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Humanware Issues In A Government Management Information Systems Implementation

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EXECUTIVE SUMMARY

A United States Government Defense Agency charged with the acquisition and procurement of weapons systems required a comprehensive Management Information System (MIS). The Integrated Product and Process Management Information System (IPPMIS) was expected to integrate standard procurement functions through a hardware and software application. A defense contractor was 'hired' to design, develop, build, test and deploy an integrated acquisition project MIS, including career development and the management of personnel for program managers. The information system was designed and implemented without due consideration or management of the human side of systems development. The lack of human factors generated cost overruns, time delays and ultimately a partial failure of the system. This case addresses the behavioral, managerial and organizational shortcomings of the MIS process, which ultimately led to a less than effective implementation.

BACKGROUND

The Naval Sea Systems Command

NAVSEA—the Naval Sea Systems Command—is hierarchically linked to the Executive Branch of the United States Government through the Department of Defense, Navy Department. NAVSEA manages 139 Acquisition Programs assigned to the Command's seven affiliated Program Executive Offices (PEOs) and various Headquarters elements. The Naval Sea Systems Command is the Navy Department's central activity for designing, engineering, integrating, building and procuring U.S. Naval ships and shipboard weapons and combat systems. The Command's responsibilities also include the maintenance, repair, modernization and conversion of in-service ships, their weapons and combat systems.

Additionally, NAVSEA provides technical, industrial and logistical support for naval ships and ensures the proper design and development of the total ship, including contractor-furnished shipboard systems.

NAVSEA is the largest of the five Navy Systems Commands. Its FY00 budget of approximately $14 billion accounts for approximately 16.5 percent of the Navy's total $84.9 billion FY00 budget. This budget places NAVSEA among the nation's top business enterprises when comparing the value of assets, number of employees and budget using Fortune Magazine criteria. While NAVSEA has approximately 900 officers and 1,300 enlisted personnel, the vast majority of its employees are civilians. The Command's FY99 civilian end-strength—45,821 employees in seven PEOs—manages a number of major acquisition programs for the Assistant Secretary of the Navy for Research, Development and Acquisition, ASN (RD&A). NAVSEA's major resources include its highly specialized professional employees and facilities. Whenever possible, NAVSEA relies on the private sector (defense contractors, Ang & Slaughter, 2001) for a wide range of products and support services including ship design and engineering, production of ships, weapons and other complex technological systems. NAVSEA manages these programs through an organizational structure including Program Management Offices (PMOs).

This case study focuses on the limited attention given to human factors in the implementation of an MIS within a Program Management Office (PMO GOV). PMO GOV is tasked with weapons systems development for sea warfare. A defense contracting organization—*Prime Contractor (PC)*—designed, developed, tested and implemented the management information system. This Integrated Product and Process Management Information System (IPPMIS) was developed under a U.S. Government contract ending in the late 1990s. Additional perspective on the Defense acquisition community and the Defense Acquisition policy are located in the appendix.

This case study is organized into eight major sections: background, setting the stage, case description, current challenges and problems, references, appendix, glossary of terms, and further readings.

History of the MIS Case

A defense contractor was solicited through the normal government Request For Proposal (RFP) process. The PMO, through a U.S. Government contracting agency initiated an RFP, seeking assistance with the development of an integrated weapons systems MIS to manage all stages of procurement from concept generation to deployment and follow-on support. After a routine bid cycle, the contract was awarded to Prime Contractor and the MIS development process was undertaken.

The Management Information System was initially expected to track, monitor and manage: (1) acquisition logistics; (2) configuration and data management; (3) personnel training and education; (4) integrated product and process development including systems prototyping; (5) manufacturing and production; (6) quality assurance; (7) reliability and maintainability; (8) risk management; (9) systems engineering; (10) software engineering; and, (11) test and evaluation, through an integrated software program. These major system elements were divided into a three-stage linear program: (1) pre-systems acquisition; (2) systems acquisition, including engineering, manufacturing, demonstration and production; and (3) finally sustainment. Concept development included requirements planning and needs assessment by end users (who in this case included operating forces of the United States Navy).

One part of the MIS was the requirement to monitor the development of career acquisition professionals within specific warfare and functional sub-specializations. The component of the MIS that managed career development was titled—IDP or Individual Development Plans. The exploration of the IDP module is used in this case to illustrate systems deficiencies.

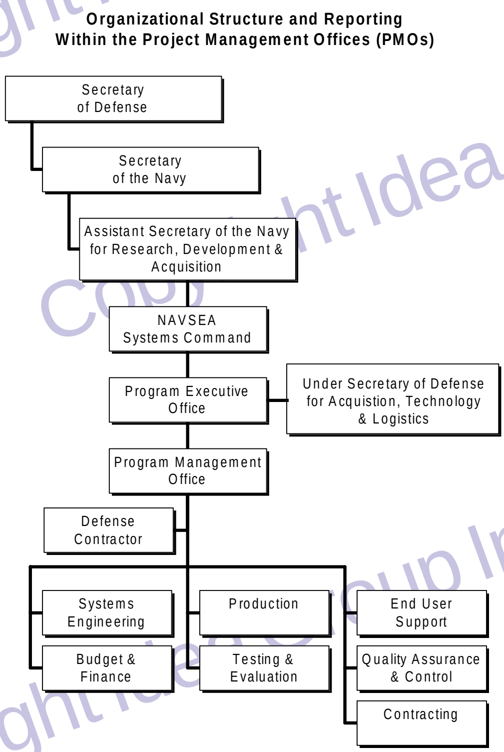
Type of Business

The two 'players' include: PMO GOV and Prime Contractor. PMO GOV is a United States Government organizational group of the Executive Branch, Department of Defense, Navy Department. NAVSEA manages the development and deployment of specific weapons systems through a complex organizational structure. Figure 1 depicts the line of authority between the Secretary of the Navy and the Project Management Office's (PMO) functional lines. Prime Contractor specialized in software and hardware development and deployment. Prime Contractor provided project management support to assist in management of weapons systems development. The reporting relationships between Prime Contractor and PMO GOV are also depicted in Figure 1 below.

Products and Services Offered

PMO GOV delivers both products and services. Products include integrated hardware and software weapons systems. Services include the management of the acquisition and

Figure 1. Organizational Chart of the Office of the Secretary of the Navy to the Program Management Office Functional Lines



technical operation of weapons systems research and development, deployment and follow-up support, to the operating forces of the U.S. Navy.

Prime Contractor develops, tests and deploys the MIS under review. Additionally, Prime Contractor provides project management and administrative support. Administrative support comes in the form of collaborative managerial assistance to PMO staff personnel for functional tasks and duties.

Management Structure

The PMO functions through a top-down management structure following the policies and procedures set forth within the Department of Defense and the Office of Personnel Management. The PMO reports to a Program Executive Officer, who further reports to an Assistant Secretary of the Navy. The Assistant Secretary of the Navy for Research, Development and Acquisition is functionally responsible to the Under Secretary of Defense for Acquisition, Technology, and Logistics.

Financial Status

PMO funding is provided through a five-tiered distribution process. Initially, funding requests are made through the Congressional budget allocation. Monies are then transferred through the Department of Defense Under Secretary for Acquisition, Technology, and Logistics, further distributed through the System Commands to the Program Executive Offices and finally to the specific Program Management Office. Projects are then developed to use the Congressional budget allocation in accordance with the U.S. Government's budget and execution processes and cycle. Financial resources are then segmented into operational resources needed to conduct the mission of the organization, and personnel resources including salary and benefits. PMO funding is provided by the U.S. Congress, under the annual federal budget Planning, Organization and Management process to the Department of Defense. Budget decisions are made by the U.S. Congress.

Table 1. Apportioned Funding Levels for Prime Contractor Over the Contract Life

1992	1993	1994	1995	1996
$1.5 Million	$2.8 Million	$3.1 Million	$2.5 Million	$0.5 Million

Overall funding levels for Defense Prime Contractor over the first five-year contract period, 1992-1996, are provided in Table 1. All financial data are approximate. Project funding levels provided to Prime Contractor over the contract period were $10.4 million.

Overall PMO budget allocation included administrative support of the PMO provided under contract by Defense Prime Contractor. Software development for program management, including the MIS development project, is included in the support contract. Funding allocation for the MIS development sub-task of this cost-plus-fixed-fee contract is shown in Table 2.

Table 2. Apportioned Funding for the MIS Development Project

1992	1993	1994	1995	1996
$380,000	$550,000	$950,000	$350,000	$70,000

In order to afford sufficient numbers of technologically up-to-date systems, cost is a critical component of DoD system optimization. Cost should not simply be an outcome as has often been the case in the past. Thus, cost should become an independent rather than dependent variable in meeting the user's needs.

Strategic Planning

The PMO's strategic planning includes the assessment of operational forces needs. Weapons systems development includes a planning process that looks at current defense requirements, future scenario planning and the integration of new technologies. Needs assessment is done in partnership with the operating forces based on expected operations. Strategic planning for weapons systems development is frequently based in new technological advances in engineering and the applied sciences.

In this case, a strategic initiative to develop and deploy the Integrated Product and Process Management Information System (IPPMIS) for the PMO was undertaken due to rapidly developing technology and the need to improve the management of overall resources.

Organizational Culture

The weapons systems acquisition community is a homogenous professional group of individuals with different specializations (financial; quality control; engineering; manufacturing/production; project management; testing; and, general management) all focused on the procurement of offensive and defensive weapons systems. Most personnel are college educated with supplemental professional training and many of the senior individuals within the organization have graduate degrees. *Since the organization supports the development of technology, the organizational culture tends toward early adoption and acceptance of new technological systems.* Many of the personnel staffing Program Management Offices are senior government officials, immediately below Senior Executive Service (SES) levels.

Economic Climate

This case occurred during the mid-1990s when defense spending was under a constant state of stress from Congressional initiatives to reduce military spending. Excessive defense spending was a concern to the Congressional defense oversight committees during the period of this systems development. The political climate valued defense spending cuts particularly within Research and Development (R&D), as a function of an ever-decreasing public perception of threats to national security. Although defense cuts were encouraged, spending tax dollars on this IPPMIS was expected to eventually save resources. The overall economic climate was directed toward spending minimization on all defense related projects. This environment produced constant financial pressure.

SETTING THE STAGE

An Integrated Product and Process Management Information System (IPPMIS) was created for the Program Management Office (PMO). The IPPMIS was designed to integrate all products and functional processes in a master acquisition and procurement structure. Specifically, this integrated system was to manage engineering, scheduling, testing, funding, procurement, contractor resources, personnel quality control and system upgrades.

The IPPMIS was intended to keep pace with an ever-increasing defense threat, as perceived by the Congressional military planners, both in terms of complexity and sophistication. The IPPMIS was developed concurrently with a rapidly changing weapons systems acquisition culture.

The system was meant to manage the entire acquisition and procurement process through an automated configuration. The Prime Contractor was hired to build the IPPMIS within a multiyear congressionally approved budget allocation. The contractor designed and built the information system for the PMO. The IPPMIS followed a standard systems engineering process including the planning, analysis, design, development, testing and implementation phases.

Technology Utilization

A mainframe-based system attempted to integrate all the functions and deliver them to desktop terminals using any of three operating platforms—UNIX, Mac and Windows. Engineering specifications called for a secure non-Web based system. The system required frequent purposeful updates from forty-five acquisition professionals. Islands of information were prevalent and often marked territorial boundaries. Inputs were processed daily and status reports were available upon demand.

Prior to the IPPMIS, a simple desktop database existed into which individuals would arbitrarily upload data. A flat file format necessitated multiple input points resulting in redundant data and input errors. Data extraction was hampered by lack of file integration. Management tended to maintain independent operations with limited cross-functional communications. The belief that "information equals power" produced a resistance to sharing data. Control and management of data were limited resulting in poor security. An intended outcome of the new IPPMIS was to facilitate increased cross-functional communication, information sharing and improved management coordination.

Advancements

During the five-year period preceding the time frame of this case, (1987-1992), a number of significant technological advancements were implemented. The mainframe computer infrastructure was rapidly being converted into a client-server architecture. Networked desktop computers supporting a Windows operating platform became standard throughout the PMO. Functional applications were redesigned to run within the new operating environment. New structures materialized permitting real-time on and off line data processing and updating. Processing speeds were increasing exponentially. New management philosophies were being developed that recognized the value of integrated systems and personnel. Configuration management—the use of a specialized process applying accepted business practices during the early planning phases of product development—was an emerging innovative managerial process. New specializations of personnel in the acquisition profession were also growing.

Management Practices and Philosophies Prior to Project Initiation

Prior to the implementation of Acquisition Reform in 1990, typical management practices included task assignment through a functional hierarchy, with oversight/management through a vertical pipeline. Personnel were assigned projects that were then monitored and evaluated by supervisors, usually under a prioritization structure established by management. Personnel were selected based on their past performance and typically functional specialization was limited to engineering functions. Personnel were trained as required, oftentimes however, in areas that were not associated with their functional job responsibilities or their civil service career designation. Typically there were no coordinated or systematic plans for personnel development or linking between project tasks, expertise and training.

Knowledge and skills were based in general management and there were significant overlaps and incongruity between what personnel were trained to do and what they actually did. Management was evaluated based on arbitrary and sometimes error prone systems, leading to further mismatches in integrated systems development. Typically employees were not involved in project planning or decision-making and often times were not consulted in their career development. The role of managers was oversight. The role of employees was task performance. Stovepipe structures were the norm and cross-functional coordination or even consultations were rare.

CASE DESCRIPTION

Technology Concerns and Components

The Prime Contractor was tasked with the development of a software program designed to permit total integration of all functions of the acquisition process related to the PMO. The IPPMIS components and processes included as depicted in Table 3.

Of the system parts, a new and critical component of the IPPMIS was the use of a Professional Career Development subcomponent, titled Individual Development Plan or IDP. For purposes of this case study, only the Professional Career Development module was selected for illustration. The IDP was a professional development and training element, which permitted the organized distribution of resources to optimize technical development of acquisition personnel within their designated sub-specializations, and to provide the greatest connectivity between professional competencies and functional responsibilities. At the same time, the IDP incorporated an input mechanism to facilitate managerial scheduling of future employee training requirements and served as a budget allocation tool for personnel

Table 3. Components and Processes of the IPPMIS

Components	Processes
• Personnel Management	• Requirements Planning
• Fiscal Management	• Systems Engineering
• Logistics Management	• Hardware Development
• Professional Career Development	• Software Development
	• Prototyping
	• Testing and Evaluation
	• Quality Control and Assurance
	• Reengineering
	• Field Testing and Deployment
	• Follow-Up Support

resources. The IDP was integrated into the IPPMIS through the matching of specific technical skills with project tasks and activities.

The IDP was a real-time integrated information system facilitating access to data and information from a variety of relational database files for use by all acquisition professionals. Input forms within the IDP included:

- Form A—Personal demographics, OPM grade, primary and subsidiary career field designations, job history, security clearance, and, the level of acquisition professional;
- Form B—Short term and long-term career goals;
- Form C—Developmental objectives and activities;
- Form D—Prior professional training both formal and informal education; and,
- Form E—Supervisory review and monitoring of the IDP.

The integrated system provided a means of measuring the degree of congruity between the organization's mission, needs and requirements and the IDPs. The IDP facilitated the assimilation of the PMO's mission with the planned individual staff development activities. The IDP was linked to the four component and ten process modules of the IPPMIS. An OPM approved training course catalog and the Defense Acquisition University (DAU) programs are examples of more than 30 catalogs and programs available through the IDP component. The catalogs and programs represent information islands existing within the database configuration. A supervisory review and approval form (Form E) is related to the mission accomplishment and to the career development resource allocation module. The aggregated IDP files were incorporated into the IPPMIS for the PMO, PEO and higher authorities.

The IPPMIS incorporated the acquisition reform concept of IPPD – Integrated Product and Process Development. The IPPD concept is normally implemented through Integrated Project Teams (IPTs) consisting of cross-functional members. IPPD is a systems engineering concept integrating sound business practices and common sense decision-making. The Department of Defense created the IPPD as an acquisition and logistics management program. This program integrated all activities from product concept through production and field support to simultaneously optimize the product and its manufacturing and sustainment processes. The goal of IPPD is to meet cost and performance objectives for weapons systems acquisition (DAWIA, 1990). The IPPD evolved from concurrent engineering and is sometimes called Integrated Product Development (IPD).

Issue

Limited to no attention was given to the human system. Organizations must undergo profound changes in culture and processes to successfully implement IPPD. Activities focus on the customer and meeting the customer's needs. In DoD, the customer is the end user. Accurately understanding the various levels of users' needs and establishing realistic requirements early in the acquisition cycle is an important function of the systems development process. Trade-off analyses are made among design, performance, production, support, cost, and operational needs to optimize the system (product or service) over its life cycle. In the IPPMIS implementation case study, limited attention was paid to the concurrent design and application of humanware[1].

The paradox presented in this problem is that the very foundation concept of IPPD was not followed in the design, development and implementation of the IPPMIS. At a deeper level, the part of the process that is the subject of the paper is the lack of attention paid to end user requirements, skills, and their predilection to accept change. The IPPMIS did not plan or account for the system-technological, the individual person, or the social organizational factors—the human triangle (Shouksmith, 1999) that makes up humanware.

People support what they help to create (Winslow, 1998, 1992) and in this case the end users were not involved in any phase of the Systems Development Lifecycle (SDLC) after requirements planning and prior to final system deployment. The PMO personnel who would ultimately be the end users took limited ownership (minimal support) for a system that was mandated by acquisition reform. Hence, there was limited contact between Prime Contractor and the PMO except for periodic required project audits. The government failed to recognize and support the human side of systems development and the contractor paid little or no attention to anything other than the hardware/software technical requirements. Neither the contractor nor the government recognized that this project reflected the essence of IPPD and hence the essence of acquisition reform. Even technology-oriented end users, such as those in this case, will not support something that they have little or no part creating, testing and deploying. Human factors are at least as important as the structure of the system. In a comparison of technical issues in system's development, humanware is more technically challenging than hardware or software.

Given the application of human factors issues and context of this less than optimal MIS design and implementation, what alternatives or options were available that might have resulted in a different outcome? How can humanware be built into the hardware and software to have a complete system?

There are numerous human factors that were overlooked in this implementation. Table 4 provides a partial list of human factors that were missing, organized by the human systems triangle—system-technology, individual person, and social-organizational factors.

As an example of one of the system technology factors (system ergonomics), the IPPMIS was a sophisticated program consisting of numerous modules and interfaces spanning diverse weapons systems acquisition functions. The completed IPPMIS required technical knowledge, content knowledge, database manipulation skills, limited programming skills, high navigation interpretation, a high tolerance for ambiguity and individual work-arounds to facilitate system utilization. Specific psychometric properties of display were given limited consideration during the IPPMIS design process. Examples of shortcomings in display and navigation (operation) in the IDP module include:

- *Screen Design*—each screen had a different layout as well as limited use of white space;
- *Text Design*—conventional text design principles were not followed for text layout, type sizes, spacing of text, colors, and use of section titles;
- *Activity Sequencing*—not organized consistent with end user data entry sequencing;
- *Navigation bars*—placed in the bottom left hand corner on the main screen and moved to different locations on subsequent screens;
- *Icons*—non-standard graphical icons were used on the navigation bars. Such icons did not include a tool tip or help option. Icon functionality was determined through a trial and error protocol;
- *Keyboard shortcuts*—many typical Windows based keyboard shortcuts such as Ctrl C to copy and Ctrl V to paste were not active;
- *Function keys*—were included but some function keys had dual functionality; e.g. the same icon was used both to edit a record and to save a record;

Table 4. Human Factors in Technology

System-Technological Factors	Individual Person Factors	Social Organizational Factors
System Ergonomics	Personalities	Governing Politics
Relationships Between End Users And Designers	Expectations	Organizational Politics
Transaction Volume	Feedback	User Involvement Proactive Supportive Reactive
Needs Analysis	End User Enthusiasm	User Management Involvement
Social Engineering	Education	Project Planning And Management
Technology Trust	Training And Development	Organizational Culture
Planning	Interpersonal Trust	Management Commitment
Business Planning	User Satisfaction	Cooperative Environments
Project Characteristics	Improved Productivity	Rewards And Incentives
Project Management	Interpersonal Communications	Open Communications
Human (end user) Design Features	End User Attitude	Trust Between Individuals And Organizations
	Interest	Organizational Change
		Interdependencies
		Job Design
		Resistance
		End User Diversity Work Force Age/Seniority
		Power
		Implementation Timing

- *Feedback messages*—all feedback messages appeared in the top right hand corner of the screen and generally consisted of three to five words;
- *Menu bars*—used non-standard formats;
- *Input buttons*—input button names were labeled as Form A, Form B, Form C, Form D, and Form E. Nominal descriptions were disregarded; and,
- *Report generation*—required the user to remember from which part, Form A – Form E, the requested information was located.

Final system specifications included features that were non-intuitive, non-standard, not well-labeled or disregarded conventional design principles. When the end user was queried regarding utilization, the perceived lack of systems reliability was stated as one of the issues of concern. End users also reported difficulties in information access, results consolidation and report generation. Many of these psychometric shortcomings resulted in end user cognitive overload which further deteriorated an already resistant workforce to IPPMIS adoption.

All end users were contacted to participate in the system prototype, test, and evaluation. Approximately 10% of the user population (five employees) participated during the requirements generation, design and prototyping phases. End user attention toward understanding the various system elements during prototyping was lax and was directed toward completion of daily functional activities.

The user population identified prototyping as a 'necessary evil' and a 'waste of time.' Early prototyping results produced high failure rates. Although the Prime Contractor eventually remedied these initial failures, a underlying perception of technology distrust emerged (Lippert, 2001). The distrust was geared toward not only the developer, the Prime Contractor, but toward the information system itself. The various levels of limited trust (Adams & Sasse, 1999) generated increasing resistance to system use.

Technical problems were overcome through individual procedural work-arounds. These modifications enabled knowledgeable users the ability to 'work' the system while excluding less capable individuals from solving these technical issues.

The cultural norm was that professional development, including increasing familiarity with integrated technology, took a back seat to mission accomplishment. The Prime Contractor offered limited help desk support and virtually no system training.

Managerial and Organizational Concerns

Technical system integration was not a management concern. Development costs were limited. System development occurred inside of an existing line item budget for administrative support, which posed a management problem. The Prime Contractor developed a unique system for the PMO and did not make use of Commercial Off-The-Shelf products (COTS). Several managers expressed a concern for a perceived loss of power through relinquishing their discretionary decision-making authority to the IPPMIS.

The IPPMIS failed during the operational implementation phase primarily because of a cognitive overload on the human system and personnel resistance to a complex integrated system. Specifically, the end users found the system to be complicated, difficult to navigate, and often-unreliable leading to adaptation and acceptance resistance. The IPPMIS was perceived as disempowering by its users. It is suspected that part of the system failure was a result of lack of system acceptance and use (Hilson, 2001). "The human element has become the critical determinate of IS success" (Martinsons & Chong, 1999).

Although the new system was designed to integrate the PMO cross-functional elements, many managers perceived the actual system configuration to reinforce stovepipe structures. The various functional system components were well integrated. However, locating and accessing the various components was often a challenge. Users overtly expressed resentment toward the system. Within small user groups, individuals discussed the waste of time and resources associated with the system procurement process. Management was not privy to some of these discussions. Senior individuals at the end of their careers were reluctant to learn and accept a new information system. The speed of implementation coupled with the complexity of the system overloaded the late career stage end users. These concerns and issues made it difficult for the Prime Contractor to implement the IPPMIS.

The Prime Contractor engineered the system with numerous proprietary components. The PMO was compelled to use the Prime Contractor for maintenance, upgrades and future enhancements.

Managers in the extended line of authority expressed a concern that the development costs exceeded the final system value. The perceived loss of employee productivity was problematic given the required human investment in time and energy necessary to learn and operate the new system. Limited training was available due to budget constraints and because the culture was one where individuals were expected to learn on their own.

Cultural Issues

PMO GOV, as an organizational entity, operated in a highly bureaucratic and politically charged environment under constant Congressional oversight. The organizational entity is an integration of military and civilian personnel. As typical with many government agencies, military personnel rotate in and out of their job positions on predetermined schedules. Civilian personnel rotated less frequently. There was an underlying sense of frustration within the civilian ranks that mission loyalty was stronger due to longer-term tenures within the organization.

Organizational Philosophies

Within government circles, there is a funding axiom of "use-it" or "loss-it." Budget allocations are used or returned to Congress at year's end. Defense contractors are often considered second-class citizens. There are multiple reviews throughout the contract life cycles by Congressional oversight groups including the U.S. General Accounting Office (GAO) and internal Department of Defense auditors. Internal acquisition personnel consider weapons systems development and acquisition one of the most important functions of the DoD.

CURRENT CHALLENGES AND PROBLEMS FACING THE ORGANIZATION

The systems development and implementation processes associated with this case spanned a ten-year period. Four years were spent in the initial development and implementation phases. The remaining six years were necessary to generate a fully functional product. The weapons systems acquisition development processes were sustained concurrently throughout the IPPMIS conversion process. Resistance to change remained a constant threat to this project. The system atrophied waiting on a reengineering evaluation in the last year of the contract. Business Process Reengineering (BPR) of the processes should have been considered (Broadbent, Weill & St. Clair, 1999; Roy, Roy & Bouchard, 1998; Tonnessen, 2000). That evaluation never occurred. The IPPMIS product was neglected.

The human factors that plagued this case included poor planning during all project phases. A lack of attention was given to the relationship between the end users (PMO) and the designers (Prime Contractor). Project planning did not accommodate periods of high transaction volume. Needs analysis focused on the technical hardware and software requirements. No consideration was given to the trust in the technology (Lippert, 2001). Ergonomics were minimally addressed. Project management (Chatzoglou & Macaulay, 1997) and business planning were under-funded and project characteristics were not understood.

The personalities of the individuals involved, both government and contractor, were simply not considered. Expectations were discussed, but then promptly forgotten and feedback was light and limited. The result was that the end users had little enthusiasm to accept a new system. Users were resistant to training, education and development on the IPPMIS and therefore user satisfaction was seriously compromised. The notion of improved productivity was never accepted by users and the interests and intents of the stakeholders, both government and contractor were not explicated. In the end, the end users' attitudes about the entire project and concept were ignored.

The government continues to face numerous social-organizational issues. Politics continually inhibited efforts to improve the IPPMIS. User involvement remains reactive, with limited support and marginal proactivity, by any but the PMO representative for acquisition reform. The management of the PMO uses a 'hand's off' approach and therefore project planning and management is limited. The culture of the government, the defense industry and the individual contractor were all ignored. Management commitment was difficult to identify and cooperative environments to facilitate change were never explicitly addressed. There were no rewards or incentives for adoption of the IPPMIS and open communications were limited to system evaluation at final deployment. Government personnel distrusted the contractor and the contractor personnel distrusted the PMO. Changes, from the level of acquisition reform to database management of modules such as the IDP, were resisted. The contractor did not consider job design issues. The age and seniority of the end user workforce in retrospect were misjudged. Differential power through consumer/provider, user/developer was misunderstood. The final outcome of this lack of attention to the human factors was a less than fully functional system, at an unreasonably high cost, with marginal utility.

ENDNOTES

[1] The notion of humanware originated from a case study of the Ambrake Corporation (Gupta, Holladay, & Mahoney, 2000).

FURTHER READING

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GLOSSARY OF TERMS

Commercial Off-The-Shelf Products (COTS)—pre-developed products, including software applications, available for purchase directly through vendors or commercial sources.

Defense Acquisition Work Improvement Act (DAWIA)—the formal institutionalization of acquisition reform policies, practices and procedures within the Department of Defense (DoD).

Individual Development Plan (IDP)—a database module of the IPPMIS focused on professional development and training.

Integrated Product and Process Development (IPPD)—a management program permitting the integration of all acquisition products, processes, functions, structures, configurations and systems.

Integrated Product and Process Management Information System (IPPMIS)—a MIS designed to integrate engineering, scheduling, testing, funding, procurement, contractor resources, personnel quality control and system upgrades in a master acquisition and procurement structure.

Integrated Project Team (IPT)—a cross-functional group of personnel assembled to execute a specific project.

Naval Sea Systems Command (NAVSEA)—is hierarchically linked to the Executive Branch of the United States Government through the Department of Defense, Navy Department.

Program Executive Office (PEO)—a small executive staff tasked with evaluation and management of operations for related Program Management Offices (PMOs).

Prime Contractor—a solicited defense contractor within the commercial sector hired to support the development of the IPPMIS.

Program Management Office (PMO) – responsible for either an offensive or defensive system that functionally discriminates, e.g. an air-to-air combat defense system, for identification of unfriendly aircraft and data feed-forward into a combat system for target acquisition and weapons deployment. The example PMO might function under a Program Executive Office for air combat systems. (The PMO GOV is the POM in this case.)

Request For Proposal (RFP)—a formal proposal process used to solicit work through a bid, competition, evaluation, and award procedure.

BIOGRAPHICAL SKETCH

Susan K. Lippert *is an assistant professor of Management Information Systems in the Department of Management at Drexel University, Philadelphia, PA, USA. Her current research interests include use and management of information technology. Her special interest is in the exploration of technology trust. She has also completed research in the area of technological innovation in training and education. Dr. Lippert received her PhD in MIS and an MBA in Logistics, Operations, and Materials Management from The George Washington University, Washington, D.C. Professor Lippert has published in the Journal of End User Computing, the Journal of Management Education, and the Journal of Mathematics and Science Teaching. She has presented papers at numerous conferences and symposia such as the Academy of Management, the Information Resources Management Association, the International Conference on Information Systems, and the Academy of Business and Information Technology.*

APPENDIX

Background on the Defense Acquisition Community

The Department of Defense Acquisition workforce is the primary and relevant community within the case. This background history attempts to contextualize the cultural and environmental conditions of Acquisition Reform related to the specific MIS case under discussion.

Over a three-decade life cycle (1970-2000), the development and procurement of offensive and defensive weapons for the U.S. Department of Defense has undergone massive changes. Under the organization of the Under Secretary of Defense for Acquisition, Technology and Logistics, weapons procurement contracts are solicited (through an Request For Proposal—RFP process), evaluated, accepted, granted (won) and managed.

In the late 1980s, a complete reorganization of the process of weapons development and acquisition was implemented, ending in the Acquisition Reform Act of 1990—Defense Acquisition Work Improvement Act (DAWIA) (Gill, 2001). This reform was necessitated by the limited controlled and often overlapping weapons development and procurement processes that emerged after WWII and continued throughout the next five decades. Extensive cost overruns, contractual fraud, cases of the Government being compelled to accept systems that failed to meet specifications, all shaped a Congressional mandate to reform the entire weapons systems development and acquisition process. Additionally, acquisition and contracting practices were constantly challenged with managerial problems and were frequently under pressure from an increasingly vigilant and accountability driven U.S. Congress.

In 1971, both the House and Senate Armed Services Committees called for a Department of Defense wide multiyear review of the whole weapons acquisition and procurement program. This review included all systems, processes and contracts within each military service. An outcome of a Congressional study commissioned by the House and Senate Armed Services Committees—Packard Report, 1986—included a structural reorganization and integration of the entire weapons acquisitions and logistics programs (Jefferson Solutions, 2000; Acquisition 2005 Task Force, 2000). Some of the major recommendations included the:

- integration of the weapons systems acquisition process including planning, engineering, development, testing and deployment;
- joint service management of all weapons development phases under a newly created DoD organizational structure which merged the old logistics specialty with the weapons systems and acquisition specialty; and,
- integration of personnel, professional development and management into individual project and program management ventures.

Reorganization took place from 1979 to 1990, as 'state of the art' logistics management was unveiled. Under the Reform Act, in 1990, a new weapons systems acquisition and technology development structure and programs were enabled.

From 1984 through 1994, there was a steady but relatively slow migration of personnel functions and mission. The functional migration included the movement from the old disassociated systems to the new integrated system including the creation of a new structure of Program Executive Offices (PEOs) with oversight for a series of related Program Manage-

Figure 2. The DoD 5000 Acquisition Model

ment Offices (PMOs). A PMO is typically responsible for either an offensive or defensive system that functionally discriminates, e.g. an air-to-air combat defense system, for identification of unfriendly aircraft and data feed-forward into a combat system for target acquisition and weapons deployment. The example PMO might function under a Program Executive Office for air combat systems.

The acquisition reform process began to coordinate weapons systems development among armed services. The integration of weapons systems development eliminated, for the first time, the need for overlapping functions and systems. A current, FY02, outcome of this reform action includes the Joint Strike Force Fighter (JSF) aircraft (Struth, 2000). This aircraft is currently in testing and pre-production and supports the Navy, Air Force and Marine Corp aviation communities.

Figure 2 depicts the four-stage acquisition model used by the Department of Defense acquisition organizations, which manage weapons systems development and field deployment.

While legislative reform was in progress, organizational changes were being implemented and new systems development technologies were being proposed. Research into the use of Integrated Product and Process Development (IPPD), the use of Integrated Project Teams (IPTs), new financial and database management systems, and the application of the latest developments in quality assurance and control, all led to the complete overhaul of the weapons systems acquisition process.

The human side of weapons systems development also experienced reform. The creation of a Department of Defense Acquisition University (DAU) established a government graduate college for training and developing weapons systems acquisition professionals. New federal career tracks under the Office of Personnel Management (OPM) were opened permitting acquisition, logistics and technology development to become independently recognized as discriminate civil service and military specialty professional career tracks.

From 1984 through 1994, there was continuous growth in the acceptance of acquisition reform policies and procedures. Organizational and managerial problems and structural dilemmas were solved. Professional training and development became institutionalized. Weapons systems were produced and deployed on time, within budget and with minimal error due to:

- the structural reorganization of the Program Management Offices;
- the reorganized secretariat within the Department of Defense; and,
- acceptance of new techniques in using systems engineering principles and procedures to manage the integrated acquisition process.