be stored electronically in either the Marine's pay/personnel record in the MCTFS or in the Official Military Personnel File (OMPF) record maintained by the Commandant of the Marine Corps-Personnel Management Support Branch (CMC-MMSB).
- The system must provide adequate information security to resist and otherwise prevent electronic attacks and other system misuses and abuses.
- Technical knowledge, rules, and edits must be built into the system to minimize the training requirements for users and to enhance self-service actions. This also includes maximum use of plain language vice codes.

An implied requirement is that the TFAS be compatible with current and future DoD initiatives. The DoD initiative with the most impact on the TFAS is the Defense Integrated Military Human Resources System (DIHMRS) initiative. The objectives and requirements for the DIHMRS are as follow.

- Must be a fully integrated personnel and pay system that allows for one-time entry that updates all personnel and pay transactions.

- Include existing functionality of the 17 current legacy systems in use DoD wide.
- Provide standard data and data requirements.
- Provide flexibility to include service specific modules where needed
- Use a commercial or government off the shelf software

The TFAS implementation is currently scheduled to happen in four phases, spread over eight or more years. The TFAS is currently in the first stage, normally called the Concept Exploration Phase. However, the Marine Corps has already started to implement many of the requirements that would normally be accomplished in later phases in a traditional development or acquisition program. Thus, it would not be accurate to call Phase I of this program, Concept Exploration. With the TFAS initiative, the Marine Corps is attempting to leverage available technology and tie it to its existing technology to create a new human resources system that will be less manpower intensive and more scalable.

The TFAS initiative will focus on the following areas to enable Marine Self-Service. There are other initiatives and process improvements that have been proposed for phasing into the program that are not directed toward Marine Corps Self-Service. The forms and processes that will be brought to the Web are:

- Servicemen’s Group Life Insurance (SGLI)
- Income Tax W4
- Tricare Enrollment
- W-2 Form
- DEERS Form

- Dependent Application Form 10922
- Request for Waiver of Indebtedness
- Combined Federal Campaign (CFC) Allotments
- Reenlistment/Extension Requests
- Lateral Move Requests
- MCI Course Registration Requests
- Separation/Retirement/Resignation Requests
- Tuition Assistance Requests
- Name Change Request
- Master Brief Sheet Review
- Benefits Waiver
- Personal Awards Process Program
- Audit capabilities such as: Basis Individual Record/Basic Training Record (BIR/BTR), Record of Emergency Data (RED), Latest Leave and Earnings Statement (LES), Career Retirement Credit Report (CRCR), and Basic Allowance for Housing) Certification.

Figure 1, 2, 3, and 4 below are diagrams that demonstrate and compare the current administration processes against the proposed processes after the TFAS implementation. Figure 1 demonstrates how the new process eliminates steps, time, and the middleman from current processes.

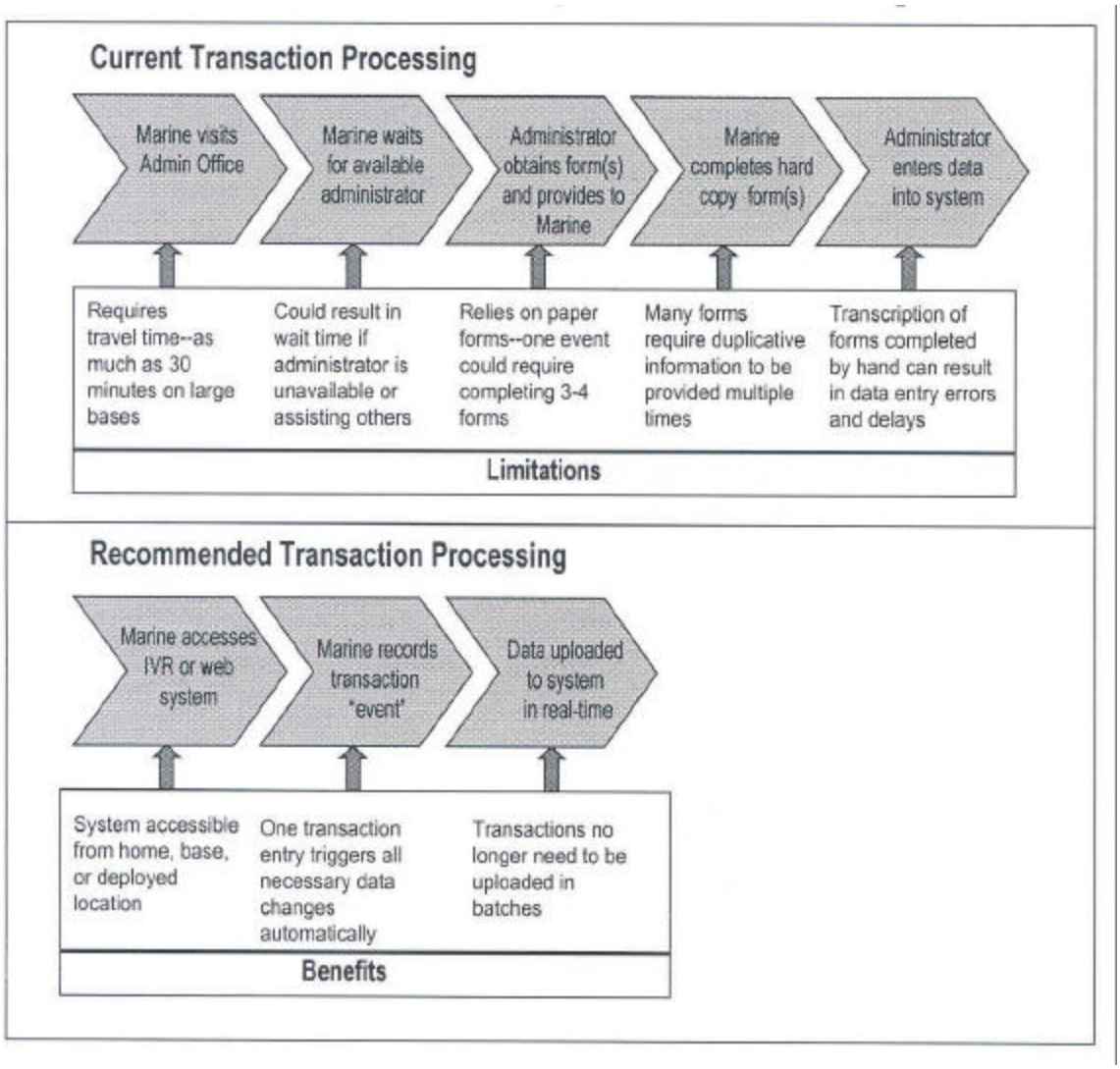

Figure 1. Comparison of Existing and Recommended Processing
From Ref. [2]

Figures 2 and 3 are my representations of the current process based on my last experiences as a Marine Corps administrator. These figures show some additional steps that are not in Figure 1.

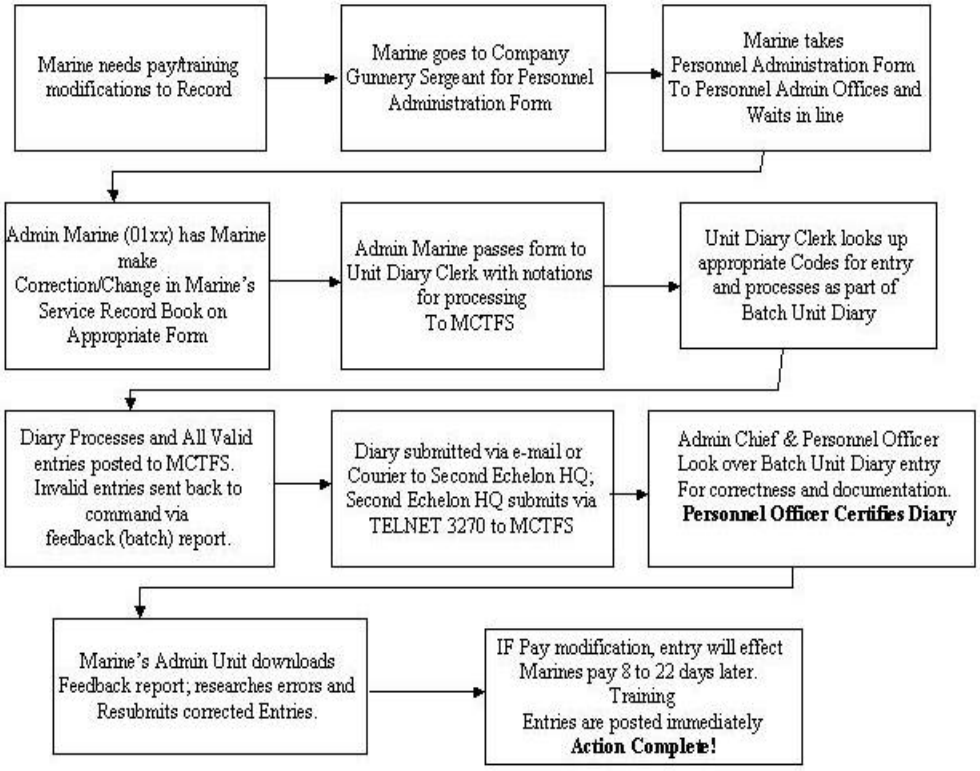

Figure 2. Current Administration Process

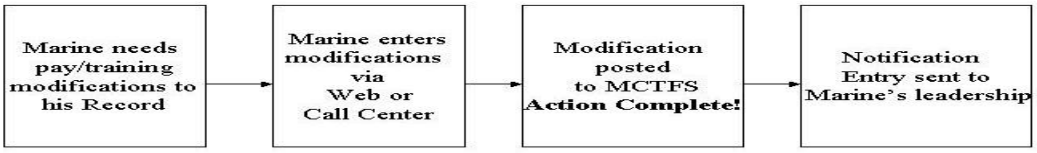

Figure 3. Proposed Administration Process

Figures 4 and 5 are data flow diagrams that demonstrate how the number of levels of interaction with the system will increase from two to five with the TFAS implementation. The diagrams also show that the system will now have to be reengineered to add more approval safeguards into the system whereas the current system requires approval of data prior to input.

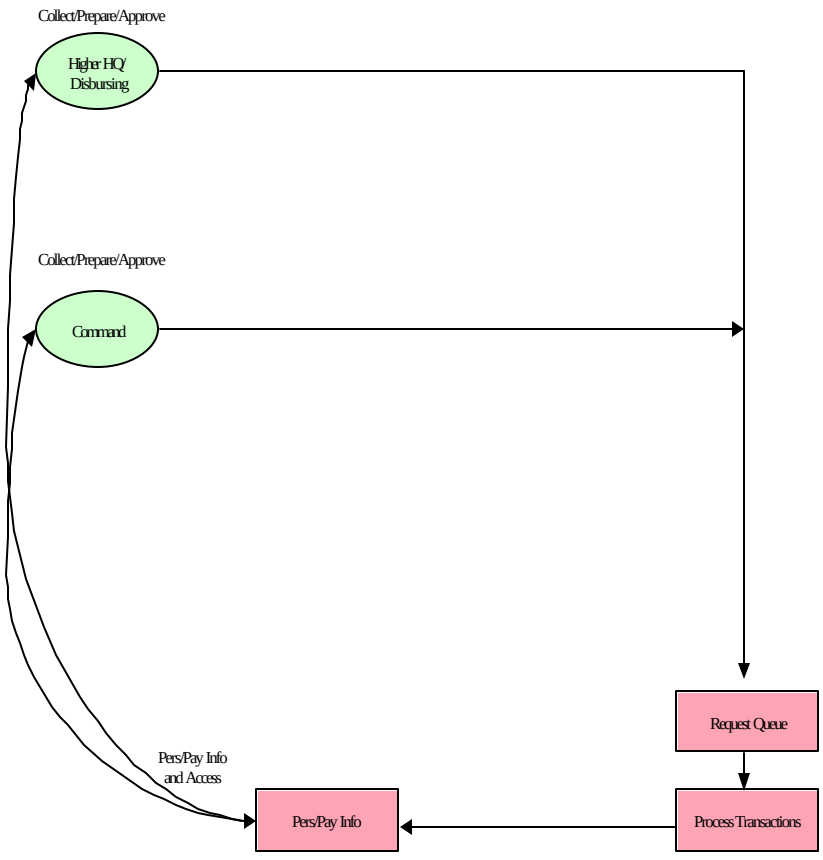

Figure 4. “As Is” Operational Architecture From Ref. [2]

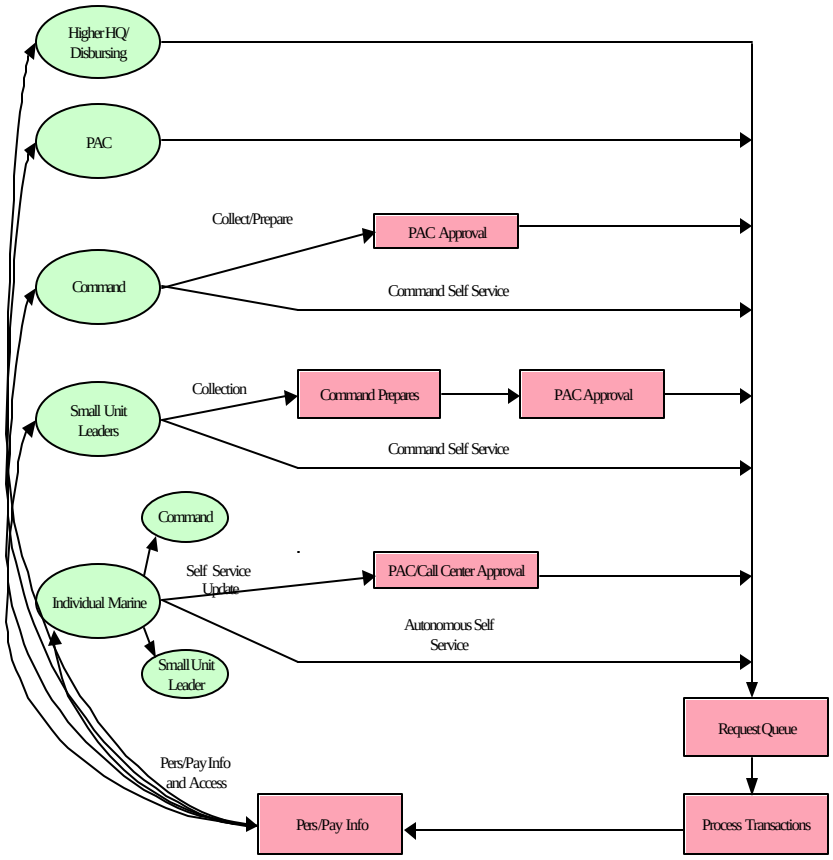

Figure 5. “To Be” Operational Architecture From Ref. [2]

Some of the processes that will be reengineered as a part of the TFAS include, separations, audits, and personal requests.

As mentioned previously, the TFAS does not address any changes to the MCTFS. The Marine Corps believes that the MCTFS should and will be addressed as part of the DIHMRS

initiative and that the TFAS will work regardless of the backend system, whether that system is the MCTFS or the DIHMRS. The DIHMRS was scheduled to be operational by January 2002 but is currently behind the original schedule established by DoD. The DoD awarded the DIHMRS contract to PeopleSoft less than one month ago during August 2001. [Ref. 3] The article also states the following:

> PeopleSoft said the Defense Department would purchase the PeopleSoft 8 Human Resources Management System (HRMS) to consolidate several legacy applications for payroll and human resources. By consolidating the systems of all military branches and making records available to military personnel over the Internet, the Defense Department hopes to save money and improve efficiency in providing information to servicemen and women. DIHMRS will cut costs by allowing military personnel to easily check their own records around the clock without the intervention of the department's personnel in many cases. [Ref. 3]

The Marine Corps contracted Klynveld Peat Marwick and Goerdeler (KPMG) consulting to analyze its current technical architecture and several administrative processes to determine inefficiencies and establish a baseline or the real costs in terms of time, manpower, and money. At the same time, PricewaterhouseCoopers was hired to document the best business practices of the Marine Corps and to recommend processes that should be considered for reengineering. According to the PricewaterhouseCoopers analysis, there is a commonality between the human resource functions and processes of the Marine Corps and other organizations that could be leveraged to facilitate easier process reengineering in those initiatives.

Additionally, the Marine Corps established a Quality Leadership Board and a Total Force Administration Steering Group to oversee and ensure success of the initiative. These two groups organized the best and brightest minds from the administrative community and the technical community to mirror the work being done by the consultants. They organized a test bed for new and promising ideas. The program manager for the Marine Corps, Lieutenant Colonel (LtCol) Gaskin says, “The success or failure of TFAS is dependent upon the Corps’ program management approach, prioritization, scope, and management of operator expectations.” [Ref. 4]

B. PREMISE

The premise of this thesis is that the TFAS initiative can benefit from looking at the challenges, mistakes, and lessons learned endured by corporate America. Applying those lessons learned to the TFAS implementation will increase the initiatives chance of success. Additionally, the initiative can benefit from a comparison of the proposed architecture for the TFAS against proven methods and standards of architecting an enterprise system.

C. OBJECTIVE

The areas that this thesis focuses on are enterprise architecture, enterprise system implementation, and how the Marine Corps can leverage the lessons learned from other enterprise implementations to ensure success of the TFAS. Therefore, the objective of this thesis is two-fold. The first objective is to evaluate enterprise resource systems

implementations of American corporations and to create a list of lessons learned from that could be applied to the implementation of TFAS in the Marine Corps. The second objective is to review the proposed architecture of the TFAS enterprise system. Architecture here refers to the set of processing components and processes of the system that represents a common approach.

D. RESEARCH QUESTION

The research conducted during the course of this thesis is intended to answer two main questions:

- Can the Marine Corps leverage the lessons learned from other Enterprise Resource Planning (ERP) implementations to achieve a higher level of success with fewer problems?
- Does the architecture of the TFAS as currently proposed have any apparent shortcoming?

To better support the main questions, other questions that will be answered are:

- What are the characteristics of a successful ERP implementation?
- Are there any metrics that can be used to classify an ERP implementation as successful or a failure?
- What are the common mistakes made during corporate ERP implementations ?
- What lessons learned from American corporations can be applied to the TFAS?

- Historically, what are the major hurdles of an ERP implementation?
- Are there any ERP implementations that closely resemble the TFAS plan?
- Are there any deficiencies in the TFAS plan?
- Is the TFAS concept a valid concept? Is it achievable?
- Is TFAS scalable?
- Does TFAS fit into the future Joint DoD architecture?
- What are the Key Success Factors for TFAS?
- Are there any overarching architectural or implementation issues that have been overlooked?

E. SCOPE OF THESIS

This thesis reviews the proposed architecture and the implementation of the TFAS. Concurrently, this thesis focuses on previous enterprise system implementations for similarities or for lessons learned that might be beneficial to the TFAS program management. This does not include a detailed analysis of individual or internal Marine Corps Personnel Administration or the TFAS processes. Additionally, this thesis will also make recommendations as to areas of further thesis study that could benefit the TFAS implementation.

F. LIMITATIONS OF THESIS

Literature reviewed for the TFAS in this thesis were preliminary documents on preliminary documents and thus many topics are mentioned in concept only without details being provided in the actual documentation. Some of the issues that were glanced over include security, communication platform(s), and design architecture(s). I was unable to acquire copies of the formal technical architecture study to give a complete analysis of the TFAS architecture. Therefore, I reviewed the preliminary architectural documents that were provided. Additionally, I have been unable to contact my Marine sponsor to clarify questions or to gain additional information. This thesis will proceed with the information as contained in the aforementioned preliminary documents.

This thesis will not examine in detail the call center or IVR technology proposed by the TFAS. Call center and interactive voice response technology are both mature technologies with histories of smooth implementations. Both of these topics could however be included in follow-on research.

G. ASSUMPTIONS

This thesis assumes that the baselines established by KPMG and PricewaterhouseCoopers to be accurate and that all information posted on the official TFAS Website or provided by the program manager to be the official, latest, and most accurate information on the TFAS initiative. The baselines revolve around costs and benefits of the current system

upon which cost-to-benefit analysis of the alternatives were developed.

H. METHODOLOGY

This thesis will utilize the archival research method. The archival research method involves analyzing case studies and articles of Enterprise Resource Planning (ERP) system implementations in American corporations. Case studies are evaluated for similarities to the TFAS initiative and for general lessons learned that possibly could apply.

I. DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations are defined as found in the TFAS documentation for the purpose of consistency.

> **Architecture:** structure of components, their relationships, and the principles and guidelines governing their design and evolution over time. [Ref. 5]
>
> **Defense Integrated Military Human Resources System (DIMHRS):** DIMHRS is to provide a fully integrated military personnel and pay capability for all Components of the Military Services of the DoD to overcome shortcomings in legacy systems. [Ref. 2]
>
> **E-business:** improves business performance by using electronic information technologies and open standards to connect suppliers and customers at all steps along the value chain. The early stages of a company's e-business effort are almost always focused on reaching the customer,

the later stages on streamlining value-chain activities to deliver more value to the customer. [Ref. 6]

Electronic Data Interchange (EDI): EDI represents an early form of e-commerce built on essentially proprietary technology. Available long before the Internet achieved wide usage, EDI attempted, but failed, to become a computing standard that would allow non-compatible computers to share information. Today, the Internet combined with e-commerce is replacing it. [Ref. 7]

Enterprise Resource Planning (ERP): integrates the management functions within a company such as logistics, financial and human resources/payroll to enable enterprise-wide management of resources. [Ref. 6] The term "information resources management" is more appropriate for the military.

Extensibility: The ability to extend an application to other enterprise systems; specifically the data warehouse. [Ref. 6]

Information Resources Management: the process of managing information resources to accomplish agency missions. The term encompasses both information itself and the related resources, such as personnel, equipment, funds, and information technology. [Ref. 8]

Joint Technical Architecture (JTA): Identifies a common set of mandatory information technology standards and guidelines to be used in all new and upgrade acquisitions. [Ref. 2]

Marine Corps Total Force System (MCTFS): The MCTFS is an integrated personnel and pay system. The Finance Systems Activity (FSA) at the Kansas City Center maintains the MCTFS central database, which contains all of the MCTFS data elements.

This file is commonly referred to as the Central Master File (CMF). The CMF is comprised of more than 500,000 records containing specific data file elements of all Active/Reserve Marine personnel. These records are available to commanders and administrators throughout the Marine Corps for pay purposes, personnel management, or personnel management reporting. Use of this information facilitates procurement, training, assignment/mobilization, promotions, budget preparation, and pay service. [Ref. 9]

Marine OnLine (MOL): The MOL was envisioned as a way to strengthen the Marine Corps community, to enhance communication among every member of the enterprise, and to build a sense of connectivity that extends beyond geographic boundaries. Similar in concept to popular commercial Web-based services, the MOL is a Web-based system that facilitates the collection, organization, processing, and presentation of information. [Ref. 2]

On-Line Diary System (OLDS): OLDS is an input/output (I/O) system that supports Headquarters Marine Corps (HQMC), other higher headquarters elements, and their supporting establishment (e.g., non-Fleet Marine Force (FMF) commands). The system requires on-line connectivity to the mainframe-processing site at the mega center in St. Louis, Missouri. OLDS is a class 1B system that provides a primary method of data entry into MCTFS. OLDS is a self-prompting system that allows the operator to choose various commands for data entry and retrieval. This allows the MCTFS diary and payroll transactions to be prepared, reviewed, deleted, certified, decertified, and printed. [Ref. 9]

Operations Architecture: Operations architecture is a combination of tools, support services, procedures, and controls required to keep a production system up and running well. [Ref. 10]

Operational Data Store-Enterprise (ODSE):

Operational Data Store (ODS) is an infinitely extensible, universal repository that contains functionally independent, functionally dependent, relational, hierarchical and aggregate data. ODS data is both current and historical and is stored, normalized, on the ODS server. This relational architecture is a staging area that supports data quality assurance, data mining and the production and management of data warehouses, data marts, new application databases, and feeds to other organizations. There is no user access to the ODS. [Ref. 11]

Technical Architecture Framework for Information Management (TAFIM): The TAFIM is a set of documents produced by DoD to guide information systems toward open systems architecture. It provides the services, standards, design concepts, components and configurations that can be used to guide the development of technical architectures. [Ref. 2]

Total Force Administration System (TFAS): The TFAS initiative is a comprehensive effort to modernize the Marine Corps service model for providing pay and administrative support to commanders and Marines. This modernization effort includes a review of the role of the commander, the role of the individual Marine, organizational structure, processes and technology. [Ref. 4]

Unit Diary/Marine Integrated Personnel System (UD/MIPS): The commander's personnel and pay reporting and retrieval system that can be used from any location worldwide. The UD/MIPS is a state-of-the-art application that is scaleable to support the entire spectrum of reporting environments -- for both the active and reserve components of the Marine Corps. [Ref. 9]

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II. HISTORY OF ENTERPRISE SYSTEMS

"Computing has always been about extending human capabilities," says Mark Goodyear. [Ref. 10] Figure 6 below is a graphical representation of the advances computing has made over the past 40 plus years, with at least one major platform in each decade.

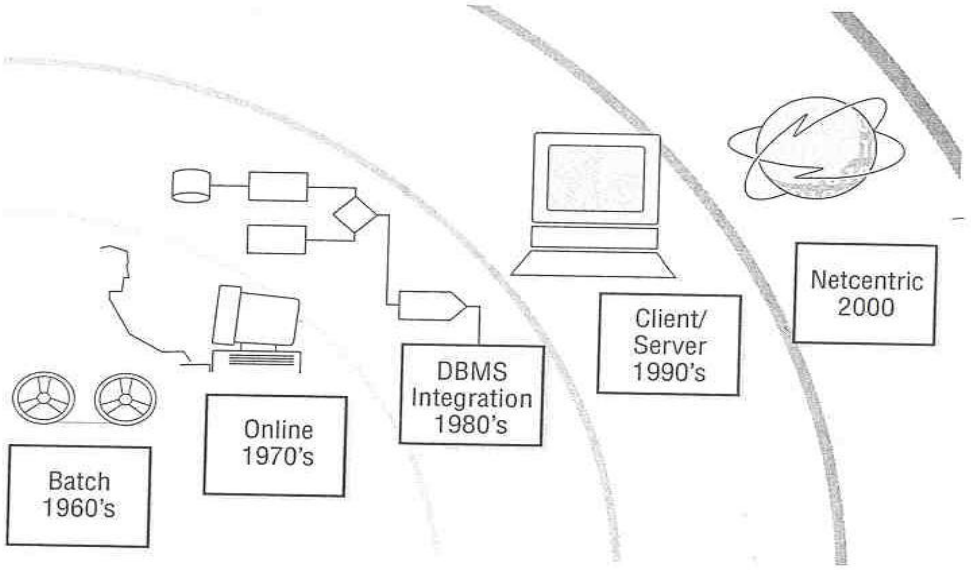

Figure 6. History of Computer Systems From Ref. [10]

A. BATCH COMPUTING

The 1960's were the decade of batch computing. In batch computing, the system would process a group of transactions submitted together without user intervention. At the end of the processing, at some point, the computer would provide a report about the batch and list any errors. The report(s) would be batch printed on a daily or scheduled basis. Any items listed on the batch report as

errors would have to be resubmitted after proper research and correction of the error.

B. ONLINE TRANSACTIONS

The 1970's were the decade of on-line transactions. Online transactions allowed the user to submit transactions one at a time and receive immediate verification as to the success or failure of the transaction. Additionally, online transactions allowed all concerned to know the impact of the transaction. This changed the workflow of business and had an impact of how business was conducted. Later in the decade, the advent of on-line interactive systems allowed for businesses to communicate internally and with each other through wide area networks which had its beginning in this decade also.

C. DATABASES AND DATABASE MANAGEMENT SYSTEMS

The 1980's was the decade of databases and database management systems (DBMSs). Databases and database technology had been used, developed and implemented by corporations in the 1970's, but it was not until the 1980's that corporations began attempting to share data across organizational and application boundaries. [Ref. 10] Database technology did not change the way business was conducted per se; what it did for business was to make it more convenient to access data and "ensure it was updated while maintaining the integrity of the data." [Ref. 10] Up to this point, large database systems were usually written in COBOL; adding a field to a record or changing the byte

length of a data field required major overhaul. The DBMSs, particularly relational ones, eliminated that problem and enabled a lot more prototyping. This was only a back-office improvement and did not change the interface with the system.

D. CLIENT/SERVERS

The 1990's ushered in the decade of client/server technology. The implementation of client/server technology represented a major fundamental change in computing. The first change with client/server computing was that a transaction could now be processed on a keystroke-by-keystroke basis, which represented a change in the level of interaction between the user and the computer. Secondly, client/server computing facilitated communication in workgroups on local area networks (LAN) at speeds of 100 to 1000 times that of wide area networks (WAN). [Ref. 10]

In client/server computing, there are usually multiple processors: a workstation for making an entry and then multiple servers, in which transactions are processed across and finally several databases that updated to reflect the transaction. There is typically a three-level hierarchy of servers. The first level is the workstation, the middle level is the work group server, and the highest level is the enterprise server. A two-level hierarchy can also suffice in a client/server environment in which the workstation interacts directly with the enterprise server or mainframe.

E. NETCENTRIC/NETWORK-CENTRIC COMPUTING

The promising new platform for the first decade of the new millennium seems to be netcentric or network-centric computing. Some of the new capabilities that promise to revolutionize computing in the netcentric environment are the use of browsers to create universal clients, the establishment of direct supplier-to-customer relationships, the ability to share richer documents than at any other time in history, and application version checking and dynamic update. [Ref. 10]

Netcentric computing is a natural evolution of client/server technology best represented by a mathematical formula, Mark Goodyear [Ref. 10] states as,

"Netcentric = Client/Server + Reach + Content"

This formula shows netcentric computing as client/server computing with the new and improved capabilities of "reaching, interacting, communicating, transacting, and partnering with more entities in more locations; and there are new and richer forms of content being published, interacted with, or transacted." [Ref. 10]

III. BACKGROUND

A. HISTORY

The Commandant of the Marine Corps (CMC) made the decision in 1997 to cut the manning level of the Marine Corps' administrative occupational specialty by over 1000 billets. The decision was made based on recommendations that came from a General Officer's symposium and a force structure review of the Marine Corps. [Ref. 1] The recommendations were based on two primary facts or statistics that came from the review. First, most combat units were being staffed under targeted goals both during deployments and especially after returning from scheduled six-month deployments. Additionally, often Marines were being recycled from units returning from deployments to units going out on deployment or being sent on deployments with other units ahead of their deployment schedule in order to back fill vacant billets. The second factor was the size of the Marine Corps administrative community. In 1997 between 9,000 and 10,000 administrators serviced approximately 175,000 Marines, a ratio of 1:19, whereas corporate America's average ratio was 1:68. [Ref. 9]

It was an obvious conclusion that there must be some way to make Marine Corps administration more efficient. However, at the time that the decision was made, there was no clear-cut, preplanned vision on how to make this happen in the Marine Corps or how to redistribute the workload within the now smaller administrative community.

It just so happened that the right technology and the right technical personnel, along with the oversight boards setup by CMC were in place to envision the TFAS.

> During the fall of 1997, I Marine Expeditionary Force (MEF) and Marine Forces Reserve (MarForRes) began planning to test the concept of consolidating personnel administration services above the traditional battalion/squadron level. These tests were developed in response to the 1997 Force Structure Review Groups' (FSRG) recommendations to seek improved methods of performing administration while reducing the size and composition of the 01 occupational field. These tests were also designed to exploit the availability of improved technologies (tools, systems and solutions). [Ref. 12]

Additionally, the Marine Corps contracted with KPMG consulting to analyze its technical architecture and administrative processes to determine which processes would yield the most savings in time, manpower, and cost. PricewaterhouseCoopers was hired to conduct a best business practices analysis of Marine Corps Personnel Administration, an analysis of corporate better business practices and finally to deliver a Personnel Administration alternatives and cost-benefit analysis to the Corps by May 1999.

The backbone of the Marine Corps administrative system is the Marine Corps Total Force System (MCTFS). The MCTFS is proprietary back office mainframe and server technology from the early 1980’s, which contains integrated personnel and payroll data for active, reserve, and retired Marines.

The two means of entering or retrieving data from MCTFS are the On-Line Diary System (OLDS) and the Unit Diary/Marine Integrated Personnel System (UD/MIPS). While

these systems provide commanders and personnel administrators with personnel and pay data, information is not readily accessible to the Marine. This system relied heavily upon administrators and thus creating inefficiencies such as:

- Increased processing time and backlog
- Increased data entry error in transferring information from paper-based forms.
- Degraded service to Marines and commanders.
- Increased labor costs in the 01XX (Admin) Occupation Field (OccFld) because of the need for administrators to support 100 percent of personnel transactions. [Ref. 9]

The implementation of the MCTFS predates the rapid growth of client/server technology, automated workflow functionality and the ubiquity of Web-based applications. The current front-end system used with the MCTFS is the UD/MIPS that is based on batch technology. The decision to undertake the TFAS initiative provides the Marine Corps with significant opportunities to automate and streamline its personnel administration system. The TFAS, as discussed in this thesis is essentially a new front-end system for MCTFS. It will function as the foundation of a self-service center, with a 24-hour call center, and interactive voice response (IVR) telephony Web-based applications. [Ref. 9] The 19 business processes have been selected for reengineering as part of the new streamlined data flow process.

Figure 7 below is a diagram of the current environment.

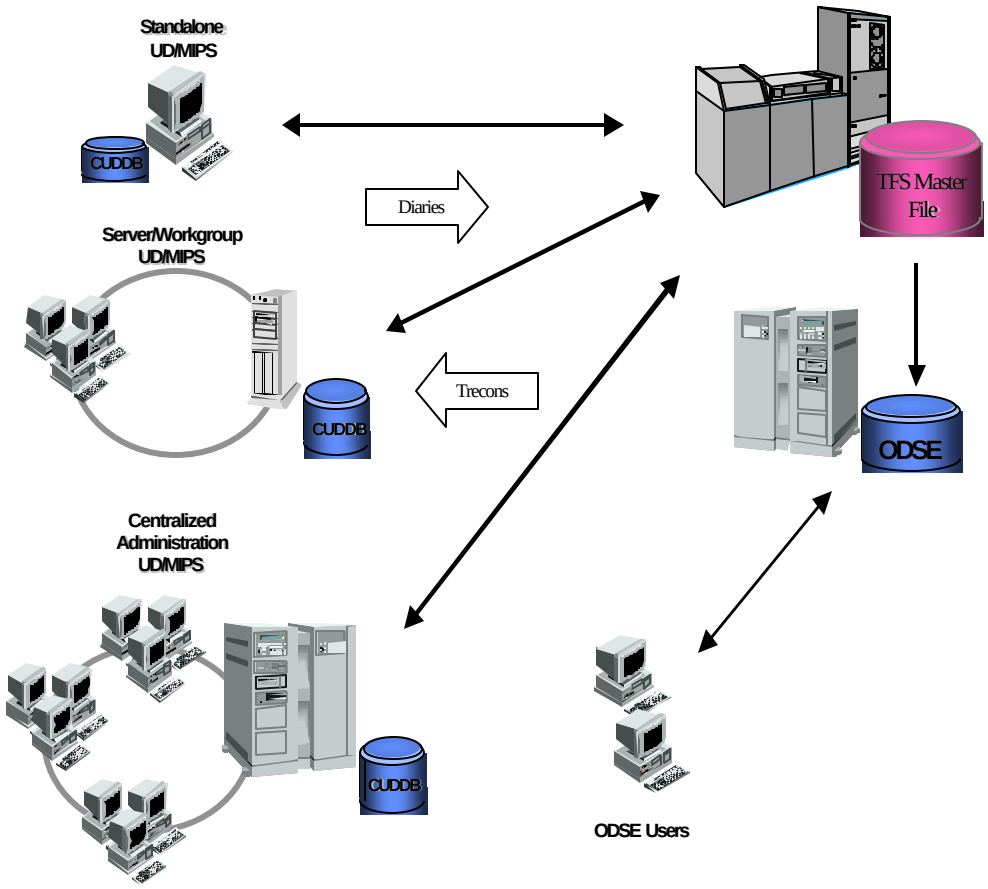

Figure 7. Current Environment From Ref [2]

B. CURRENT SITUATION

The TFAS is still in phase one, which is scheduled to last through fiscal year 2002 (September 30, 2002). Administrative Marines have already been consolidated from the battalion and squadron level to the regimental and group level. [Ref. 13] An interim set of standardized tools and processes have been deployed Corps wide. Other things scheduled for completion during phase one are the development of a technology acquisition strategy and establishment of Military Construction (MilCon)

requirements; and the completion of the technical architecture plans (scheduled to be completed by end of FY00). The Marine Corps plans to use an Abbreviated Acquisition Program profile to acquire the TFAS. The TFAS is currently budgeted at $12.8 million and with a request for $11.6 million in FY02. [Ref. 1]

The TFAS leadership after reviewing the options presented by the PricewaterhouseCoopers analysis has chosen alternative one as the best option. The Marine Corps did not, however, contract with PeopleSoft as the contractor for the project as the analysis recommended, choosing instead to tackle the front-end in house.

It should be noted that alternative two was the option with the greatest cost to benefit ratio. [Ref. 9] However, each of the options was less expensive than the status quo, due to the manpower intensiveness of the current system.

Alter-native	**Description**
One	**Maintain the MCTFS and implement self-service technology.** This alternative includes developing Web-based applications and interactive voice response (IVR) telephony to enable individual Marines to conduct routine transactions without assistance from an administrator. These new applications would be integrated with the existing MCTFS. This alternative also includes developing a shared-service call center for Marines who require additional assistance.
Two	**Replace MCTFS with a Human Resources Information System (HRIS) and implement self-service technology.** This alternative includes replacing MCTFS with a COTS client/server HRIS. Also, it includes developing Web-based applications and IVR telephony to enable individual Marines to

	conduct routine transactions without assistance from an administrator. These new applications would be integrated with the HRIS. This alternative also includes developing a shared-service call center for Marines who require additional assistance.
Three	**Maintain MCTFS and outsource the management of self-service technology.** This alternative involves selecting an outsourcing contractor to provide Web-based applications and IVR telephony to enable individual Marines to conduct routine transactions without assistance from an administrator. The contractor would provide call center services for Marines who require additional assistance.

Table 1. Summary of Alternatives From Ref. [9]

The Marine Corps has invested approximately $1.1 million in TFAS over the past two fiscal years.

1. Marine OnLine (MOL)

> The Marine Corps has established the foundation of a Web-based self-service environment through the creation of Marine on Line (MOL). The MOL is the portal or communications medium that will allow Marines regardless of location to access and interface electronically with their personnel data via any standard web browser connected to the Internet. The MOL has been designed to employ state-of-the-art security architecture to include Lightweight Directory Access Protocol (LDAP) and Secure Socket Layer (SSL). Appropriate technologies such as Public Key Infrastructure (PKI) combined with the proper business rules will authenticate the identity of the individual submitting information for processing. Verification procedures will ensure the validity of the information being submitted. [Ref. 2]

Information from Marine service records have already been linked to the MOL Website http://www.mol.usmc.mil/.

With a UserID and password, Marines can go online now and view or query selected data such as personal, training, and service information about themselves and their units. The MOL will be linked to the DFAS Employee/Member Self-Service (E/MSS) site and the Marine Corps Operational Data Store-Enterprise (ODSE). The Marines have reengineered processes in 19 areas that are being prepared for the TFAS and the MOL Website. These modules are being tested in the Fleet Marine Force (FMF) and will be implemented in modules once TFAS architecture has been implemented throughout the enterprise.

It should be stated that the Marine Corps was able to start the TFAS initiative in FY00 because of its cost and schedule strategy which will allow the leveraging of current resources allocated to UD/MIPS, MCTFS, and TFAS. [Ref. 2]

2. Information Technology Directorate, Kansas City Center (IDT-KCC)

The TFAS leaders chose ITD-KCC as the integrator for the TFAS project. This decision was made based on ITD-KCC's familiarity with the MCTFS and UD/MIPS and ITD-KCC's established service record of meeting the demands of the Marine Corps pay and personnel communities while providing cost effective service. [Ref. 2] The ITD-KCC was once a Marine Corps Central Design and Programming Activity. The ITD-KCC created the MCTFS that is considered the only integrated personnel and pay system within the DoD and one of the most technologically current personnel and pay client-server systems, UD/MIPS, found in the DoD.

3. Software Development

The TFAS will use the existing configuration control board for the MCTFS and the UD/MIPS that consists of ITD-KCC, the Marine Corps and DFAS-KC. Software will be released during the normal MCTFS and UD/MIPS software release schedule of April and October of each year. The TFAS has been broken down into 19 separate work packages that will be phased in by fiscal year. Preliminary documents do not specifically say who will create the software for the TFAS. Regardless of who creates the software, there are two concepts that are critical to interoperability when writing this software.

a. Modularity

Modularity is important when writing software because it can isolate system and hardware platform dependencies. Modularity allows the isolation of operations or processes that are likely to change, isolation of data management, and the isolation of input and output, which is what the TFAS wants to change most. Modularity supports encapsulation, which can result in greater cohesiveness. Cohesion is defined here by how closely the operations are related in a module and by the functionality of the unit. The best cohesion is functional—each module or unit has only one task. [Ref. 14]

b. Loose Coupling

Highly coupled modules traditionally have more errors and are more costly to maintain. Therefore, loose coupling is considered the best practice. “Good coupling

between units is loose enough that one unit can easily be used from another." [Ref. 14] Coupling refers to the strength of a connection between two modules or units of connection.

4. Risks

Managers for the TFAS have identified the risks associated with the initiative and developed a risk mitigation strategy. Risks identified include the following: [Ref. 2]

a. Project Risks

- TFAS relationship to the Defense Integrated Military Human Resources System (DIHMRS)
- Available funding for out years
- Selection of a vendor(s) and
- Ability to execute the plan

b. Technical Risks

- Technical architecture design
- Infrastructure support
- The infusion of new technology into the current service model

c. Development Risks

- The software development environment
- Integration with current initiatives

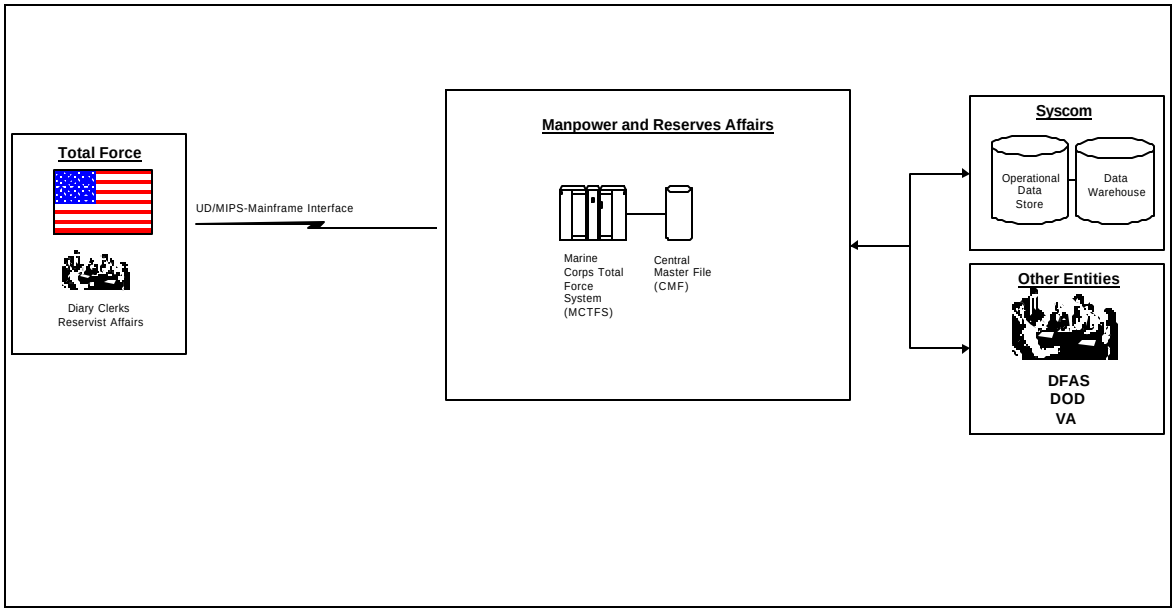

Figure 8. Primary Baseline Technology for Personnel Administration From Ref. [9]

C. DIFFERENCES BETWEEN THE MILITARY AND CORPORATE AMERICA

There are differences between corporate America and the military that can effect how an ERP or enterprise system is implemented. It is important to highlight these differences prior to moving to the analysis portion of this thesis. Figure 9 below illustrates that the information systems direction and computing architecture for an organization is derived from its organizational direction and requirements.

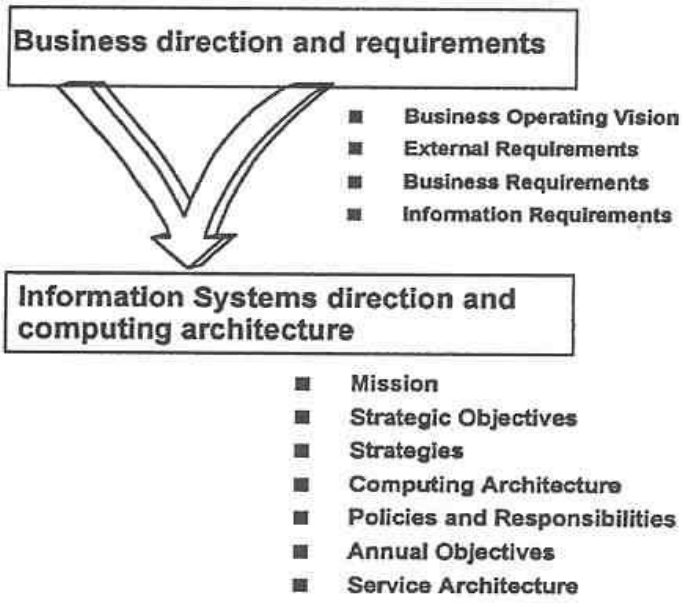

Figure 9. Current IS Situation Summary From Ref. [15]

It is very obvious that the military has a different mission and strategic objective than corporate America. Corporations are in the business of making money. There interests in implementing an ERP, e-business or enterprise information systems, will be centered on building corporate wealth. This can involve increasing consumer satisfaction, consumer loyalty, and giving contractors and consumers outside of the enterprise access to information found in applications and databases. The military does not sell a commercial product. Our customer is usually someone within the enterprise.

The biggest difference between the military and most organizations are the environment and external requirements in which our systems must be able to operate. Corporate

America does not have to worry about a potentially constantly changing hostile environment, such as a deployment or in a combat zone in the middle of the desert. Our garrison architectures often look alike with the exception that the military must build redundancy into their system and account for being able to communicate with minimum bandwidth in situations such as those mentioned previously.

Military systems often have long acquisition times and cycles because of the Congressional budget and oversight process. The military often does not use cutting edge technology. In the information systems arena, even when the military attempts to use cutting edge technology, by the time the project has been completed, the technology is no longer cutting edge. There have been recent exceptions to this rule under abbreviated acquisition rules. The military does not have competitors in the traditional sense and thus has more of a focus on increased efficiency and quality.

Both military and corporate organizations share the same type of concerns surrounding sound architectural and project implementations. However, corporations normally try to implement IT changes as quickly as possible, the military normally takes a slower, deliberate approach to implementation. The biggest reason for this is that the corporation normally considers opportunity costs as a part of the equation when determining the actual implementation costs. The military normally wants the system to work at the end of the implementation on or near budget. Different

information, external and business requirements lead to different implementation times.

There are different security considerations between military and other organizations. Access to military systems are usually concerned with allowing access only to personnel within the enterprise. However, most corporations have multi-tiered relationships with customers, potential customers, contractors, suppliers, and employees involving international and multilingual requirements. The military has security concerns that will require stringent user identification and authentication prior to access to any portion of the enterprise system. Thus while corporate America is ensuring that their platforms will allow for the connection of their systems to other suppliers and customers, the military builds their systems to prevent unauthorized access to their systems. This difference is the reason that military systems must use modularity and loose coupling in the majority of their systems.

The military lifecycle for systems and programs is different than corporate America. Example, when corporate America purchases a computer, often that computer will be upgraded or replaced in 18-month cycles; the military will keep this same computer in its inventory for many years, sometimes for as long as it is functional. It is, however, more risky for most organizations to upgrade their software than it is to upgrade their hardware.

According to PricewaterhouseCoopers, the Marine Corps personnel administration shares similar functions with corporate human resource systems many of which have been

modernized to include a self-service capability. [Ref. 9] This suggests that a self-service capability for the Marine Corps personnel administration is a natural evolution. The differences between the two are the processes and environmental factors previously mentioned.

IV. LESSONS LEARNED FROM CORPORATE ERP IMPLEMENTATIONS

The information gathered and compiled for this chapter comes from books, case studies, and magazine articles related to e-business, e-commerce, supply-chain management, ERP, and other enterprise information system implementations over the past couple of years. I attempted to capture the mistakes, problems, successful strategies, and hints that recurred most in my research or that stood out as being relevant to the TFAS. Keeping in mind the differences between corporate America and the military that were stated previously, the lessons learned that appear in the body of this chapter will not all apply to the TFAS implementation. Finally, I will focus on compiling a list of Key Success Factors for the TFAS implementation.

It should be noted that ERP projects outside of the military have a reputation for running over cost and behind schedule. However, there are numerous examples over the past two years of ERP implementations that have been both within cost and schedule. Web or Internet based implementations have become extremely popular during this time.

A. COMMON MISTAKES

The most common mistakes that ERP vendors, major corporations, and other organizations have reported from enterprise-wide information system implementations follow.

These mistakes are not listed in order of importance or frequency of occurrence.

- Companies often choose ERP packages simply from the functional requirements of the business without considering the company's ability to migrate to the package. [Ref. 10]
- Most systems focus primarily on either the planning requirements (on the front end) or the time and attendance/data collection (on the back end). [Ref. 6]
- An organization does not know its own system. Integration of existing systems is a regular speed bump of ERP implementations. "There are often surprises lurking in legacy systems and processes" says James McCullough a former CIO with Delta Airlines [Ref. 16] McCullough says of an ERP implementation "We thought we understood how the previous system worked…but when we really got down to it, we found it wasn't like we thought."
- Organizations attempt to customize packages. Customizing packages should be a last resort in rapid-implementation plans, as the practices included in these plans are usually better than existing practices. However, in the military we often get locked into processes that we would like to change due to Federal laws and regulation. [Ref. 17]
- Assumption that careful planning will lead to success. It takes vigilant monitoring of detailed goals, the committed involvement of executives and workers alike, a focus on customer needs and the careful building of a business case for the endeavor. [Ref. 17]
- The organization identified the new or destination architecture too late. Architecture in this passage refers to designing the system prior to determining the business direction or interrelationship and processes that must occur. [Ref. 10]

- The information from the back end of ERP does not always make it into e-commerce (Web-based portals, front-end system) applications. [Ref. 18]
- Difficulties with defining uniform data fields and ensuring data integrity. The result is IT departments can not accurately track their e-commerce data in their ERP systems and can not push information from ERP to e-commerce applications. [Ref. 19]
- Implementation takes longer than planned. The average ERP implementation takes between one to three years. "Real transformational ERP efforts usually run between one to three years, on average." [Ref. 20] Do not focus on how long it takes to implement the program; rather focus on why you need it and how you will use it to improve your business. Note: ERP implementations have gotten quicker. This comes from a 1999 case study.
- ERP has hidden costs that can result in budget overrun. [Ref. 20] Training, integration and testing, data conversion, data analysis, and post-ERP depression are just some of the hurdles that must be jumped in an ERP implementation. Acquisition overruns are still common in ERP implementations today. However, underestimate the cost to upgrade the IT infrastructure support is an overrun that is common but less publicized.
- Planners do not allot enough time in the work plan to deal with vendor problems. [Ref. 6]
- Most enterprises end up with incompatible technical architectures. Two most contributing factors to this are: 1) Bad decisions on how to handle legacy systems and 2) IS personnel take too long to come up with a decision about technical architecture and then the end-user community goes ahead without the Information Systems department involvement. [Ref. 10]
- Companies do not budget or plan for the costs of new IT skills and infrastructure in addition to the ERP package implementation. The technical

audit helps indicate the cost of migrating to ERP packages. [Ref. 17]

- Most companies do not have good change management resources. [Ref. 17]

B. KEY SUCCESS FACTORS

The factors below were recurring themes in my literature review. If you put a "did not" in front of the following key success factors, the result would be additional things that could be added to the list of mistakes an organization can make during an ERP implementation. The things that should be done are as follow:

- Plan prior to implementation. Plan for actual rollout of the new system early on in the project cycle. Perform an IT readiness assessment to determine if the necessary IT infrastructure is in place to make sure each site can handle the new system. [Ref. 21]
- Users should conduct a rigorous internal audit before selecting application packages to ensure package-readiness and to facilitate the package selection and implementation process. [Ref. 22]
- The various architectures must be established and agreed-upon prior to starting work on the first application. All system developers should employ this architecture as a framework for their design efforts. [Ref. 10]
- The organization must conduct a thorough review of business and technical audit prior to selecting the ERP package. The package you choose should be based on business goals rather than desirability of features. [Ref. 10]
- Perform a Legacy Audit where the existing applications are divided into three categories. 1) Maintain, 2) Maintain and interoperate, or 3) Replace with new solutions. [Ref. 2]

- Companies need to consider the practicality (cost and complexity) of their real-time requirements. Companies need to decide whether to focus on a unified mega-center approach or on distributed islands of automation. [Ref. 22]
- An ERP package should be viewed as a framework capable of supporting targeted niche solutions. The corporate project team should determine the required integration for each division and evaluate existing working solutions as well as targeted niche alternatives. [Ref. 22]
- Form an effective project team and establish effective communication mechanisms up, down, and across the organization. [Ref. 22]
- The project team must have representation from senior management, application package vendor, the systems integrator, the database vendor, and the hardware/server vendor. [Ref. 22]
- A system integrator should be used for large ERP projects. [Ref. 16]
- Consider the presentation tier, application tier, and database tier when designing the architecture of ERP packages. The separation of the presentation, application, and data layers (either physically or logically) has become the accepted paradigm for building deliverable, modular, and updateable client/server applications. Good application design, with emphasis on reducing network input/output is critical to success in client/server environments. Additionally, selecting scalable and high-performance servers and tuning them properly is also essential. [Ref. 22]
- Users should choose infrastructure components (hardware, DBMS, operating system) with the broadest market acceptance. They will have the broadest potential "integration tool set" from which to choose. [Ref. 23]
- Users should attempt to run all operational applications against a single operational data store because this provides for the best or most elegant integration. If this is not possible the

user should focus on the openness of the applications data model and the underlying infrastructure platform. [Ref. 22]

- Ensure extensibility of the system. [Ref. 22]
- Users should anticipate the need to extend ERP packages to data warehouses and pay particular attention to the infrastructure requirements. [Ref. 12]
- Develop a quantifiable business case. Establish concrete goals for the business processes you want to improve and calculate the expected benefits to be realized from these improvements. [Ref. 20]
- Define best practices. Identify key migration points and the precise type and timing of change. [Ref. 21]
- Strictly monitor implementation schedules and costs. Once rollout actually begins, all milestones should be carefully tracked, measured and rechecked to ensure that scheduled changes were made on time and on budget. [Ref. 21]
- Cross-cultural training. Make sure that all affected people are provided with training on the new program. [Ref. 21]
- Rigorous tracking of deliverables. Identifying and then relentlessly tracking the complex web of incremental milestones is critical to the success of a project. [Ref. 21]
- Access to all tools should be accessed from one portal. Portals can be customized based on the level of user or all users can see the same menus but with access safeguards built-in. A single access point can also be a security feature. [Ref. 24]
- Map out the functions that an integrated system must perform. [Ref.17]

- Articulate expectations before implementation. What will the project’s stakeholders say are the attributes of the new environment in a year?

Where are the gaps in the plan? What conflicts of opinion exist today? [Ref. 17]

- Do not change too much at once. Major change requires an evolutionary approach. Do not overwhelm your organization with a system that has more functionality than you absolutely need. Consider a phased rollout and shoot for short wins to generate momentum during the project. [Ref. 17]
- Keep to the basics. Resist customizing the software or including optional features … ways aim high enough to make a difference, but not so high that the target will be missed," says Jorge Taborga, vice president and CIO of Bay Networks Inc. [Ref. 17]
- Do not let technical problems dominate the project's time. Create a dedicated staff position for change management within the organization. Use your best and brightest people on the change team. [Ref. 17]
- View ERP implementation as a business initiative, not an IS initiative. [Ref. 18]
- Keeping an integration project in-house can offer the freedom to find creative solutions to integration problems. Hacking through an integration process in-house lets CIOs experiment with various integration methods and architectures." [Ref. 18]
- Do not be afraid to hire out. [Ref. 18]
- ERP implementations often leave the company still in a position where it cannot share information horizontally. These companies have to figure out how to connect their internal e-commerce and ERP applications outside of the enterprise. In the military, we would be concerned about possibly being able to share information in a joint environment. [Ref. 18]

Figure 10 below is a summary of the key success factors for any enterprise information system implementation.

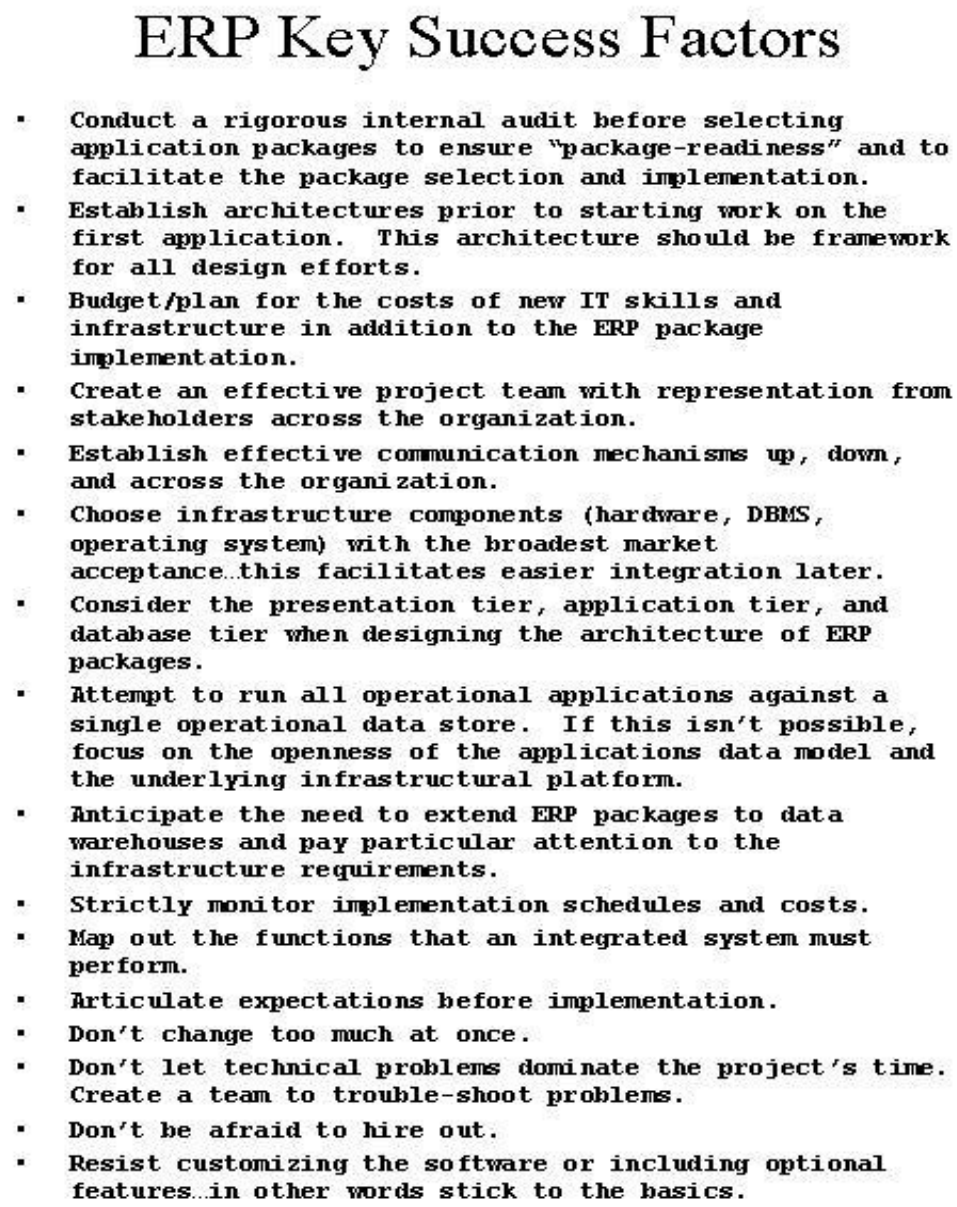

Figure 10. Traditional ERP Key Success Factors

Figure 11 below is a condensed list of the things that I consider the most relevant to the TFAS project.

Figure 11. TFAS Key Success Factors

The lessons listed while seeming universal are not applicable to all enterprise system implementations. The mistakes and success factors are not all applicable to military enterprise systems. They are not even universal to all corporate enterprise implementations. It should be noted that this list is not all-inclusive. Absent from most of the literature I reviewed were concerns for building operational type security features into the enterprise system. Additionally, there was little in the lists on communication platform mistakes. The unique requirements of military systems and the environments in which our systems must work in are part of the reason for this. I am sure that there are other areas that I have not covered in this thesis. Thus, those who know the TFAS system the best must add to this list of key success factors.

V. EVALUATION OF TFAS'ARCHITECTURE

Mark Goodyear [Ref. 10], states that the four main components of effective enterprise information architecture are the business solutions, application architecture, technical architecture, and the communications platform. This thesis only attempts to evaluate the technical architecture of the TFAS initiative.

The business solution architecture is a combination of the environment, business requirements and data architecture. Goodyear says, "When it comes time to decide what technical architecture to use, many of the answers are found by looking at the business solutions architecture." [Ref. 10] The applications architecture refers to those components that provide the automation support for a business function or activity not including the platform. The technical layer is comprised of the (1) execution architecture, (2) development architecture, (3) operations architectures, and (4) the infrastructure and system software layers combined. The platform architecture involves the "servers, workstations, operating systems, and networks." [Ref. 10] Figure 12 is an illustration of how these different architectures of the technical layer relate to each other and, as a whole is the foundation of the enterprise application.

The C4ISR Architecture Framework states that the three types of architectures as operational, systems, and technical. "The C4ISR Architecture Framework provides guidance on describing architectures." [Ref. 5] The C4ISR puts much focus on architecture views or diagrams and the

tools available to build effective diagrams. Chapter III even lists six steps to building architecture. However, reference ten, "Enterprise System Architectures: Building Client/Server and Web-based Systems" was used as the basis of most of the definitions in this thesis because of this thesis' focus on corporate and enterprise architecture.

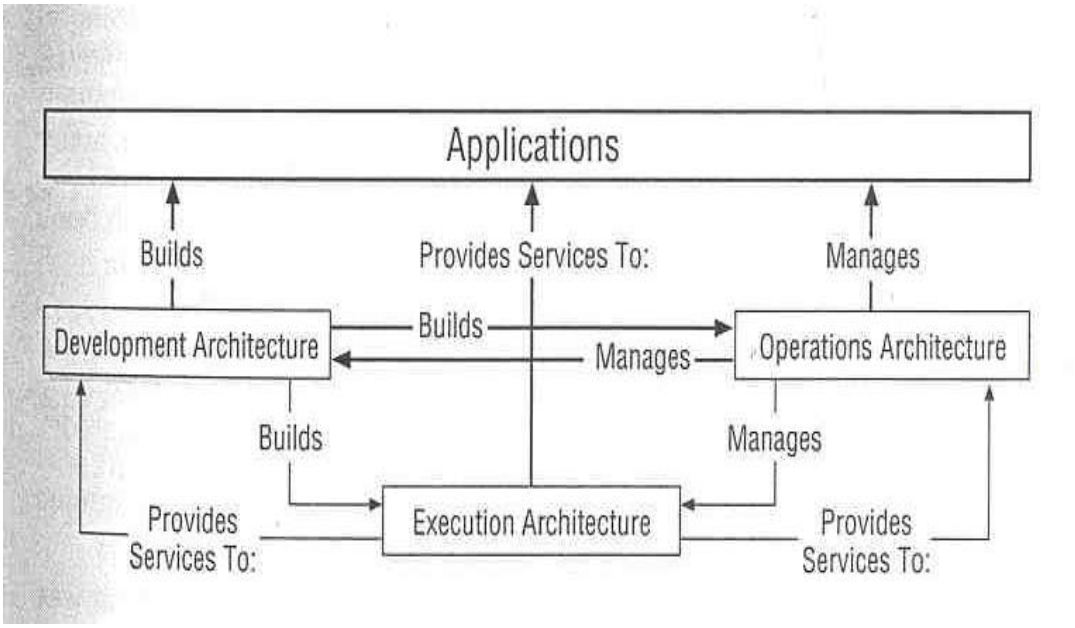

Figure 12. Relationship Among the Technical Architectures From Ref. [10]

A. TECHNICAL ARCHITECTURE

1. No Development Architecture

No development architecture was included in any of the preliminary documents or in the study conducted by the two consultants KPMG and PricewaterhouseCoopers. A formal

technical architecture study was completed and published by KPMG prior to September 31, 2000 (FY' 00). **However, this study has not been posted for public viewing and was not provided, as requested prior to the completion of this thesis.** Therefore, this thesis can only evaluate the currently published architectural information. I am unaware of whether development architecture was included in this technical study. The TFAS documentation does mention that the TFAS will be accomplished within the TAFIM and JTA architectural standards. Figure 13 and figure 14 below are the JTA and TAFIM models that TFAS has to comply with.

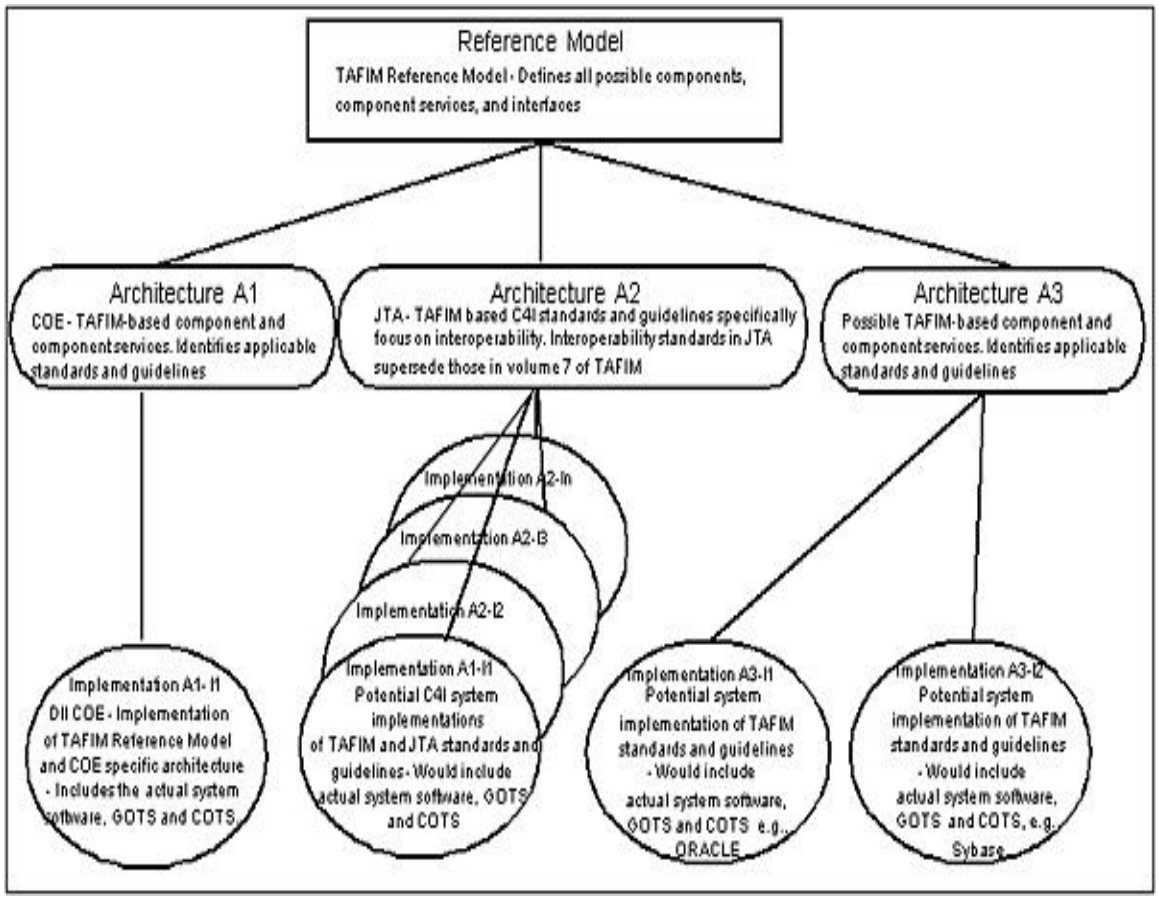

Figure 13. JTA Model From Ref. [25]

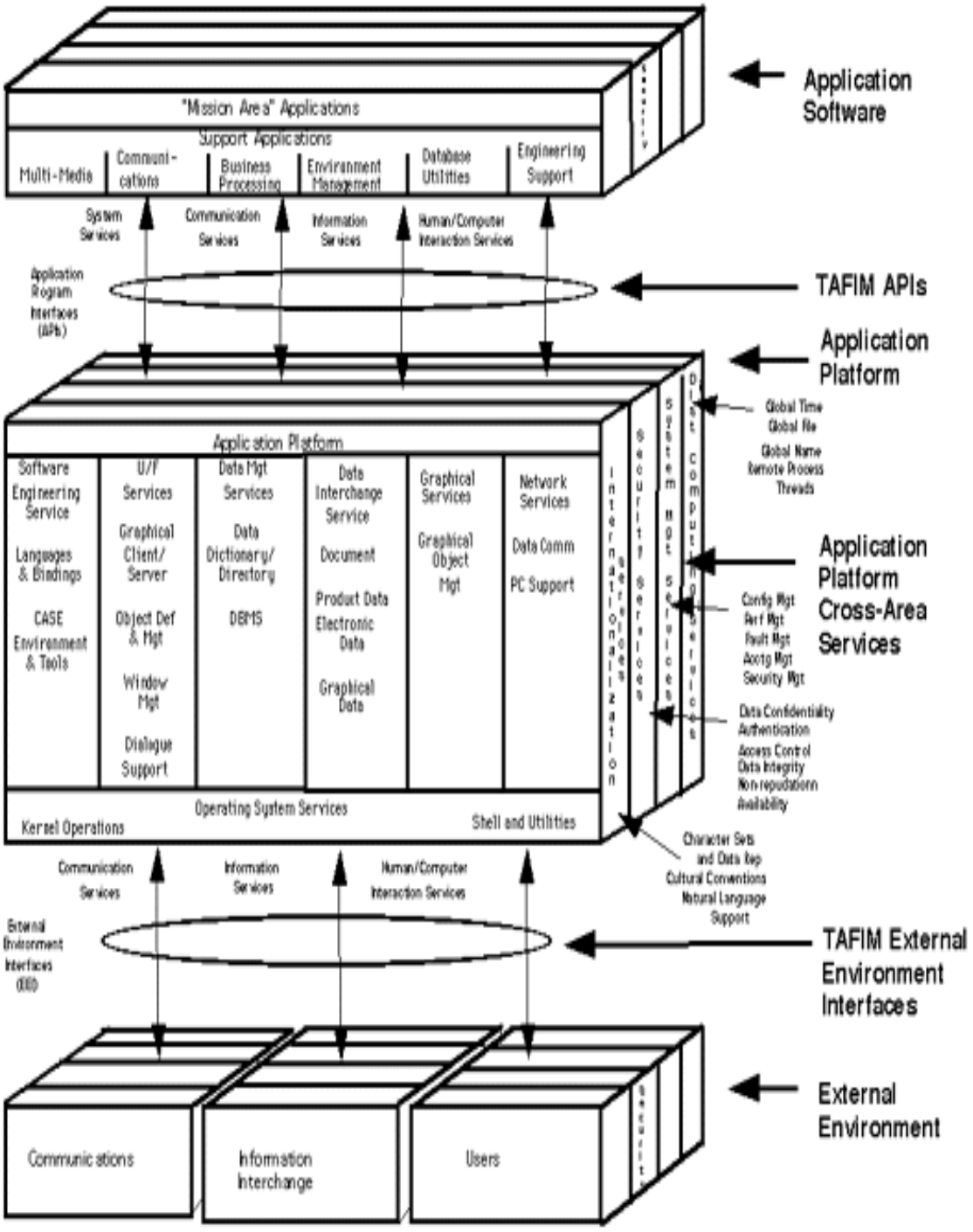

Figure 14. TAFIM Model From Ref. [26]

However, I am not thoroughly familiar with these two models, thus this thesis will not evaluate the TAFIM and JTA models and how they apply to the TFAS. The TFAS designers have listed the following qualities [Ref. 2] that the TFAS architecture will have to take into consideration to meet TAFIM and JTA standards.

- Interoperable – allowing connectivity and interchange of information among information resources on the network, application, presentation and data levels without special connections, procedures or other intermediate translation, and gateway devices.
- Transparent – providing the user with a virtual information services environment so the user does not need to know where the applications and data reside.
- Scaleable – supporting information system environments from large, fixed facilities, and networks to hand-held and disconnected devices in any clime or place.
- Responsive – guaranteeing assured services, quickly available, when and where needed worldwide.
- Secure – implementing multiple security policies and assuring required information systems and communications security and availability.
- Easy to use – providing intuitive interfaces tailored to the user's preferences where possible.
- Flexible and maintainable – architecture must allow quick migration and integration of new applications and technology (e.g., through the use of standards-based and vendor-independent approaches).

- Reliable – architecture must support alternative resource and service access or graceful degradation.
- Affordable – architecture must provide the best value for required services (and only required services) in the most efficient way available consistent with mission needs.
- Evolvable – architecture must include special methods, metrics, tools, and environments to evolve to new capabilities.
- Survivable – Architecture must ensure essential information is available to meet mission requirements under varying conditions.

Although, not included in this list, information integrity and operational security are two qualities that all military system architecture should have as cornerstones in addition to the list above.

Figure 15 is a guide for understanding the development architecture or environment and an illustration of things that should be included.

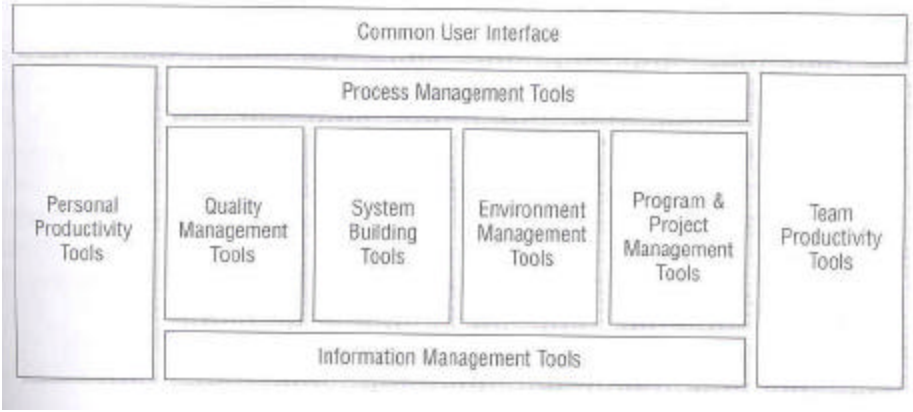

Figure 15. Development Architecture From Ref. [10]

Mark Goodyear [Ref. 10] raises one major concern about the development architecture and environment. He states as follows:

> In the client/server and netcentric environment it is vital to get the development environment right the first time. Changing the development environment when construction is fully staffed may entail serious disruptions and expensive loss of productivity. The purpose of the development architecture is to support the tasks involved in the analysis, design, construction, and maintenance of business systems as the associated management processes. [Ref. 1]

> The purpose of the system architecture process is to provide integral technical overview and consistency, to maintain the integrity over time, and bridge the gap between the policy and planning process and the product creation process. [Ref. 16] The technical architecture provides a standard and consistent approach for creating or modifying a system. Normally a technical architecture will have three parts: the execution architecture, the development architecture, and the operations architecture. Having these three architectures as part of the overall technical architecture provides: "a common background for information system personnel, a more rapid delivery solution and a reduced impact of change. [Ref. 10]"

Muller [Ref. 27] indicates that the key issues in drafting systems architecture plans are: balance, consistency, integrity, simplicity, and elegance. The goals to be balanced by the system architecture process are: external and internal requirements, short term needs and long term interests, efforts and risks from

requirements to verification, detailed designs mutually, and value and costs.

Figure 16 demonstrates that as project complexity and degree of business process increases so does project risk and cost.

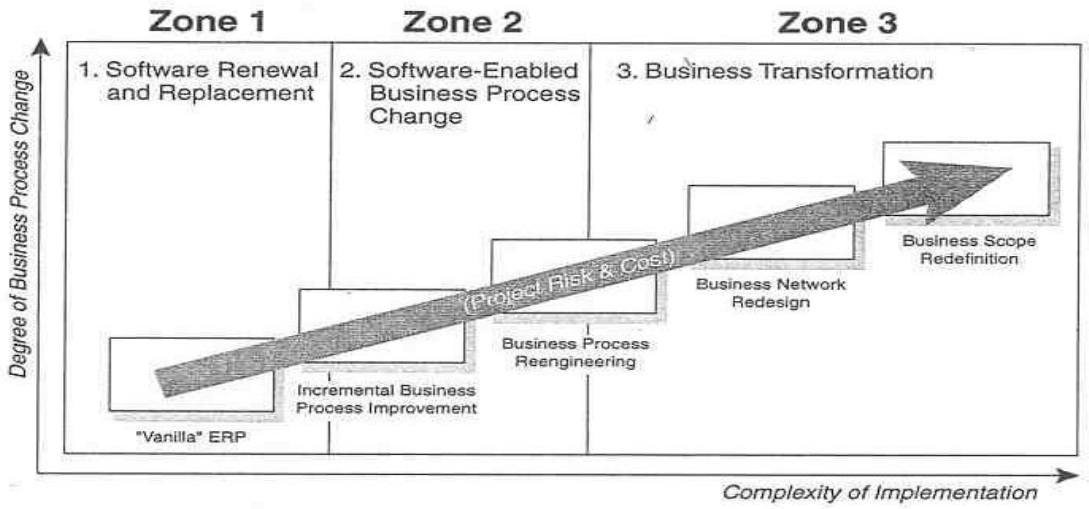

Figure 16. Complexity Increases with Increased Process Change From Ref. [6]

Prior to implementing any system, an organization should assess its current capabilities and its desired capabilities. Figure 17 was created by PricewaterhouseCoopers [Ref. 6] to assist companies in determining where they are in standard enterprise and e-commerce terms and where their desired changes will take them. Using this model as a basis, I would rate the Marine Corps' current system as a borderline Nonintegrated System and Limited/Single Function ERP. The TFAS implementation is only a channel enhancement that better

positions the Marine Corps to move to the value-chain integration arena. The Marine Corps current status can be seen in Figure 18. It is highly unlikely that the DoD or the Marine Corps will ever achieve or even desires to achieve the industry transformation phase. However, the idea of achieving an integrated Enterprise ERP system is something that should appeal to the U. S. Marine Corps and the other military services. An integrated Enterprise ERP system is one in which human resources, finance, supply and logistics, and other areas such as recruiting are all interoperable and connected allowing for richer knowledge and decision support. If this phase could ever be achieved, the idea of convergence would then be imaginable, where all the services integrated ERP systems could be linked together for the sharing of information within DoD and amongst contractors.

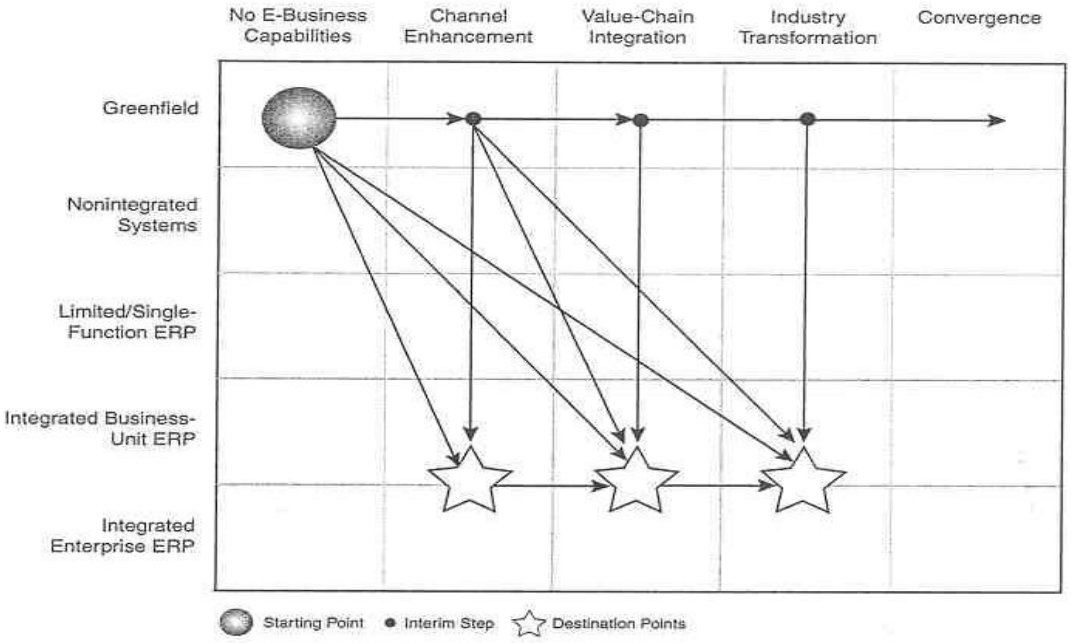

Figure 17. ERP evolution From Ref [6]

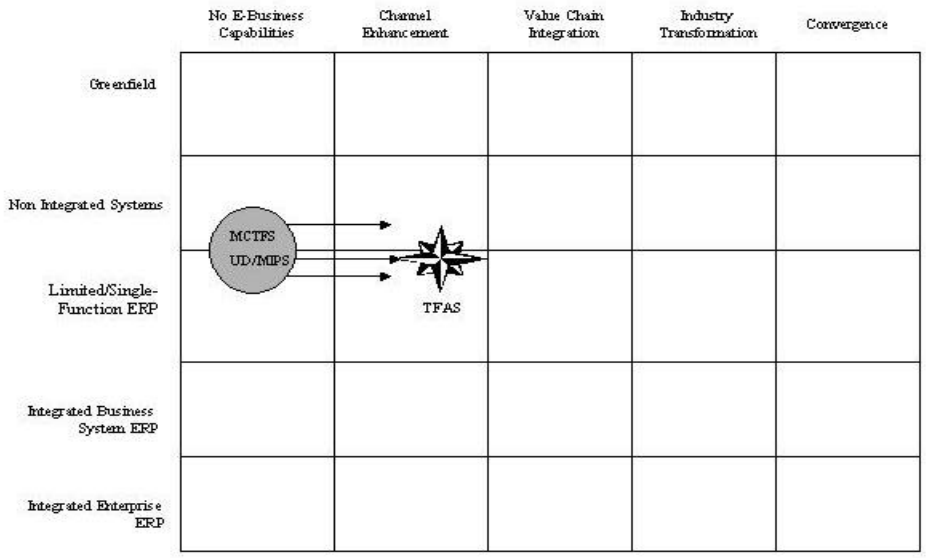

Figure 18. The TFAS Evolution After Ref. [6]

B. OPERATIONAL ARCHITECTURE

"The operations architecture is a combination of tools, support services, procedures, and controls required to keep a production system up and running well." [Ref.10] The primary users of the operations architecture are "system administrators and production support personnel." [Ref. 10]

Figures 19 and 20 below are listed in the TFAS documentation as operational architecture diagrams. They actually represent more of a data flow rather than operational architecture. However, since these are the only "operational architecture" diagrams found in the

preliminary assessment, we will evaluate the information in these diagrams at this time.

1. Current Operational Architecture

a. Observations from the "As-IS" Operational Architecture

The "As-Is" Operational architecture tells the same story as the situational state diagram. This architecture shows interaction with the system to be limited to just two levels in the current architecture. It demonstrates the systems reliance on administrators to validate, authenticate, enter, and access data.

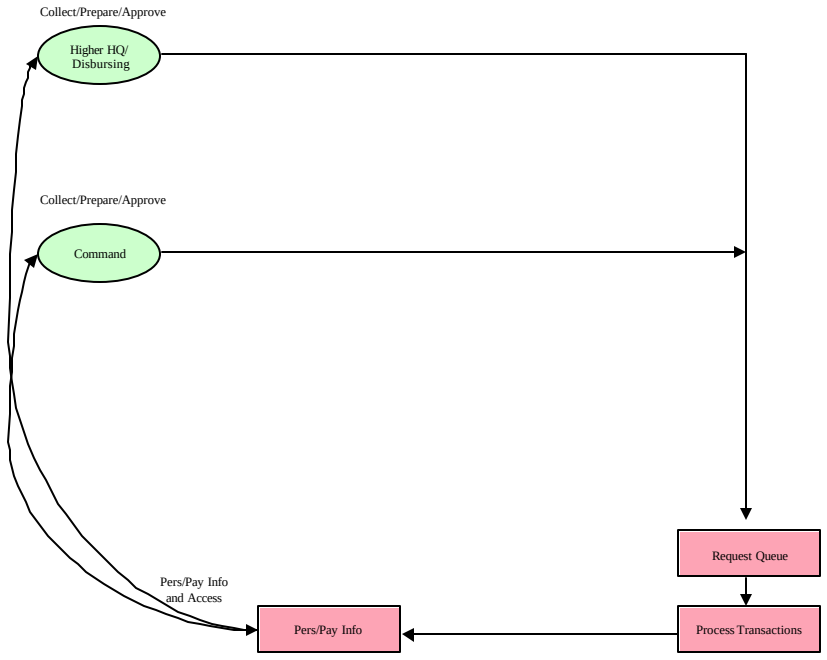

Figure 19. "As Is" Operational Architecture From Ref. [2]

2. Proposed Operational Architecture

a. Observations from the "To-Be" Operational Architecture

The "To-Be architecture is simply a demonstration of the five levels of interaction with the current system. The purpose of the TFAS is to spread the responsibility for keeping records up-to-date from the administrator to the individual Marine and others in the chain-of-command. The operational architecture accurately portrays this concept. The approval blocks show some of the controls that will disperse throughout the system at different levels.

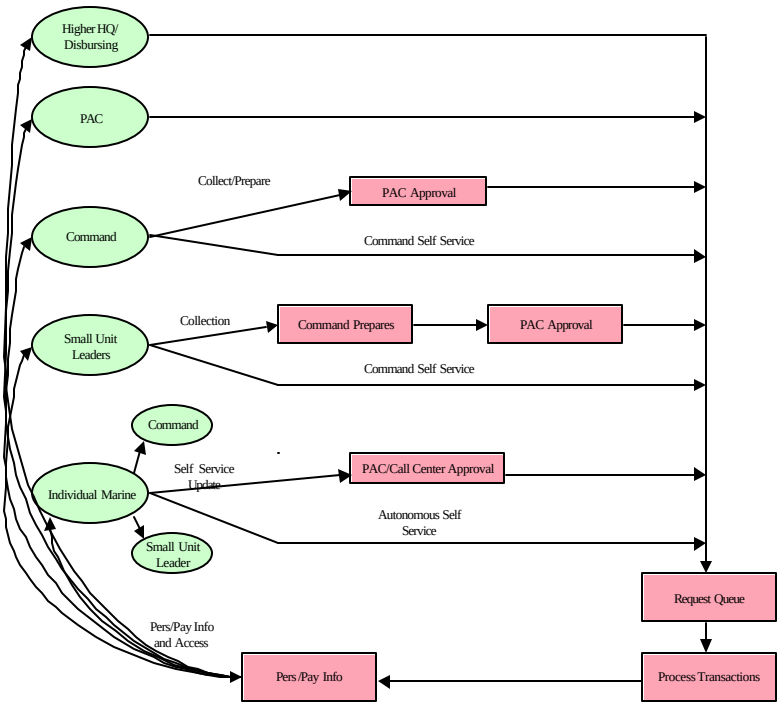

Figure 20. "To Be" Operational Architecture From Ref. [2]

C. EXECUTION ARCHITECTURE

The Marine Corps describes the current environment, Figure 21, as a "state of the art, distributed client-server system" that has evolved in the last three years through technology refreshments." [Ref. 2] It is true that the current architecture has client/server capabilities. However, the majority of data input into the system is still based on batch unit diaries. Information can be retrieved via UD/MIPS online, but that data is not always the most current due to the processing time of unit diaries. The TFAS documentation says that the current system is "providing users access to information, resources, and capabilities never experienced within the realm of Marine personnel and pay administration." [Ref. 2] While this may be true, the output from UD/MIPS probably falls somewhere between the data and knowledge realm. It has been two years since I last used UD/MIPS and therefore am unaware of whether it has been updated to provide richer data that could better support decision support.

The TFAS is intended as mainly a garrison solution for Marines, and the execution diagrams below reflect that view. However, for the TFAS to achieve the goal of being compatible with Operational Maneuver from the Sea and have the reach back capability that this will require deserves attention now in the early stages of the program. With the bandwidth requirements of the TFAS, it is certain that solutions for the deployed, bandwidth-limited environment must be developed to allow the smallest administrative footprint possible. Administrators can use UD/MIPS in a

deployed environment much as they do today to handle the bulk of the administrative workload. However, Marines will be used to having information at their fingertips in garrison and would have to adjust their routine or process for handling administration while embarked on ship for example. However, options can be built into the system to make the transition from garrison to austere conditions easier for the individual Marine. Some of those options include decoupling the information system to facilitate e-mail transactions to the PAC rather than the keystroke-by-keystroke environment they would encounter via the Web; A cd-rom(s) with all Marine info could be deployed with the Marines to allow Marines to continue to access their info per the latest cd-rom update; or using secondary memory (cache) on shipboard servers or other computers to store data. Any of these solutions would minimize required bandwidth and interactivity with MCTFS servers/databases and PACs. Additionally, the use of multi-casting data to the PACS could reduce PAC interactivity with MCTFS servers and databases.

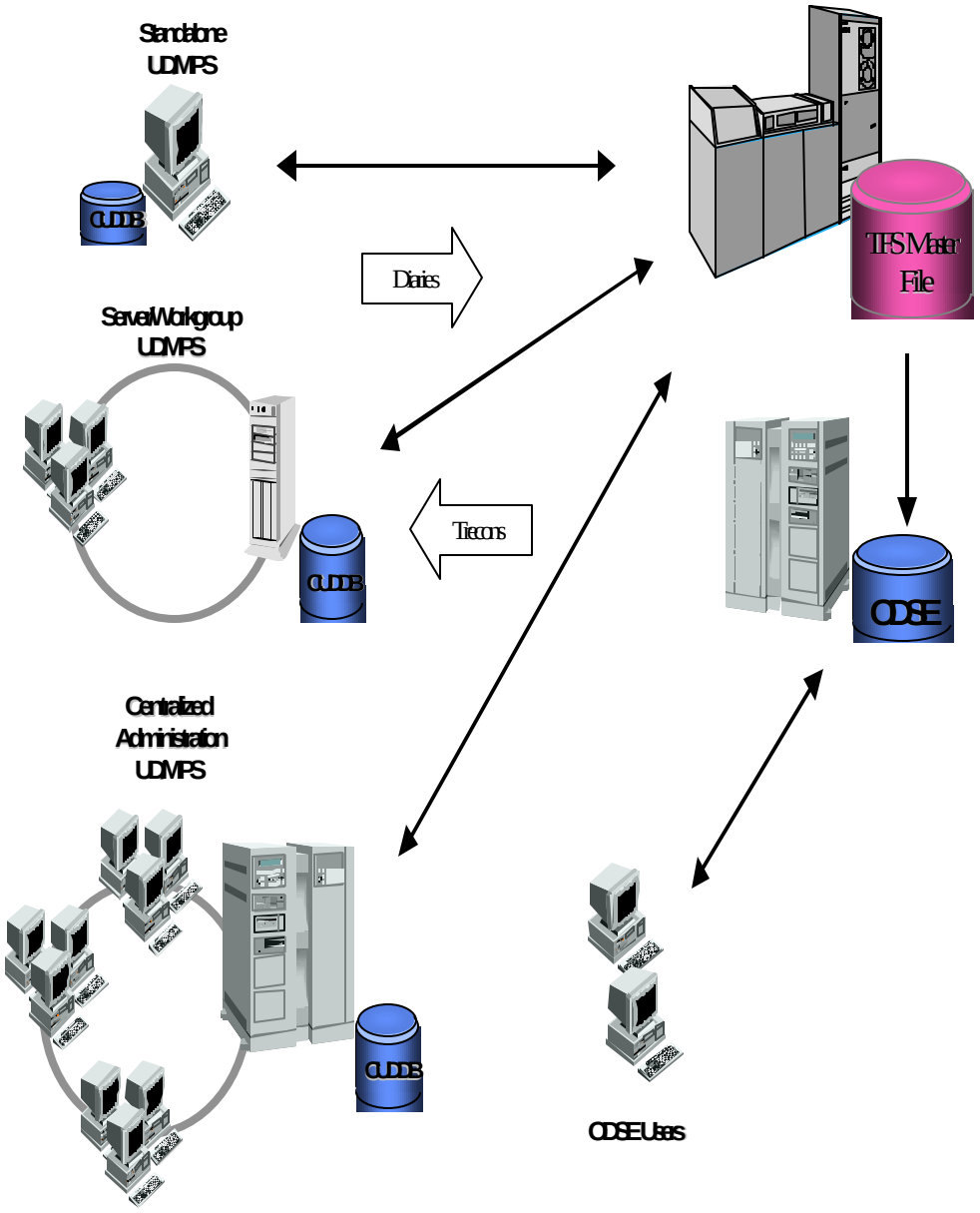

Figure 21. Current Environment From Ref. [2]

1. Level 1: The Individual Marine

a. Desired End State

Capabilities will be made available to individual Marines that allow them to submit pay and personnel-related information via telecommunications systems to central processing activities, identified as Personnel Administration Centers (PACs). Marines will primarily submit transactions via a Web-based, menu-driven application from a computer with Internet access. They will be able to access their pay and personnel accounts to review information and to submit required changes electronically, telephonically or via the mail without having to physically go to a personnel administration office. This capability will also be available from ships and the full range of expeditionary environments. [Ref. 2]

b. Figure Depiction

The individual Marine will be able to access information and report certain transactions via a computer with a Web browser. The Marine can also phone the Call Center and review information or submit transactions through the interactive voice response system (IVRS). In the event Marines need assistance, they will be able to talk directly to a call center representative who will them information and submit certain transactions on their behalf. Marines will also be able to get support in a

conventional manner through their small unit leader or traditional reporting unit admin section. [Ref. 2]

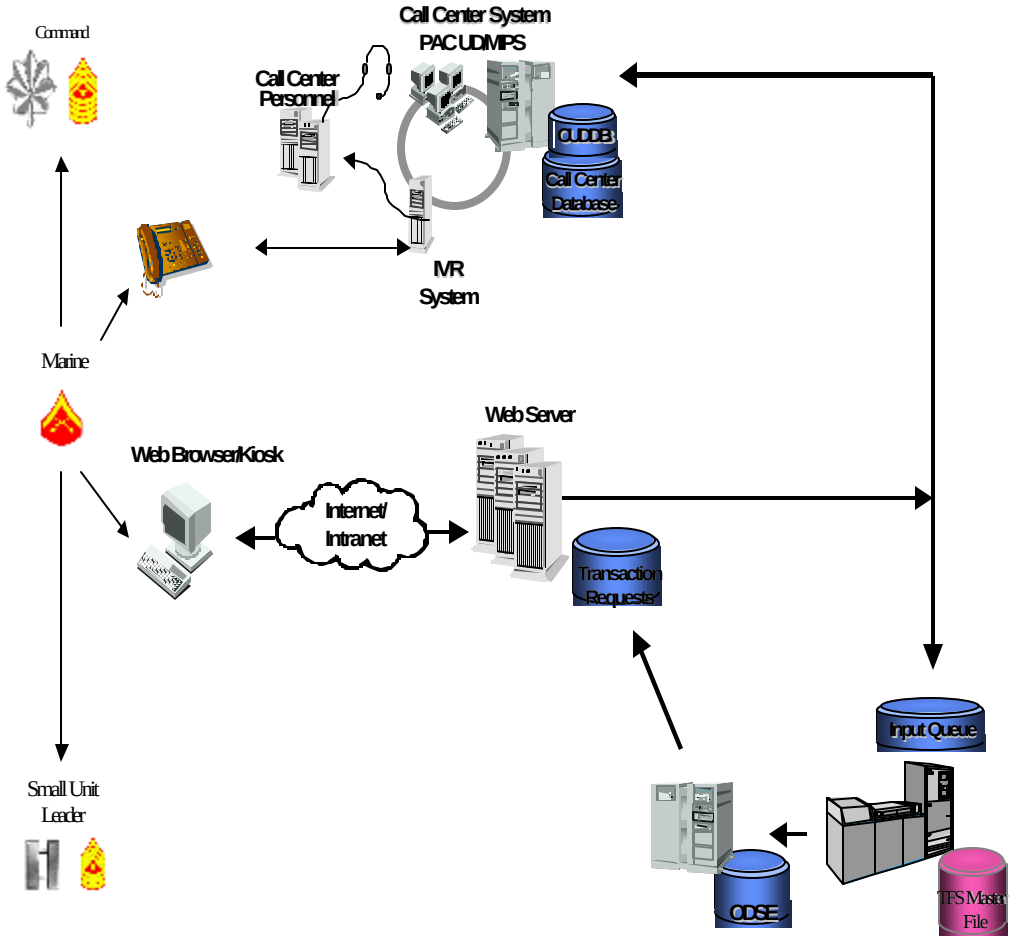

Figure 22. Individual Marine From Ref. [2]

c. Analysis

Success of the TFAS project depends upon success at this the first level. If the TFAS implementation works as pictured in this Figure 22, which shows the individual

Marine taking care of the majority of his own administrative needs with minimal guidance from his small unit leadership. Information from Marine individual records have already been pushed to the Web via MOL, the key is for Marines to have the ability to push information back.

2. Level 2: Small Unit Leaders

Figure 23 is a diagram of the level 2 execution scheme.

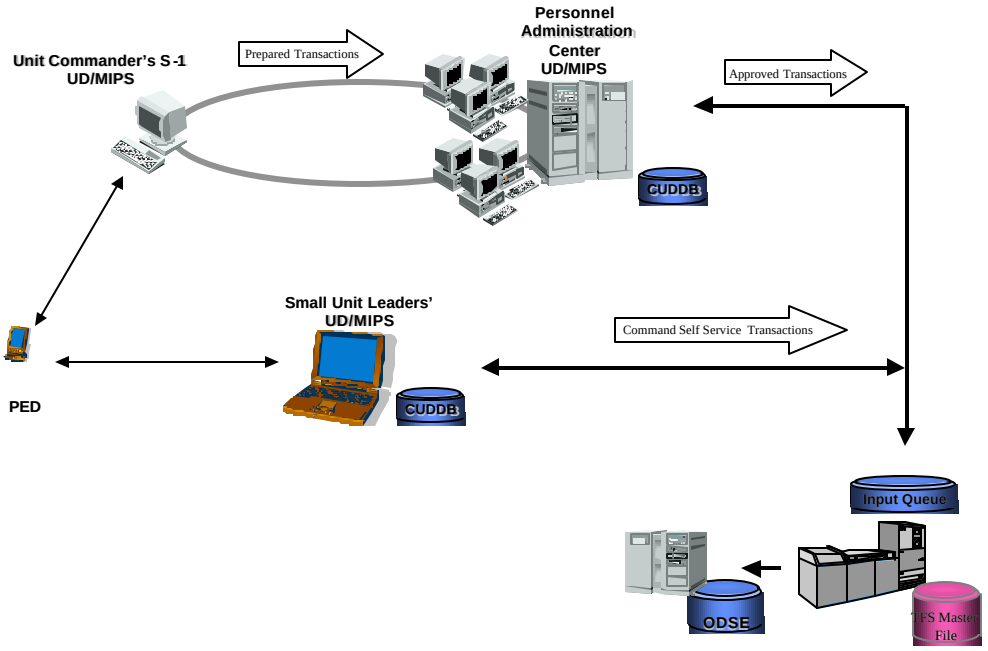

Figure 23. Small Unit Leaders From Ref. [2]

a. Desired End State

The goal for small unit leadership is to be able to input Marine training information into the system while

providing oversight of individual Marine transactions. An abbreviated version of UD/MIPS should be in place so that unit leaders do not have to become experts with the current UD/MIPS that requires training and expertise for information input.

b. Figure Depiction

Small unit leaders will be able to remotely capture information with a personal electronic device (PED) similar to a personal digital assistant (PDA). The PED can upload information directly into MCTFS via a significantly scaled down and abbreviated version of UD/MIPS designed for non-administrators or the full version of UD/MIPS located at the traditional reporting unit level. Transactions can also be keyed directly into the UD/MIPS. The PEDs can receive downloads from the small unit leaders simplified UD/MIPS or complete UD/MIPS, and allow users to view pay and personnel information in a highly portable configuration. Small unit leaders will also have the capability to review pay and personnel information on their Marines. [Ref. 2]

c. Analysis

The idea is to use PEDs to record information at training events and then go back and hot-sync the PED to a computer with a scaled down version of the UD/MIPS. This appears to be a great idea, but there is little information in the preliminary documentation that discusses how this will be accomplished. I am not sure how feasible an abbreviated version of UD/MIPS is either.

3. Level 3: Battalion and Squadron Commands

a. Desired End State

Commanders at the battalion/squadron and above levels will retain an administrative capability to collect, provide quality control and forward personnel and pay-related information to the Personnel Administration Center (PAC) for final processing. This will be primarily focused on command-originated data, but the capability to forward any information on behalf of the individual Marine will be available. These administrators will also review feedback reports on data submitted to a PAC by individual Marines via Web applications, toll free telephone services or the mail. This will enable the commander to stay informed of the changing personnel status of his or her Marines. The commander will have electronic access to pay and personnel-related information on Marines to facilitate situational awareness and unit-level decision making.

b. Figure Depiction

Figure 24 simply shows that at the battalion and squadron level, administration will be conducted the same as it is now. The only changes are that the number of transactions that will be processed at this level will be significantly streamlined. The squadron or battalion will have oversight over certain functions that only happen above the company level and not requiring (PAC) approval.

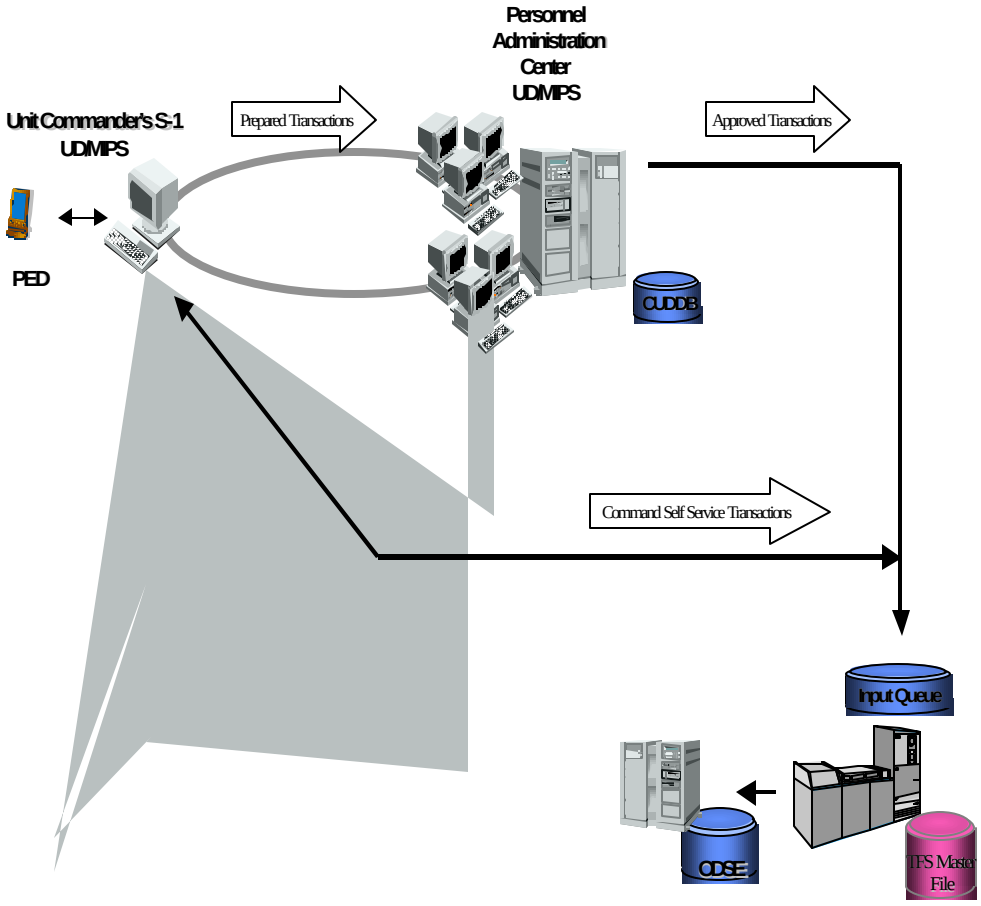

Figure 24. Command (Battalion & Squadron) From Ref. [2]

c. Evaluation of Desired End State

This is how things are done today with fewer transactions and responsibility. I see no problems with acquiring this level of the TFAS.

4. Level 4: Personnel Administration Center

a. Desired End State

The Marine Corps plans on establishing a minimum of three Personnel Administration Centers (PACs). The consolidation of Marine Corps administrators would eventually end at the PAC level. Administrators would migrate from Regimental/Groups to Division/Wing and then finally to base or PACs. With each consolidation, the number of administrators required to handle the administrative would be the level at which Marine Corps administrators would be consolidated.

b. Figure Depiction

The PAC will have the ability to receive traditional reporting via the UD/MIPS in addition to processing required information from Marine self-service. One of the PACs would host the TFAS call center for handle all call center functions. A second call center would be the alternate call center that would be operated when the primary call center was inoperable. Each PAC would focus primarily on serving Marines whether active duty, reserve, or retired in their region of responsibility. However, a PAC could process information on any Marine during times of system failure. The PAC users would have access to information in the operational data store enterprise (ODSE) database.

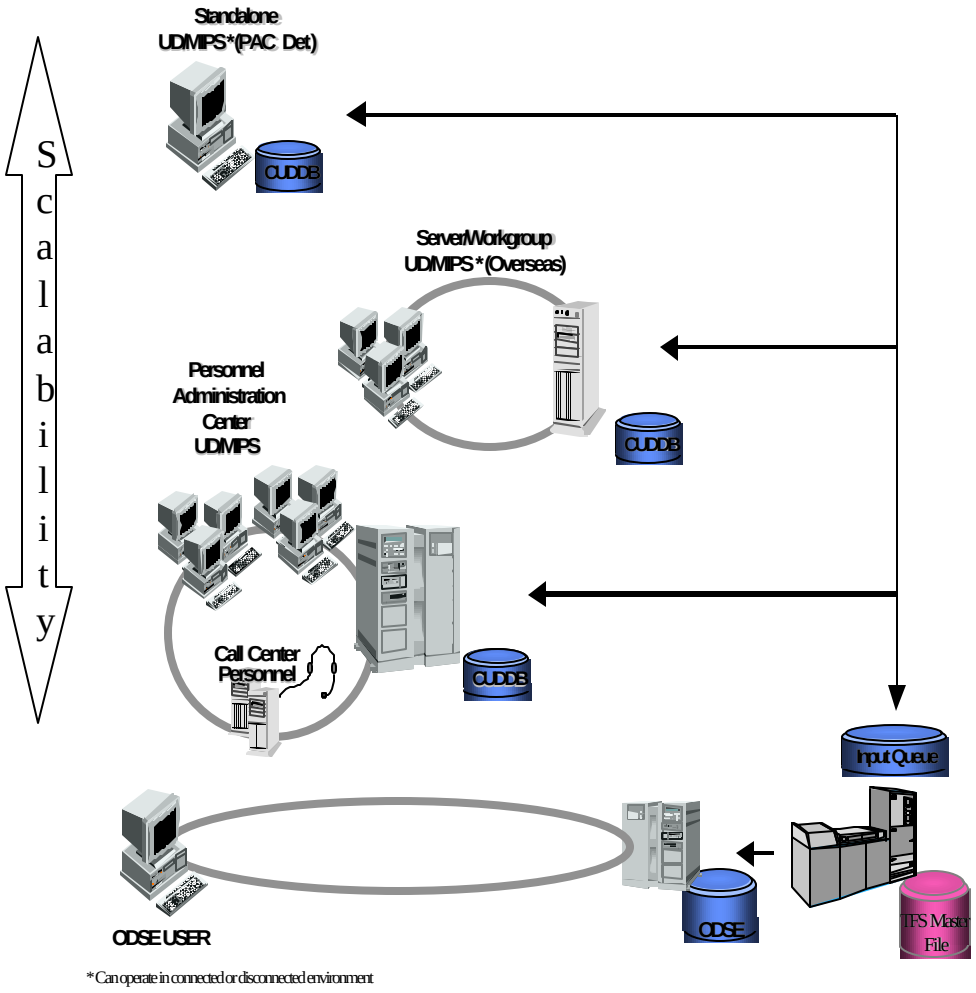

Figure 25. Personnel Administration Center From Ref. [2]

c. Analysis

The PAC is the key to the success of the TFAS initiative. This is a totally new level that incorporates most of the administrative responsibility that battalions and squadrons previously held plus the additional responsibility of handling call center and Web input.

5. Level 5: Higher HQ and Disbursing

a. Desired End State

At this level Manpower and Reserve Affairs will retain functional sponsorship for personnel administration and the Deputy Chief of Staff for Programs and Resources will retain functional sponsorship for pay.

b. Figure Depiction

Figure 26 is a replica of the level four diagram minus the call center.

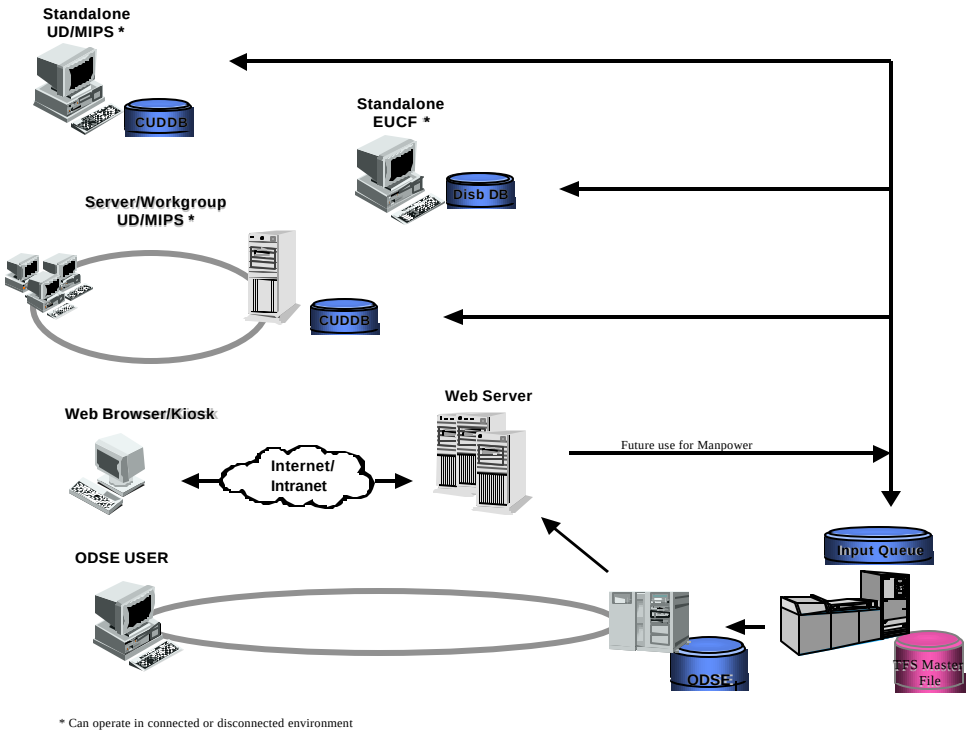

Figure 26. Higher HQ/Disbursing From Ref. [2]

Administrators at this level would not perform a function in the direct support of the individual Marine, although pay and administration functions based on the input data into the system would occur here. This is also the level at which strategic administrative functions would occur, much the same as they occur today.

c. Analysis

Nothing changes at this level. All relationships remain virtually the same. Responsibilities for oversight of functions do not change.

D. TRANSACTION STATE DIAGRAMS

1. Analysis

As you would imagine, there are not many differences between the “As-Is” and “To-be” transaction state diagrams, Figures 27 and 28. Simply stated, TFAS is simply adding an additional front-end to the current system. However, there is a difference in the two diagrams. The first difference is that in the “As-Is” architecture a data entry must be approved prior to entry into the system whereas with the “To-be” architecture process rules must be coded and installed into they system to differentiate between entries that must be approved and entries requiring no approval. Additionally, the “As-Is” diagram appears to be simpler and more timely than the TFAS transition diagram, but it does not show the levels of bureaucracy that occur between an event and its initial entry or key punch into the system.

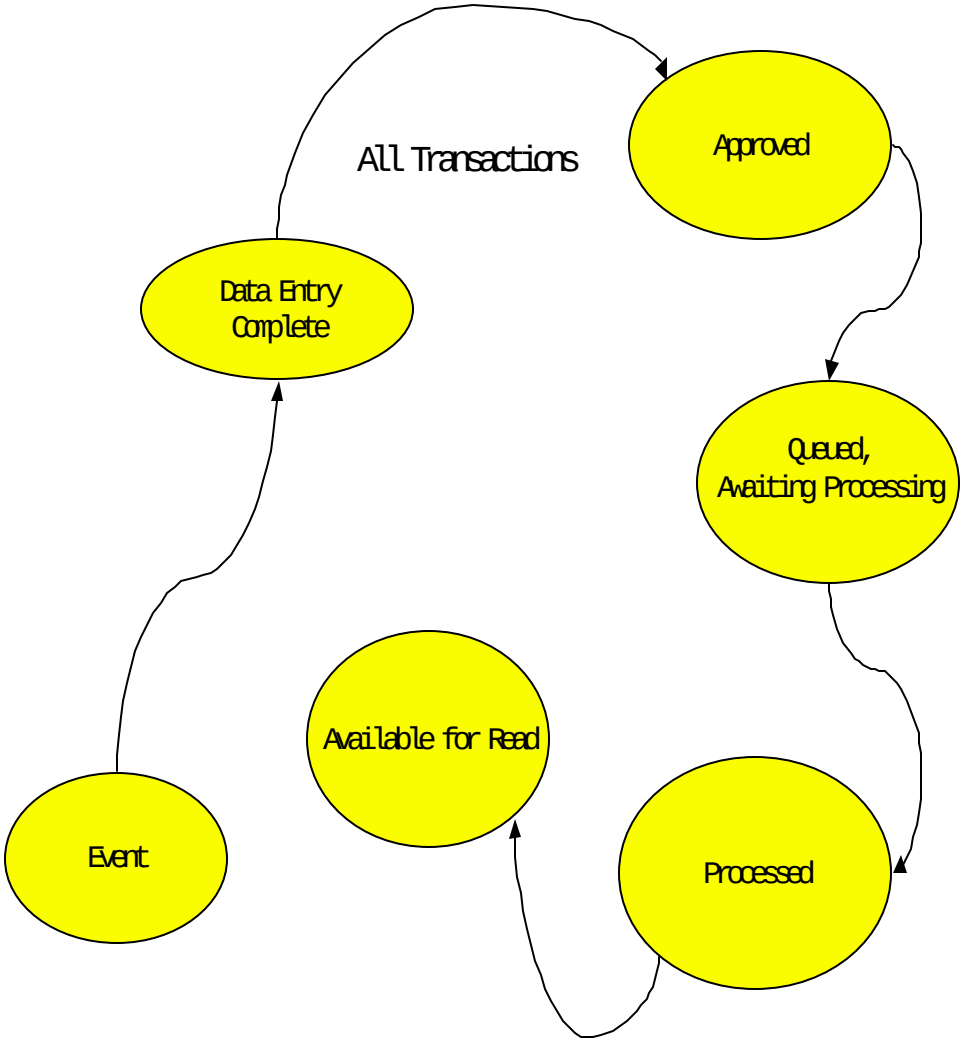

Figure 27. “As Is” Transition State Diagram From Ref. [2]

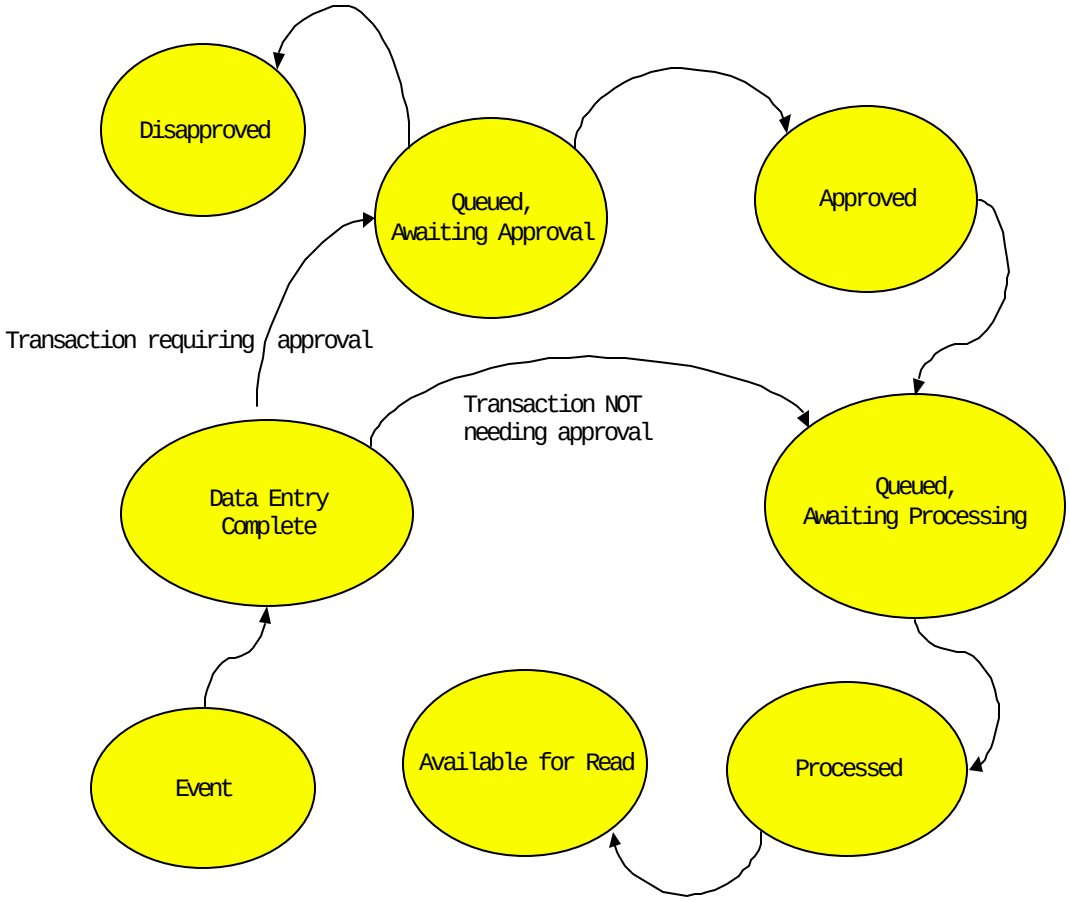

Figure 28. “To Be” Transition State Diagram From Ref. [2]

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VI. CONCLUSION AND RECOMMENDATIONS

A. PROJECT CONCEPTION

The TFAS initiative is the Marine Corps initiative to reengineer its manpower intensive human resource system by adding an individual Marine self-service capability to the current system. It is envisioned that this capability will allow the Marine Corps to increase its tooth to tail ratio and increase the level of customer service to the individual Marine. This thesis evaluated previous enterprise system implementations searching for common mistakes and key success factors that could be applied to the TFAS implementation. As stated previously, corporate and military human resource systems are similar in functions but different in the environments in which they must work. Similar functions include but are not limited to: insurance, income tax, tuition assistance, pay records, benefits, and audits. The differences, operational security and bandwidth-limited environments, are why modularity, loose coupling, and operational security must be built into military systems.

B. SUMMARY OF ANALYSIS

All of the TFAS documentation that I reviewed focused on getting the MCTFS data to the Web and on giving the Marine access and responsibility for updating some of that data. None of the documentation talked about creating knowledge or increasing the decision support capability from that data, an aspect normally associated with an ERP system. Absent in the documentation is talk about someday

linking this enterprise information system to other enterprise systems within the Marine Corps such as supply, recruiting, etc. Thus, the TFAS initiative in all reality has the appearance of more of an e-business (Web) implementation rather than an ERP project.

The TFAS leadership characterized their overall strategy for proceeding with the TFAS, as a strategy of "do no harm." [Ref. 2] As the documentation in this thesis has shown, the TFAS initiative represents only a small step or enhancement of the status quo. However, this small step is all that was required to meet the original goal of CMC to decrease the ratio of administrators to Marines, thus allowing the assignment or reassignment of more Marines into combat arms military occupational specialties (MOSs).

Even without the new TFAS front-end and customer service center, the initiative has already paid dividends for the Marine Corps. The TFAS initiative forced the Marine Corps to look at its processes, many of which had not been modified since they were implemented nearly 20 years ago when the MCTFS was first brought online. Streamlining the processes alone has allowed the Corps to accomplish its goal of reducing Corps-wide the number of administrators required to support the fleet. Earlier this year, the Marine Corps migrated most administration functions and administrators from the squadrons and battalions to the Marine Aircraft Group (MAG) and regimental level.

A successful implementation of TFAS will see administration functions consolidated at the Marine Corps

Base or PAC level. Although no information has been provided as to the exact number of administrators that can be retrained or assigned to the fleet in other more critical MOSs, the economies of scale created as administration is consolidated at higher levels should be significant. Also, remember that 1070 administrators were reassigned during the first year of the program, and we can see that the Corps has already started reaping the benefits of the Commandants' vision. The TFAS simply attempts to leverage existing technology to further multiply the manpower and cost savings while introducing the customer service concept in addition to the old focus of functionality to Marine Corps administration.

The key drivers in the choices made in the TFAS planning process were cost and risk. The initiative as currently defined is virtually risk free and at a projected cost of near $30 million. The implementation of TFAS over a period of eight years allows the Marine Corps to use money that would normally have been used for upgrades to the Unit Diary/Manpower Information Processing System (UD/MIPS), thus a basic reallocation of money. The TFAS is also a cheaper alternative than the status quo over a five-year period according to PricewaterhouseCoopers calculations. It can, however, be argued that for the same $30 million or less, the recommendations of PricewaterhouseCoopers could have been accomplished in a shorter period of time. Human Resource self-service technology is already a proven technology with most corporate implementations having few or little implementation problems. However, most corporations implement self-service technology and ERP systems to

achieve the maximum gains in productivity to get the most return on investment.

Looking at the TFAS documents provided and reviewed for this thesis: the three PricewaterhouseCoopers' studies, the Marine Corps Vision and End State document, and the preliminary assessment, it is not possible to predict with absolute certainty that this will be a successful implementation. I see no problem with the preliminary architecture; the diagrams demonstrate the picture of the TFAS as expressed in the TFAS vision. However, some diagrams were missing and those diagrams present were all very high-level and thus do not portray the level of detail necessary to make a more detailed analysis. The TFAS is of limited scope, the level of complexity is low compared to corporate implementations, and call center and Web-based portal technology is mature, thus TFAS appears on the road to success. Additionally, the familiarities of the implementation team with the MCTFS, the UD/MIPS and the other back-end and middleware systems currently in-place, and the involvement of all stakeholders in the implementation process are all complementary to the TFAS implementation. The TFAS implementation appears to have a solid project management plan based on a balanced integration plan.

This thesis will not be as beneficial to the TFAS leadership as it would have been if the study had been completed prior to actual execution of the plan. However, the Marine Corps can leverage the lessons learned from other implementations and this thesis to avoid pitfalls that could be lurching in the projects future. Lessons

learned from corporate implementations can be beneficial to the TFAS leadership. However, some of the lessons learned focus on a time prior to implementation and thus can only be used as a reflective area of caution. Some of these issues will be further developed in the concerns and recommendations portion of this thesis.

My study shows that there is no standard set of metrics by which an ERP or enterprise system implementation can be measured a success. Success or failure should be defined prior to implementation by the goals or vision for the project. Organizations determine their own metrics, such as cycle time and Full Time Equivalent (FTE's) improvements. However, in a military organization, a system should always be evaluated for its impact on operation security, something that could be overlooked in a human resource enterprise implementation. The key is whether the organizational goals and vision are met. However, the organization must establish a baseline of existing process metrics to compare with post-ERP process metrics. This project should satisfy the stated goals of the leadership.

C. CONCERNS AND RECOMMENDATIONS

My biggest concern with the TFAS initiative is that the Defense Integrated Military Human Resources System appears to be poised to duplicate the TFAS effort. If this turns out to be the case, the DIHMRS, because it is a DoD initiative will have precedence over the TFAS. Thus, a lot of time and money may have been spent needlessly. Based on the description of TFAS found in reference three as quoted

earlier there will definitely be a duplication of function of the TFAS and the DIHMRS. A second issue with this duplication is the possibility that the MCTFS, the Marine Corp's back end system, will not be addressed as part of the DIHRMS initiative, an assumption that the TFAS initiative relies on heavily in its preliminary assessment.

Another concern is that TFAS leadership has proceeded with the TFAS implementation prior to designing and finalizing all architectural decisions. One of the key success factors from Chapter IV says do not start on any applications until the architectural design has been completed. It appears that the TFAS implementation has violated this rule. The reason giving for proceeding with the TFAS implementation prior to the completed architectural study is that many of the updates and actions fell in line with the UD/MIPS upgrades. The risk of doing this is that the TFAS architecture will not be consistent and that integration will be more difficult later on in the TFAS process. The architecture is the foundation of everything that happens with the project, and this alone introduces considerable risk into the project. Having a technical architecture provides many benefits to the consistency of a project, including as mentioned earlier in the thesis, a common background for information system personnel, more rapid delivery of solutions, and reduced impact of change. [Ref. 10]

A third concern for the TFAS implementation is the lack of depth of explaining some of the concepts of how the TFAS will work with PDAs/PEDs and be programmed for use at levels two and three to be able to input information into the TFAS system. There are examples in industry of

companies using PDAs in this fashion; however, it should not be assumed that this would be an easy thing to accomplish. Will we contract this out to an established contractor or will it be done in house? Does PeopleSoft have the capability to accomplish this with the DIHRMS initiative? These are all questions that should be answered. Additionally, what is the concept for the TFAS during combat operations that will allow the TFAS to support OMFTS? Will we rely on UD/MIPS as we currently do or do we attempt to use the Internet from the battlefield to input into the TFAS?

There is little discussion as to who will create the software for the TFAS. It suggests that ITD-KCC will create the software applications as well as implement the entire project, but this is not clear. The software for an enterprise system is even more important than the hardware, thus I would like to have seen more information about this in the preliminary assessment. As defined earlier in chapter two, modularity and loose coupling should be used as a part of the software building process. The goal should be for the system to be interoperable and non-hardware specific. This will pay dividends in the future when the DIHMRS migration must occur and when hardware is being chosen for PEDs. Additionally, consideration should be given to how the system will work in bandwidth-limited environments, such as on ship. Caching could be built into the system or downloading information to disks to make required connection to the server as limited as possible from austere, bandwidth-limited situations.

There are other issues that have less to do with the TFAS and more with PeopleSoft who has received the DIHMRS

contract. PeopleSoft is being sued by a subsidiary of CIGNA Corp, Connecticut General Life Insurance Company. PeopleSoft is being accused of botching the ERP software development and failure to properly implement the system. [Ref. 9] PeopleSoft stated [Ref. 9], "It is unfortunate that for internal reasons, CIGNA was unable successfully to adopt our software, but this was not related to the quality of the software or services provided by PeopleSoft." I would recommend that the Marine Corps push PeopleSoft8 (DIHRMS) migration back until it has been successfully deployed in the other services. Since the Marine Corps has already proceeded with the TFAS, if DIHMRS migration proves to be unsuccessful in other parts of DoD, the Marine Corps can fall back on the TFAS and delay migration until the problems have been worked out.

PeopleSoft is a company that is growing quickly. Some question their ability to sustain this growth and support all of their responsibilities. With the size and complexity of DoD, PeopleSoft might have problems with the DIHMRS migration. PeopleSoft has won several high profile contracts in recent months to include the IRS and the DIHRMS contract both of which have been promised product delivery within one year. PeopleSoft has 2000 current customers who have requested upgrades to PeopleSoft 8, of which only 200 have been upgraded as of September 1, 2001 and projections of only an additional 500 being up and running by next year. Delaying implementation until the end will be a good risk mitigation strategy for the Marine Corps. It is too late for the TFAS project to completely change direction. Therefore, if I were the program manager for the TFAS project, I would proceed with the project as

planned but tread cautiously. I would come up with a contingency plan to address the MCTFS as a risk mitigation strategy just in case this thesis is correct that DIHMRS and TFAS do duplicate effort. I would perform a second review of the TFAS architecture study to ensure the TFAS applications are built on a solid basis.

D. Further Research

There was not enough information available to conduct a thorough analysis of the TFAS architecture. The TFAS leadership may have already negotiated many of the concerns discussed in this thesis. I am sure that there is more documentation that I was not privy to that could lend more credibility to a concern or provide the answers to questions that would make the concern invalid. Research should be conducted on a comparison of the DIHMRS and the TFAS to determine if the assumptions of the TFAS leadership that TFAS is addressing areas different from the TFAS and that the DIHMRS will address the back end systems neglected by the TFAS are indeed true. Until this is accomplished, I think it is futile to study other areas of the program.

However, once this has been completed the other areas that could benefit from further research are a review of any official technical architecture that goes beyond the preliminary documents reviewed in this thesis would be beneficial. The study of the security features of the TFAS and the communications platform are all areas ripe for study. A study of what it would take for the Marine Corps to have a truly integrated enterprise, e.g., tie supply, finance, human resource, all to one system where data from

anywhere could be moved anywhere in the enterprise is another area for study.

Additionally, some type of comparison should be done to determine whether the quality of service to the individual Marine actually increases or decreases because of the TFAS implementation. In the short term there will probably be some degradation of service, especially during the period prior to Marine self-service coming online when administration is being consolidated at higher levels. Capturing and applying the lessons learned from the TFAS implementation to the DIHRMS implementation and future human resource implementations are areas that should also be considered.

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