

# MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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## RE-ENGINEERING THE UNITED STATES MARINE CORPS SPECIAL EDUCATION PROGRAM (SEP)

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Within the United States Marine Corps, there exist billets (jobs) that require specialized graduate education. Department of Defense agencies submit requests to add billets to their organizational structure. Marine Corps Orders require for every billet added another must be removed elsewhere to balance manpower requirements. Additionally, continuing validation of the billets is required to ensure compliance with Secretary of Defense criteria. Problems in the key function, billet validation, include inflexible, inefficient, and ineffective processes, and nebulous validation criteria.

We address these problems by developing a centralized decision support system to be used in a distributed collaborative setting. The objectives of the Special Education Program (SEP) Billet Validation System are to allow SEP billet holders and commands to evaluate and justify existing SEP billets, to assist Military Occupational Specialty Sponsors in identifying manpower reductions, and to validate the graduate education requirement for existing SEP billets. Methods from Multi-Criteria Decision-Making (MCDM) specifically Multi-Attribute Utility Theory (MAUT) and the Analytical Hierarchy Process (AHP) are used to formalize Secretary of Defense requirements and quantify relative ratings of billets. The system employs a Web Browser front-end application to allow the administrative review process to be performed in a parallel manner.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software, Manpower, Personnel and Training, Modeling and Simulation

**KEYWORDS:** Graduate Education, U.S. Marine Corps, Decision Support, Manpower, Web Browser, Utility Theory

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## MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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### **THE IMPACT OF INFORMATION TECHNOLOGY ON ORGANIZATIONS: IMPLICATIONS FOR ORGANIZATIONAL INTEGRATION AND THE MANAGEMENT OF INFORMATION TECHNOLOGY**

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The goal of this thesis is two-fold. First, the paper explores and discusses how information technology (IT) is used as an integrative mechanism in organizations. Second, the paper suggests why organizations have experienced increased IT management requirements.

The paper examines how Internet technology is used by companies to integrate operations. Supporting case studies of Wal-Mart and Calyx & Corolla are examined to determine the effectiveness of using IT as an integrative tool. Next, this research discusses how a buying versus building strategy has led to increased demands on IT management. Supporting case studies of SAP (Systems, Applications and Products) and British Petroleum are reviewed to determine if IT management will increase.

This research concluded that IT is used as an integrative tool in organizations. Companies are using Internet technology to electronically link to other companies to form virtual organizations. In addition, IT is used as an effective means of collaborating and sharing information and knowledge in order to make decisions and innovate faster. Finally, although companies have achieved clear benefits of using IT for integration, there also have been negative repercussions. Using IT and adopting a buying strategy results in greater IT management requirements.

**DoD KEY TECHNOLOGY AREA:** Other (Information Technology Integration)

**KEYWORDS:** Information Technology, Integration, Information Technology Management

### **A PARADIGM FOR CONFERENCE COLLABORATION ACROSS A GLOBALLY NETWORKED ENVIRONMENT**

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Manual, labor intensive efforts are traditionally required to plan professional conferences and symposiums. Methods for receiving, verifying, recording, sorting and scheduling papers and presentations continue to rely heavily on administrative personnel resources. In recent years, some electronic methods have been incorporated into the conference planning process, but there have been no efforts to provide an integrated collaboration system which takes full advantage of the existing Internet architecture. Advances in World Wide Web technology provide an opportunity to revolutionize the entire conference planning process. For the 1998 IEEE International Symposium on Circuits and Systems (ISCAS '98), a prototype is built to demonstrate and evaluate the effectiveness in using Internet technology to provide an automated system for conference collaboration. Use of this prototype throughout the ISCAS conference planning effort clearly identifies the on-line requirements which are essential to support a globally networked collaboration environment.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software, Human Systems Interface

**KEYWORDS:** Conference and Symposium Planning, World Wide Web, WWW, Database

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## MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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### DECISION SUPPORT FOR RECONNAISSANCE USING INTELLIGENT SOFTWARE AGENTS

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Research in reconnaissance traditionally focuses on data detection and discrimination methods. Less emphasis is placed on transforming the collected data into useful information and presenting it to key command and control nodes in time for operational use. Information not presented in a timely manner is excluded from the decision process. This thesis proposes a conceptual model of intelligent software agents to support the human decision process and reconnaissance related tasks. The Mobile Agent Reconnaissance Kit (MARK) suggests a hierarchy of software agents to facilitate data integration and coordination in a network-centric multisensor environment. The model uses static and mobile agents to collect data from dispersed, heterogeneous data sources, process and fuse the data, and present the resultant information to the user in an HTML file. The authors explore applications of MARK in terms of the Military Intelligence Cycle, the Joint Director of Laboratories (JDL) Technical Panel for C3I Data Fusion Model, and the Joint Operations Planning and Evaluation System (JOPES) Crisis Action Procedures.

**DoD KEY TECHNOLOGY AREAS:** Command, Control and Communications, Computing and Software, Human Systems Interface

**KEYWORDS:** Software Agent, Intelligent Software Agent, Mobile Software Agent, Reconnaissance, Decision Support

### K-12 LOCAL AREA NETWORK DESIGN GUIDE

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This thesis is presented as a Local Area Network (LAN) design and planning guide for kindergarten through twelfth grade (K-12) educators preparing to design and implement LANs in K-12 schools and libraries. Data was collected during the implementation of LANs in K-12 schools of the Monterey Peninsula Uniform School District (MPUSD). Though the author recognizes that each school will have unique issues it is also reasonable to assume that other K-12 schools will have needs and face challenges similar to those of the MPUSD.

This document provides a person who is not a network professional with a LAN design guide based on network design practices and lessons learned from the MPUSD LAN implementation. The information in this document is also relevant to Navy commands preparing to implement LANs in small and medium sized offices and training schools. Navy commands and schools will face many of the same challenges that the MPUSD schools faced when planning and implementing LANs. The author focuses on areas that were most effective or most challenging during the MPUSD LAN implementation. High-

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## MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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lights of successful initiatives employed by educators during the MPUSD network installation process should prove valuable to other educators preparing to implement LANs in K-12 schools.

**DoD KEY TECHNOLOGY AREA:** Computing and Software

**KEYWORDS:** Local Area Network, LAN, Network Design, K-12 LAN, Networking

### ADVANCED MATERIAL PRESENTATION: A STUDY IN TECHNOLOGY AND ERGONOMICS

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**Frank Barrett, Department of Systems Management**

Governments and local school systems continue to invest millions of dollars in educational technology. Most of these investments have not produced as promised and some are complete failures. The purpose of this thesis is to determine the state-of-the-art for the implementation of educational technology into the classroom and create a set of common lessons learned from these experiences. Also, an experiment using Microsoft Powerpoint is used to determine students specific likes and dislikes on the infusion of technology into their classroom. Two sections of the same class are used for the experiment. One is a control group that has the lecture material presented to them in the traditional manner (overhead transparencies and blackboard) and the second receive the same material plus additional information made possible by the abilities of Powerpoint. The students are then given a three-part survey to express their feelings on the use of presentation technology. Overwhelmingly, the students prefer the use of presentation technology. They feel that the use of technology increases their ability to learn and adds flexibility for the professor and students. Also, the decreased time the instructor must spend writing notes on the blackboard is beneficial.

**DoD KEY TECHNOLOGY AREA:** Computing and Software

**KEYWORDS:** Information Technology, Education

### A DEMONSTRATION AND ANALYSIS OF REQUIREMENTS FOR MARITIME NAVIGATION PLANNING

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Restricted water transits by U.S. Navy ships require detailed planning by Commanding Officers, navigators and the entire ship control watch team. The methodical maritime navigation *planning process* currently used has not changed appreciably since World War II. The process remains a manual one, relying primarily on hard copy data (which is distributed via the U.S. Postal System or other Governmental shipping means) for updates to the navigation picture. The explosion of information sources and technology provides an opportunity to revolutionize the entire maritime navigation planning process.

The thesis contains an overview of the current manual navigation planning process used by the U.S. Navy. Alternatives

## **MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT**

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for migrating the current method to an automated process are explored. A requirements analysis is conducted to capture fleet navigator feedback for a prototype automated navigation planning tool.

Conclusions drawn from this study are implemented in the prototype on-line navigation-planning tool that has been dubbed "GatorNet." Additionally, a requirements document is developed with the objective of shifting the maritime navigation planning and debriefing paradigm from a manual mindset to an automated one.

**DoD KEY TECHNOLOGY AREAS:** Command, Control, and Communication, Computing and Software, Other (Maritime Navigation)

**KEYWORDS:** Navigation, Planning, Lessons Learned, Prototype, Database, WWW, Middleware

### **INTRANET FOR THE SYSTEMS MANAGEMENT DEPARTMENT**

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The objective of this thesis is to describe in detail the reasoning and development of an Intranet-based decision support system. This thesis is intended to show how World Wide Web technologies can be used to develop a prototype Intranet that can provide access to information for faculty, students, and staff members via a World Wide Web browser. It provides more open communication in the Department of Systems Management, quicker and more consistent information flows (service) to the faculty and staff, and reduced time spent on the handling of repetitive and often simple information exchanges. The decision support function is supported by a database which is an information clearinghouse, providing all personnel with 24-hour access. Personnel are empowered by information availability and are likely to be more proactive. A prototype has been developed to demonstrate the concept and to demonstrate the validity of rapid prototyping as a means of validating the effectiveness of the modified Intranet development methodology. The prototype is located at (<http://131.120.41.236>).

**DoDKEY TECHNOLOGY AREA:** Computing and Software

**KEYWORDS:** Intranet, Decision Support System, World Wide Web

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## MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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### **GARRISON BASED INTRANET PROTOTYPE FOR THE 40TH INFANTRY DIVISION (MECHANIZED)**

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This thesis introduces the concept of an Intranet, chronicles the efforts required to create and deliver an Intranet, and provides a discussion of advantages and disadvantages of using an Intranet. It demonstrates that an Intranet can be a useful mechanism to solve problems related to information control and distribution for the reserve component of the 40th Infantry Division (Mechanized).

The thesis contains a detailed description of the rapid prototyping process model, as well as the modifications required to adapt the process for Intranet development. Further, it describes the gathering of system requirements using the results of several structured walk-throughs. It also describes, in detail, the development efforts to address each of the requirements identified.

The prototype developed as part of this thesis demonstrates several key aspects of Intranet development and deployment. For example, it incorporates webpage development using commercial-off-the-shelf products common to the division, and the development of interactive functions with spreadsheet and database programs. This thesis also addresses issues such as security and content control which are crucial for Intranet deployment.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software, Human Systems Interface, Other (Intranet/Network Design)

**KEYWORDS:** Intranet Design, Garrison, Ground Unit

### **HANDHELD COMPUTER APPLICATIONS IN THE NAVY COMMAND ENVIRONMENT**

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As society becomes increasingly information-oriented, the drive for more capable machines to retrieve, store, process, and present such information anywhere, at anytime becomes paramount to success. This is true of United States Navy and Marine Corps officers who must manage large amounts of information while operating in remote areas. Today's very small, portable computers known as "palmtops" are capable of running powerful scaled-down versions of contemporary operating systems. When coupled with a transmission medium, palmtops represent a portable computer that can be used to communicate and process information in ad hoc environments. The Naval Postgraduate School Staff Officer Palmtop Computer Project is designed to analyze the effectiveness of Windows CE-based palmtop computers as an aide to professional Naval officers. The study project provides Naval officers with a popular palmtop computer and allows them to use the device for a four-week period. During this time participants are encouraged to use the palmtop for work and personal information tasks. The primary complaints with these devices are ergonomically oriented. There is no convenient and reliable method

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## MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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of data entry and they cannot be easily carried while in uniform. Results from the study indicate that current Windows CE “handheld PCs” are not appropriate for use in this capacity. Recommendations for more useful portable personal computers complete this research.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software, Human Systems Interface

**KEYWORDS:** Mobile Computing, Handheld Computers, Palmtop Computers, Windows CE

### **ANALYSIS OF THE DIGITAL VIDEO BROADCAST STANDARD FOR USE IN THE GLOBAL BROADCAST SERVICE ARCHITECTURE**

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**Second Reader: Michael W. Boudreau, Department of Systems Management**

The demand for robust, space based, communication systems, for the Department of Defense, continues to increase. The proposed architecture for the Global Broadcast Service (GBS) will meet many of these demands. GBS is a Department of Defense CONUS-based Direct Broadcast Satellite (DBS) project utilizing commercial-off-the-shelf components for the transmission and reception of video, Internet Protocol (IP) and Asynchronous Transfer Mode (ATM) data transmissions. The satellite transmission standard plays a key role in the success of the GBS program. In November 1997 the GBS prime contractor, Hughes Information Systems, announced the use of the Digital Video Broadcast (DVB) standard as the satellite transmission standard for GBS.

This thesis presents an independent evaluation supporting the use of the DVB standard within the GBS architecture. Data contained in this thesis evaluates the theoretical effectiveness of the GBS system while using the DVB transmission standard. This thesis contains a comparison of the DVB supporting documentation against the GBS requirements documentation. The conclusions of this thesis strongly support selection of the DVB standard as the satellite transmission standard for GBS.

**DoD KEY TECHNOLOGY AREAS:** Command, Control, and Communications, Manufacturing, Science and Technology, Space Vehicles

**KEYWORDS:** Global Broadcast Service, Command, Control, and Communication Systems, Direct Broadcast Satellites, Digital Video Broadcast (DVB)

### **STRATEGY AND GUIDELINES FOR TRANSITIONING A HELICOPTER SQUADRON TO THE DEFENSE MESSAGING SYSTEM WITHIN THE IT 21 CONCEPT**

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IT 21 is the Navy’s program to establish standards for fleet units to have the necessary computing infrastructure to support emerging and future requirements. One of the cornerstones of next century’s command and control system is the Defense Messaging System (DMS) which replaces AUTODIN. This thesis gathers existing program information and literature, filters the information, and provides the relevant information in one source. The result is a strategy and methodology that

## **MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT**

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achieves DMS and IT 21 objectives. It recommends an architecture that is flexible for future growth, provides group collaboration opportunities, and maximizes shared databases. Additionally, a strategy for purchasing network components and DMS training is recommended.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software, Command, Control, and Communications

**KEYWORDS:** Defense Message System, IT 21, Implementation Strategy, Organizational Change

