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Information Resource Management: An Analysis of the Critical Skills, Training Sources, and Training Adequacy as Perceived by Air Force Communications and Information Officers

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AFIT/GIR/LAS/97D-12

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THESIS

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THESIS

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Abstract

This study explores what Information Resource Management (IRM) skills are required as perceived by the Air Force officers performing IRM duties. The following questions set the stage for this research: (1) What does current literature say about the required skills needed for IRM professionals? (2) What IRM skills do officers in the field perceive as important to the IRM mission? (3) What is the primary source of any IRM training received by the officers? (4) How adequate was this training, if any?

The results suggest that Air Force officers have a grasp of IRM concepts and know what skills are necessary to perform the mission successfully. This study also revealed that formal training received by the officers is adequate or better. This completes two pieces of the puzzle: (1) What skills are needed to complete the mission, and (2) The formal methods of training are effective and adequate.

The third piece of the puzzle has not been realized. More people need access to formal training sources. It does not matter how good the training is if no one has the opportunity to attend. As the Air Force leads the way into the information age, people must be trained to manage the criticality resource--information.

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I - Introduction

> **The Information Resource Management (IRM) construct is a comprehensive approach to planning, organizing, budgeting, directing, monitoring, and controlling the people, funding, technologies, and activities associated with acquiring, storing, processing, and distributing data to meet a business need of the entire enterprise.** (27:199)

Overview

This chapter introduces the research conducted to study the effectiveness of training for Air Force personnel fulfilling the roles of Information Resource Managers. This chapter also provides the background information pertaining to the general issue and purpose of this study, the scope, specific objectives, and research questions, as well as definitions of important terms.

Background

As the Air Force leads the way into the 21st century, communications and computer systems will engender a major portion of this effort. Air Force leadership has ascertained the importance of information and information resources and in 1996 added Information Superiority to the list of Air Force core competencies (8:1). With constant

advancements and improvements in information and system technology, we need to ensure that the people responsible for managing these state-of-the-art systems are fully trained and capable of doing so.

As the government, more specifically the Department of Defense (DoD) and the Air Force, spends billions of dollars on information technology and systems, it is imperative that personnel are properly trained to handle the new technology and systems and meet ensuing challenges head on. As the quote preceding this chapter states, Information Resource Management (IRM) encompasses many facets of acquiring, storing, retrieving, and manipulating information, as well as the systems used to handle this valuable resource.

In 1990, the U.S. federal government spent over $20 billion on acquiring new information systems (32:60). Since that time federal agencies have spent over $145 billion building, buying, and maintaining computer systems and networks. The DoD was responsible for a large portion of these acquisitions and estimates that additional spending on system migration projects between now and the year 2000 will total more than $11 billion (37:26).

GAO/HR-97-9, Information Management, also lists several examples of what can happen if billions of dollars worth of systems and technology are placed into the hands of someone incapable of successfully completing the project. The report specifically mentions the Internal Revenue Services' (IRS) failed Tax Systems Modernization Plan which had cost over $3 billion, and was still incomplete. The IRS has had to obtain additional contractor support to attempt to salvage the project. Similarly, in 1994, the

Federal Aviation Agency (FAA) had to scrap a large portion of their Air Traffic Control (ATC) modernization program because of delays and program shortfalls--a loss of $7.6 billion, and like the IRS plan, the program was not completed. A final example was expected to save billions of dollars by streamlining operations and implementing standard information systems supporting such important business areas as supply distribution, material management, personnel, finance, and transportation--the DoD Corporate Information Management (CIM) plan. Instead, after 8 years and $20 billion, the objective remains unmet. Two specific recommendations from the GAO report to prevent recurrences of similar shortfalls are: (1) improving controls over information technology investments and (2) not initiating system improvement projects without sound economical and technological analysis (37:13-25).

As illustrated in the aforementioned examples, there is a great deal to gain or lose in the information management and technology arena. While there are many other examples of cost overruns, schedule setbacks, and poor results chronicled in GAO and congressional records, the public sector has experienced some of the same problems. The government could raise the level of quality and services and realize drastic improvements in the IRM arena by benchmarking from the best practices in the industry.

Specific Objectives

The Air Force has several good systems created and implemented to maintain and allocate resources. For example, the accounting and finance system was established to handle the financial resources and an extensive personnel system was established to

manage the personnel and manpower resources. Precise policies, procedures, and systems have been implemented to acquire, control, and monitor the aircraft and other major weapon systems. While these are good systems, they are separate systems and do not communicate or correspond with each other, resulting in duplicate information contained within them. Specific Air Force Specialty Codes (AFSC) were established to manage the finance, personnel, and weapon system resources. Currently the Air Force does not have a specific information career field. However, according to Lewis, information has become just as valuable a resource as people and money--"In spite of the ambiguity, the premise underlying the IRM concept acknowledges that information is a valuable resource to the enterprise, comparable to other organizational assets such as people, plant, and capital and should be managed accordingly (27:200).

On 1 March, 1996 the Command, Control, Communications, and Computers career field and the Information Management career field merged into the new Communications and Information career field, designated by the 33SX AFSC. The duties that fall under the realm of information resource managers have been turned over to officers serving in the Communications and Information career field (35:1). The IRM duties and responsibilities have become increasingly critical as the Air Force aligns with the DoD to satisfy the objectives of legislation passed on the subject of information systems and technology, such as OMB Circular 130, ITMRA, Paperwork Reduction Act and Clinger-Cohen Act (16:2).

As we move further into the information age, information as a resource has and will continue to become a vital asset. "Institutionalizing the precept of information as an

Air Force strategic resource is critical to the future of the Air Force" (5:1). To ensure appropriate measures are taken to protect and utilize information, the Air Force Chief Information Officer (CIO) is charged with the following responsibilities. By answering the investigative questions, listed later in this chapter, this research will assist the Air Force CIO in assessing the current Air Force IRM training requirements as addressed in the following objectives:

1. Assess the established IRM knowledge and skill training requirements for Air Force personnel and determine if the requirements are adequate.

2. Assess the extent to which the executive and management levels of the Air Force meet the IRM knowledge and skill requirements.

3. Develop strategies for the hiring, training, and professional development of Air Force personnel in the areas of IRM and information technology (5:1).

The specific objective of this study was to determine what IRM skills are required for IRM professionals as perceived by the Air Force officers performing IRM duties. This research effort will also ascertain if the Air Force officers have received or have access to the proper training required to develop the skills necessary to successfully conquer the challenges they face as information resource managers.

Justification of Research

Top Air Force leadership supports the movement into the information age and realizes the criticality to treat information as a valuable resource. Former Secretary of the Air Force Dr. Sheila E. Widnall, and Retired Air Force Chief of Staff General Ronald R.

Fogelman produced a document entitled Air Force Information Resource Management VISTAS. The overarching view of the document, as presented in the forward, specifically mentions:

> Information is now a new realm in which warfare is conducted. The Air Force must have information superiority to operate effectively and defend air and space. Information is also critical to Air Force business processes. In the future the Air Force will need to do business more effectively and efficiently.

VISTAS defines Information Resource Management as "the process of managing information resources (information and related resources such as personnel, equipment, funds and related technology) to accomplish agency missions and improve agency performance" (6:1-9).

VISTAS lists four specific goals for the Air Force IRM movement (6:4):

1. Provide decision makers with on-demand access to reliable and sufficient information.

2. Increase effective and efficient use of information as an Air Force resource.

3. Develop a broad-based, Air Force-wide understanding of the value of information resources management.

4. Redesign and improve processes before applying technology.

VISTAS also specifically lists skilled and empowered workers as one of the critical success factors for successful IRM practices.

Top management support for the necessity of a strong IRM program is evident through VISTAS.

> The Air Force must have information superiority to operate effectively and defend air and space. Information is also critical to Air Force business processes. In the future, the Air Force will need to do business more effectively and efficiently. To meet the challenges of the future, the Air Force must manage information as a strategic resource to enhance the Air Force mission. All members must understand the value of information resources, and use them more effectively and efficiently.

VISTAS does not mention who is be responsible for performing the duties associated with information resource management, what skills these personnel need to complete the tasks, and how training will be implemented (6:1-9). This research effort will identify the required skills, tasks, and training required for successful IRM implementation.

Investigative Questions

The following investigative questions are proposed to thoroughly cover the research topic and accomplish the specific objectives mentioned above:

1. What does the literature say about the required skills needed to performs duties as IRM professionals?

2. What IRM skills do officers in the field perceive as being most important in performing the IRM mission?

3. What is the primary source of any IRM training received by the officers?

4. How well did this training, if any, prepare the officers for their duties?

These research questions parallel those previously mentioned in the specific objection section of this chapter, as taken from the AF CIO website. The information obtained by answering the above investigative questions, not only answers the AF CIO questions, but will assist the Air Force in assessing the current and future Air Force IRM training requirements.

Scope of Research

The scope of this research is limited to Air Force officers currently serving in the 33SX (X = any skill level or shredout) career field. The entire career field was considered as any 33SX officer may be called upon to perform IRM duties. The 33SX, Communications and Information career field, is the group of people who are in a position to perform the roles of IRM professionals within the Air Force. Due to time constraints, this research was limited to Air Force officers currently stationed within the continental United States.

Definitions of Terms

As previously stated, the idea of IRM within the Air Force is a relatively new concept. The following definitions, taken from "Air Force CIO - Definitions" are provided and explain terms used throughout this thesis:

Chief Information Officer (CIO) - Responsible to the head of the agency regarding acquisition of information technology; management of information resources and establishing a Capital Investment Plan for information technology.

Information Dominance - "A condition in which a nation possesses a greater understanding of the strengths, weaknesses, interdependencies, and centers of gravity of an adversary's military, political, social, and economic infrastructure than the adversary has of that nation." Information dominance is not the main focus of this thesis, however it is one of the key factors in determining the importance of IRM.

Information Management (IM) - The functional proponents creation, use, sharing, and disposition of data or information as corporate resources critical to the effective and efficient operation of functional activities consistent with IM guidance issued by the Command, Control, Communications, Computers, and Intelligence (C4I). It includes the structuring of functional management improvement processes by the Office of the Secretary of Defense Principal Staff Assistants to produce and control the use of data and information in functional activities; information resource management; and supporting information technology and information services.

Information Resources - Information and related resources, such as personnel, equipment, funds, and information technology.

Information Resources Management[1] (IRM) - The process of managing information resources to accomplish agency missions and to improve agency performance, including the reduction of information collection burdens on the public (1:2-5).

Organization of Thesis

The first chapter of this thesis contains an introduction of the study, to include background information on the general issue of the specific research questions. Chapter I also includes the specific objective, investigative questions, scope of the research, and definition of terms used throughout the thesis.

Chapter II is a review of current literature relevant to the research effort. Topics covered include a comparison between what are considered core competencies for IRM professionals in the civilian sector and within the Air Force.

Chapter III is a complete description of the methodology used to solve the specific objectives and answer the investigative questions. Chapter III will also outline the method utilized for data analysis.

Chapter IV is an analysis of the data collected from the participants in the survey.

Chapter V concludes the research effort by presenting the findings of the study, drawing conclusions from the analyzed data, and using this information as a basis for conclusion and to make recommendations.

[1] Throughout this thesis the terms information systems (IS) professional, information manager, and information resource manager are used interchangeably.

II - Literature Review

Introduction

To many people, the concept of Information Resource Management (IRM) is very new. However, IRM is not a new concept, in fact several sources trace IRM back to the late 1970s. Like many other concepts and theories, IRM has evolved, and during this evolution the skills required to perform the IRM functions have also evolved. Along with the fundamental changes of IRM functions, the roles of the people performing as information managers has extended from mail room clerk, to common manager, to the position of Chief Information Officer (CIO). The focus of this chapter centers on how the set of "core skills" has progressed through time, the skill set needed to perform current IRM functions, and how this applies to IRM within the Air Force.

History

The 1970s. In his 1979 book, Forest W. Horton, Jr. said that information managers "must know a considerable amount about the theories, methodologies, tools, and applications of all the disciplines concerned with information-handling". He goes on to define information resources as "all of the data and information facilities, sources, services, products, and systems needed by the agency manager to support and fulfill his information requirements" (21:129). While the IRM movement had begun, the concept of information as a corporate resource had not been fully realized. As illustrated in

Figure 1, in the 1970s information was thought of as paperwork, printing centers, word processing, etc. (21:xi).

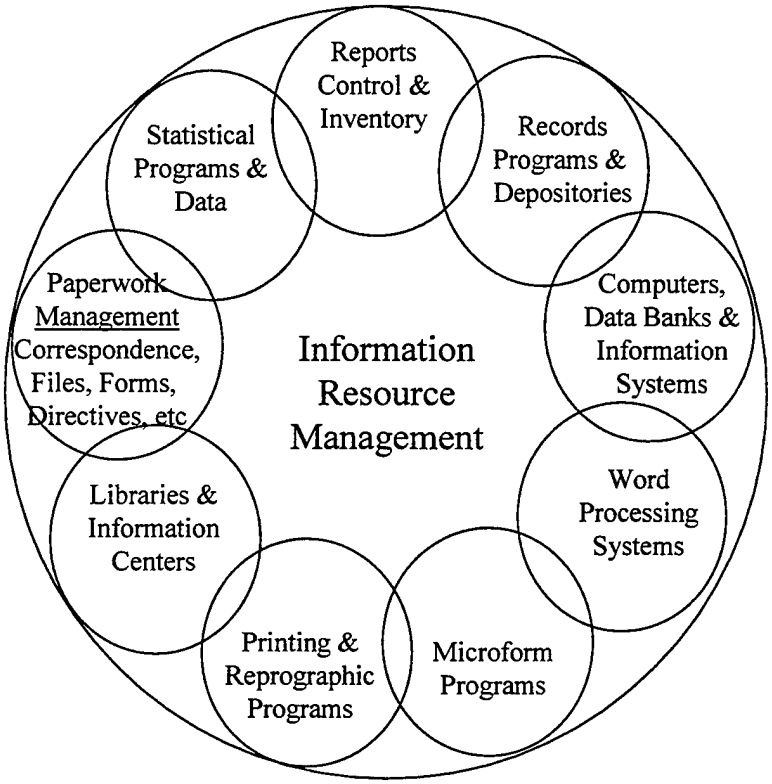


Figure 1. The Convergence of Information Functions and Fields of Specialization

Although Horton does not list the specific skills required to be an information resource manager, he does state that the administrative, technical, and behavioral skills needed by the information manager are more extensive, detailed, specialized, and complex than ever before. A few of the training and educational needs he specifically mentions are:

1. Computer Design Forms
2. Advanced Computer Systems Technology
3. Indexing and Abstracting
4. Computer Programming
5. Computer/Microfilm Information Systems
6. Advanced Scientific Computing Techniques
7. Systems Design Considerations in an On-line Environment
8. Systems Workshop for Computer Specialists
9. Automated Personnel Systems
10. Creativity in Systems Design
11. Systems Analysis for Computer Programmers
12. ADP Systems Analysis Seminar
13. Auditing On-line Systems
14. Process Flow Charting for Analysts
15. Introduction to Minicomputers for User-Managers

In addition, he lists some randomly selected course titles from training catalogs of the civil service commission, U.S. government (Appendix A).

If Horton's book is a good indicator of society's view of IRM in the 1970s, it can be summarized by saying that IRM, in practice, was still an administrative function and had not yet reached the "management level". However, theoretically, Diebold contradicts Horton as early as 1979 when he stated that "It is clear that the organizations which excel...will be those that recognize information as a major resource and structure it as efficiently as they do other assets" (17:50-53; 27:200).

The 1980s. The ideas and concepts of information management and information as a corporate resource began to evolve in the 1980s. Henry C. Lucas, Jr. said, "Firms preparing to meet the challenges of the 1980s will need a capable and sophisticated manager of corporate information. An organization's success will depend in large part on

successfully managing its information resources". Peter F. Drucker added, "Information is the manager's main tool, indeed the manager's "capital" and it is he who must decide what information he needs and how to use it" (31:6). Meltzer's book includes a section on "Information Management - the Larger Perspective". He points out that information managers have immense responsibility. They must know the information requirements of their organizations, be objective, view information as a resource, and be able to examine the information needs from an internal and external perspective. This section of the book is divided into five sub-sections, the different roles information managers must perform:

Organizational Entrepreneur, requiring organization, management, and assumption of the risks and rewards of a company. The information manager is a partner of the company, a decision maker and problem solver who is involved in operations, planning and setting corporate goals. The idea is that a person does not work for a company, they work with it. One of the many responsibilities associated with this role is the effective and efficient information flow within the company.

Provider and User of Information, requiring thought in the various ways to process the economic resource information, consider the internal needs for information to make the organization run more effectively, and be aware of the external demands for information from the various publics the organization deals with.

Policy Maker, sets policy regarding the information resources of your organization. Policy making is an inherent responsibility of the job. If the information manager is not in a position to set policy, he/she must be able to advise and persuade those who are.

Agent of Change, must have access to the capital and labor resources of the company to accomplish corporation objectives, to include efficient use of personnel and equipment, coordinated with information resources. Part of the change agent responsibilities are to determine the current state of the art in the field of information management, assess the company's current status, and develop a plan for future years.

Other Roles, including researcher, a role assumed when experimenting with new information technology, and organization coordinator (31:121).

Meltzer defines an information manager as the individual in an organization (public, private, or nonprofit) who is responsible for acquiring, processing, and using information resources effectively and for applying those resources effectively to help the organization attain its mission and goals. He goes on to say:

> the information manager must be familiar with all aspects of the information industry, so that the various elements that will best serve the organization's needs are melded. The information manager must have both the education and attitude of a manager, not that of a specialist or technician. He or she is the generalist with the knowledge and skills necessary to plan, organize, and control the information resources of the company. The information manager understands the behavioral aspects of management as well as the technological aspects of information science. (31:122)

Although the IRM movement was escalating, it was progressing slowly. The 1980 edition of the Employment and Training Administration's Dictionary of Occupational Titles of 20,000 job titles, did not include an entry for information manager. The job was also not listed in 1980 - 1981 Bureau of Labor Statistics Occupational Outlook Handbook, which covers 274 occupations in detail and mentions many others. Information management concerns at this time included word processing,

telecommunications, mail rooms, growing technology, and the emergence of a central information department. Organizations still had not realized the "big picture" of information as a corporate resource, although they had begun to realize its importance and value.

The 1990s. In 1991, James M. Kerr wrote a book entitled The IRM Imperative which put IRM in a totally different perspective compared to the 1970s and 1980s. Strong statements taken from the preface and introduction illustrate this point:

"IS professionals are moving out of the back room and into the board room" (23:vi).

"IRM, simply put, is the belief that information is an asset that should be managed rigorously and can contribute to the success of businesses" (23:vi).

"For the first time since the computer was introduced to the workplace, failure to automate may lead to business failure" (23:vi).

Kerr also recognized that a paradigm shift was needed for firms to become competitive in meeting the challenges of tomorrow. The following table makes this very clear (23:vii):

Table 1. A Fundamental Paradigm Shift within IS (23:2)

OLD MODEL	NEW MODEL
IS is a back room function	IS is a business partner
IS staff is comprised of technology wizards, who lack business knowledge	IS staff is comprised of well informed business professionals who are technically proficient
Business areas own the data they manipulate	Data is a corporate asset managed by the Data Administrator
Users must be trained in new applications	Users must be trained to use technology to its fullest

Kerr's book brings IRM into the 1990s, however, we must remember that it was written in 1991, over 6 years ago. He mentions that tomorrow's information managers should strive to become proactivists, futurists, strategists, change agents, integrators, staff professionals, and politicians, as revealed in Figure 2.

Figure 2. New Roles for IS Managers to Ponder (adapted from 31:16)

The IRM roles and functions are different today, but have continued to follow the progression previously established. The roles identified in Figure 2 are much different from the roles identified by Horton in Figure 1.

Also in 1991, Janet Laribee wrote an article discussing how IRM evolved to meet the information needs within an organization:

> The field of study of information resource management has evolved to meet these needs through the more efficient use and management of information services and resources (IRM). The concept of IRM has been in existence since 1979 and is considered to be part of the discipline of Management Information Systems (MIS). Although no universal definition exists of this emerging field, it has evolved under the premise that information and its technologies are vital organizational resources and deserve to be managed skillfully as other factors of production. (24:16)

The 1990s also brought the title of Chief Information Officer into the spotlight. This was a significant step in itself, organizations were beginning to place more

importance on the value of information as a corporate resource. This section has outlined the major developments in the evolution of the IRM concepts. The next few sections will focus on previous Air Force studies on IRM, and the critical skills needed to succeed as an IRM professional in today's organization.

Air Force Applications

The Air Force has taken a keen interest in establishing the IRM functions required in successful businesses, and feels information management is critical to mission accomplishment. One clear example of this is found in the following Air Force description of IRM:

> Information Resource Management is a management function dealing with efficient management of information and data elements throughout their lifecycle. IRM encompasses the planning, budgeting, and supervising of the facilities, systems and organizations associated with government information in accordance with public laws and regulations. It covers both the information itself and related sources, such as personnel, hardware, software, funds, and technology. The Air Force's IRM program supports the delivery of Air Force programs and the conduct of internal management functions through the administration of computer, telecommunications and related technologies and management of forms, reports, and automated and manual information systems. (4:2)

As illustrated in this definition, there are many similarities between how the Air Force and industry define IRM.

Another example of how the Air Force is stressing the importance of IRM is the recent formation of the Air Force Chief Information Officer (CIO) position. According to the Air Force CIO - Home Page (maintained by USAF/CIO), the Air Force CIO is responsible for all aspects of Air Force information management and application of

information technology of support mission goals. This is such a critical position that the Honorable Arthur L. Money (Assistant Secretary of the Air Force) was named the first Air Force CIO, and Lt Gen Donahue (USAF/SC) was assigned his deputy (2:1).

The Air Force has also published AFI 33-389, Air Force Information Resources Management Assessment Program as guidance in monitoring the Air Force IRM program (7:1). This is a big step, as none of the current literature reviewed for this study mentioned assessment guides to review an IRM program. The IRM assessment required by AFI 33-389 is aimed at evaluating the program to help determine the overall effectiveness of the Air Force's IRM program. The methodology for collection and analysis of data will be done through the use of an automated IRM assessment processor that contains questionnaires on IRM related processes. The questionnaires will be used to populate a database that will be used to create a matrix indicating how well each organization performs in each area of IRM activities. The CIO will assess these results to develop IRM policy and identify IRM resource requirements and priorities to enable the Air Force to manage information as a strategic resource to achieve the mission (7:1).

The Air Force plan for assessing the IRM effectiveness is multifaceted and includes, but is not limited to the following reviews and assessments:

Determine mission effectiveness
Determine compliance with regulations and expectations
Determine organizational effectiveness
Determine project effectiveness
Determine mission accomplishment
Implement management control processes
Identify process improvement
Identify functional elements where improvements should be achieved to enhance mission effectiveness

Utilize disciplined framework to better articulate and understand organization's mission
Provide management with comprehensive picture across organizations

Fifteen areas of IRM activities are assessed annually at the end of each fiscal year. In early January of the following year the Air Force Annual IRM Activities Assessment Report is submitted to the Air Force CIO (4:3).

Previous Air Force Studies

In 1990, Captain Summer Scott completed a thesis entitled An Evaluation of the Educational Background and Knowledge Base of Air Force Information Management Officers (34). The purpose of her study was to investigate the actual educational background and knowledge base of Air Force IM officers as compared to the background and knowledge base suggested by literature for all IM professionals. The study also identified areas of knowledge and skill IM officers perceive as necessary to the performance of their mission (34:7).

The literature reviewed by Scott revealed that information managers should be knowledgeable in the topic areas of people, computers, systems, models, organizations, and society. Through a survey to IM officers in the field, she was able to determine that the majority of those surveyed did not possess an educational background which addressed the critical topic areas associated with information management. "In essence, these officers have been given a job which they are unprepared educationally to perform" (34:83). Scott's thesis relates to this research effort in that it identified training deficiencies.

In 1992, Captains David Biros and Stewart J. Cole completed a thesis entitled An Analysis of the Effectiveness of Air Force Information Management Officer Training Based on the Perceived Needs of Current Information Management Officers (11). The focus of their research was to evaluate the effectiveness of the information management officer courses and determine if they were meeting the needs of information management officers who attended them. They also used a mail survey to ascertain the perceptions of computer training received by IM officers. The results of their work proved valuable in determining the effectiveness of the Information Management Officer technical school in regards to computer training (11:80). Their efforts focused on the computer training received and not on information management skills as a whole. The recent merger of the Communications and Computers career field with the Information Management career field has shifted any training deficiencies revealed in their study to the Communications and Information technical courses.

Also in 1992, Major Paul Condit, a research fellow at the Airpower Research Institute, conducted a study entitled Principles of Information Resource Management, A Foundation for the Future. In his report he proposes a set of IRM principles with DoD's total quality management (TQM) as a nucleus. These principles serve as the foundation for managers to plan, direct, and control IRM activities. The study focused on the use of information to achieve higher levels of integration and represents a significant departure from the current DoD approach to managing information and information systems (13:vii). Condit points out that the DoD is dependent on many automated information systems which have been implemented over several decades. These systems represent

widely diverse technology in the form of fragmented, inflexible, and often inconsistent information resources such as software, hardware, and data. He also mentions that as technology has continued to advance, efficient and effective management of DoD's total information resources has not been realized (13:xi).

DoD Directive 7740.1 states that IRM (1) applies to all DoD components; (2) covers the information management activities of information technology, data elements, information collection, privacy of records, information security, statistical activities, forms, reports, and records; and (3) covers the management of information within the DoD, as well as information provided to and received from government agencies and information received from the public (13:32).

The Air Force IRM program goes even further, requiring the IRM framework to address: (1) the development and management of manual and automated procedures in information systems; (2) the organizational considerations, including the structure and functions of the enterprise; (3) the data objects of interest to the enterprise; (4) the system development process, including methodologies, and (5) the technology used to implement information systems.

While Condit defines what IRM means to the DoD and explains some of the shortfalls within the DoD IRM programs, he fails to mention what training is required for people to perform this mission successfully. Herein lies the heart of the problem. A great deal of time and money has gone into information management systems and IRM within the Air Force and the DoD (13).

A review of the previous studies did not reveal the specific skills needed to perform the IRM functions. Before people can be properly trained or educated to perform any given function, the critical skills needed to successfully complete the tasks must be determined. The remainder of this chapter will focus on the critical skills needed to perform IRM functions as identified in current literature.

Current Skill Requirements

There have been several recent studies completed to ascertain the particular skills required to perform the IRM functions in successful organizations. The results of these studies reveal striking similarities in the required IRM skill set. One of the greatest similarities is that the skills are broken down into three distinct groups. While the group names do not correspond exactly, the concepts are the same; (1) managerial/business skills, (2) technical skills, and (3) interpersonal skills.

Young and Lee (1997) completed a study on issues related to IS hiring practices. By using a mail survey they were able to examine the critical skills needed to develop systems that solve business problems and support organizational objectives. The findings from the questionnaire included descriptive data, to include a rating of the skill sets needed by recent graduates, and a ranking of hiring criteria used by firms when selecting employees. According to Young and Lee, IS skills are commonly grouped into categories that include; knowledge (including technical abilities), interpersonal and group skills, and organizational or business experience (38:49). A complete list of the required skills identified by Young and Lee is included in Appendix B.

Trauth, Farwell, and Lee (1993) completed a two phase study to determine how recent changes are affecting information systems, technologies, applications, and personnel in considering the skills required of future information system professionals. In determining what skills are needed today and projected into the future, the authors completed this study aimed at establishing a baseline of required skills. Their study had many similarities to the study by Young and Lee, to include dividing the IRM core skills into three distinct groups; IS Tasks, Technical Skills, and Abilities (which is further divided into Human, Business, and Technical). These groups, although not identical to the groups found by Young and Lee, contain the same primary skills (36:297). The complete list of required skills as identified by Trauth, Farwell, and Lee can be located in Appendix B.

Two years later (1995), Lee, Trauth, and Farwell published another article on the required skills for information professionals. This second study was initiated to investigate anticipated changes in the IS profession, to study the impact of these changes on required skills and knowledge, and to compare the requirements to academic curricula of future IS personnel. Focus groups were used to identify the perceptions of industry and academia about the critical core sets. Critical IS activities were once again divided into groups: (1) technical specialties knowledge/skills; (2) technology management knowledge/skills; (3) business functional knowledge/skills; and (4) interpersonal and management knowledge/skills (25:323). The complete list of required skills as identified by Lee, et al can be located in Appendix B.

In 1997, Leitheiser completed a study to provide managers and educators with information on the current and future demand for MIS professionals and with information about the relative importance of specific MIS skills, and the implications on businesses, educational institutions, and researchers. "The skills required for MIS professionals are determined by the tasks they are to accomplish, the organizational environment in which they operate, and the technology with which they work" (26:71). Leitheiser also mentions specific skills required for an IRM professional, and divides the required skills into specific skill categories: (1) analysis and design, (2) programming, (3) interpersonal, (4) business, (5) environment, (6) language, and (7) applications. As you can see, the skill categories are very similar to those detailed above (26:77). The critical skills identified by Leitheiser can also be located in Appendix B.

The following table, divided into the three primary skill categories; managerial, technical, and interpersonal, lists the top skills as identified in each of the studies cited here:

Table 2. Core Skills Divided into Skill Groups

CORE SKILLS IDENTIFIED IN CURRENT LITERATURE		
Managerial	**Technical**	**Interpersonal**
Project management (1,2,4,5)	Operating systems (1,2,3,4)	Verbal Skills (2,3,4,5)
Analyze business problems (1,2,4,5)	Development of applications (3,5,)	Cross-functional group work (3,4)
Manage and plan new systems and technology (2,4,6)	Management of applications (2,4,5,6)	Written communication (3,4,5)
Maintain client/user relationship (1,2,5,6)	Networks (1,2,3,4)	Work group software (3)
Understand business environment (1,2,4,5)	Languages (1,2,3,4,5)	Persuasion (4)
Ability to understand trends (1,2,4)	Personal computer tools (4)	Disseminate information (2,6)
Politics (1,2)	Telecommunications (1,2,3,6)	Provide documentation (2)
Organizational culture (1,2,)	Data communications (2,6)	Team and group projects (1,2,4,5)
Deal with ambiguity (1,2,)	CASE tools (1,2,3,4,6)	Ability to train others (1,4,6)
Ability to learn business functions (1,2,4,6)	Relational databases (1,2,3,4,6)	Responding to emotions (4)
Ethics (4)	Systems integration (1,2,6)	Ability to function as teacher and coach (1,2,4,5,6)
Perform cost/benefit analysis (4)	Information security (4,6)	Ability to work closely with customers...maintain client relationship (1,2)
Self-directed and proactive (1,2,4)	Prototyping (4)	Plan, organize, and write clear...documentation (1,2)
Ability to learn new technologies (1,4,6)	System life cycle management (1,2,4)	Presentation skills (ie briefings) (1,2,4)
	Decision support systems (1,2,4)	
	Expert systems/artificial intelligence (1,2,4)	
	Distributed processing (1,2,4,6)	
	Systems analysis/structured analysis (1,2,4,5)	

Key: 1 = Lee et al. (1995)
2 = Trauth et al. (1993)
3 = Young and Lee (1997)
4. Leitheiser (1992)
5. Longenecker et al (1996)
6. Lewis et al (1995)

The next several sections of this chapter describe the importance of each of the skill categories as revealed in the literature review.

Managerial/Business Skills. To fully understand how management skills fit into IRM, we must first define the concept of management. In his book, Management, Griffin (1996) defines management as:

> A set of activities (including planning and decision making, organizing, leading, and controlling) directed at an organization's resources (human, financial, physical, and information) with the aim of achieving organizational goals in an efficient and effective manner. (19:5)

March and Kim go one step further and explain how management specifically applies to IRM:

> The effective use of corporate information is a significant management concern. From simple record keeping to strategic planning, from internal accounting to developing competitive strategies, the ability of an organization's information systems to provide relevant, accurate, and timely information is critical to the success of that organization. (29:6)

A review of current IRM literature reveals the importance of the managerial skills in today's organization. Lee, et al found that respondents in their study felt that business functional knowledge and interpersonal/management skills were considered the most important skills today and in the future. They also found that one of the most important IS activities of the future will be to align IS solutions with business needs (25:330). This is a powerful statement, especially since it contradicts the findings of their earlier work when they determined that "the skill mix for many IS professionals today favors technical expertise over people-handling ability" (36:293). The significance of this contradiction is

not only that the perspective on technical skills shifted 180 degrees, but it was from two different studies completed by the same team. Although their 1993 study indicated technical skills were most important, Trauth, et al did recognize the need for managerial skills. When describing a new type of IS professional, they wrote:

> The future IS professional will be required to cross political, organizational, and national boundaries in order to solve problems. The ability to carry out enterprise-wide tasks, such as business process re-engineering will become the defining characteristic of this future IS professional. (36:299)

Young and Lee also found that business skills rival technical skills in importance; one respondent in their study specifically stated that a computer science background alone was no longer sufficient (38:52).

An additional study, completed by Longenecker, Simonetti, and Mulias also supports the importance of managerial skills for today's IRM professional.

> IS professionals must be able to operate effectively in the team environment that increasingly pervades most modern organizations. They must develop project management and effective planning and organizing skills to increase their ability to provide a quality product that fits with the provider's information system. It is no longer appropriate to be a systems operator in isolation. IS professionals must be business people who provide more than information or technical applications; they must provide value-adding business solutions. To do so they must expand their knowledge and experience outside the IS function. (28:28)

Technical Skills. When considering the concept of IRM it is easy to extract the importance of "information" and "management", however technical skills are also a large part of a manager's arsenal. According to Griffin, technical skills are necessary to accomplish or understand the specific kind of work being done in an organization. He

goes on to say that since a great deal of a manager's time is spent training and monitoring subordinates, they must know how to perform the tasks to be effective (19:17).

The 1993 study completed by Trauth, et al is the only recent study to identify technical skills as the most important of the three skill categories. In order to perform effectively as information managers, IS professionals will need skills in key technical areas: (1) telecommunications and integration, (2) data access and management, (3) decision support and CASE, and (4) firm-specific technologies. Respondents in their study indicated that as information processes move to the functional areas of the organization, fourth-generation tools, packaged software, end-user computing, and business process analysis have grown in importance, while knowledge of COBOL or some other third-generation language was decreasing in importance (36).

Leitheiser's study provided the most information about the technical skills required of IRM professionals. His results indicate that skills associated with performing cost/benefit analyses, feasibility studies, conceptual designs, and information requirements determination are considered important today and remain so in the future. Also, skills involving CASE tools are the fastest growing required skill mentioned by Leitheiser. He reported that programming skills are moderately importance, with documentation becoming one of the more critical skills. The ability to prototype applications was seen to grow in importance until it becomes one of the most important skills, and the ability to develop systems for a mainframe environment is one of the most important skills in the 1990s, but will drop off significantly in the future. In the future mainframe skills will be replaced in importance with personal computers skills and

knowledge of multiple platform environments. The technical skills in the database/data communications category were perceived as being most important for the time periods of Leitheiser's study. Of the skills in the database/data communication category, physical database design, data communication systems, local area networks, and electronic data interchange are specific skills listed as most important. Software skills were considered the second most important category while hardware and advanced application skills followed. Although it appears Leitheiser has strong feeling toward the technical skill requirement, he identifies interpersonal skills as being the most important. The interpersonal skills are discussed later (26:78-80).

In their 1995 article Lee, Trauth, and Farwell wrote, "respondents considered technical specialties knowledge to be the least important for both now and in the future". The de-emphasis of the importance of technical specialties knowledge is an interesting result and is a complete contrast to their 1993 study. "Traditional IS technical knowledge, such as assembly languages, third-generation languages, and main frame operating systems are not as important as they once were" (25:328).

There are some technical areas which are growing in importance however. Respondents indicated that technical knowledge in the area of networks, telecommunications, relational databases, and fourth-generation programming languages are most important emerging areas (25:328).

Longenecker, Simonetti, Mulias (1996) also address the technical skills versus the other skills issue. They state:

> major opportunities still exist for the pure technician whose technical expertise is wholly devoted to keeping an organizations computing infrastructure operating smoothly. Yet, in the current IS climate, these skills alone are not enough to guarantee success or even survival as IS professionals are increasingly being tasked to serve as business analysts and to function like customer-oriented outside contractors. (28:27)

Young and Lee (1997) did not have a great deal to say about technical skills, but added, "Traditional technical skills, including proficiency in third-generation languages and knowledge of systems development methods, are important, as is knowledge of client/server development and the ability to work with object oriented languages" (38:53).

Interpersonal Skills. Interpersonal skills are defined as, "the ability to communicate with, understand, and motivate both individuals and groups" (19:18). Griffin identifies interpersonal skills as being equally important, both inside and outside of an organization. He goes on to say "Although some managers have succeeded with poor interpersonal skills, a manager who has good interpersonal skills is likely to be more successful" (19:18). These same feelings were exhibited in the current studies analyzed, and except for the 1993 study by Trauth, et al, all research has indicated that interpersonal skills are the most important skill category for information professionals.

Young and Lee (1997) found that interpersonal communication skills are an important hiring criteria for IS graduates because they must interact with both users and

colleagues. In fact, they felt it was so important that they identified interpersonal skills as the most important skills in the IRM professional's core skill set. "Although technical skills are still needed to perform systems analysis tasks, IS professionals must possess interpersonal skills and business knowledge if they are to succeed in today's work environment" (38:50). They also felt interpersonal skills are more important for end-user support personnel. Interpersonal skills received the high ratings and showed the highest level of agreement among respondents in the study completed by Young and Lee. "These interpersonal skills are necessary for working in business units, creating useable documentation, and interacting with functional management. IS employees can no longer use a technical job function as an excuse for neglecting vital interpersonal skills" (38:53).

Both of the studies conducted by Lee, Trauth, and Farwell (1993,1995) acknowledged the importance of interpersonal skills. "Business functional knowledge and interpersonal/management skills were considered the most important in the future (25:327). Maintaining a productive relationship with the user/client was viewed by the practitioners surveyed as the most important of the skills listed under abilities (36:296). "The future IS professional will need a strong contextual orientation. This will include a deep understanding of the business units within which they work, interpersonal skills necessary to work with the end users, and an ability to effectively apply technology in seeking solutions to business problems" (36:299).

The research completed by Leitheiser (1992) can be summarized by stressing the importance of interpersonal skills. Two previous studies identified by Leitheiser (Henry, Dickson, and Lasalle and Benbasat, Dexter, and Mantha) examined the perceived

importance of ACM MIS skill categories for systems analysts. "Both studies found that samples of MIS professionals rated "people" skills above "systems" and "computer" skills (26:71). Two other studies referenced by Leitheiser examined the perceptions of skill importance but did not aggregate results by category, however many of the highest rated skills were interpersonal. It is interesting to note that the article mentioned that end-users did not rate the interpersonal skills as highly as the analysts did. Leitheiser agrees with the researchers and authors who feel interpersonal comprise the most important skill category. In his study, he also identified interpersonal skills as the highest rated category. Respondents in his study sent a clear message about the importance of interpersonal communication. "The difference in importance between business, programming, and analysis/design skill categories were usually too small to pick one category over another with confidence. Managers tended to view these skills in roughly the same way; that is, they are important, but not as important as interpersonal skills" (26:77).

Finally, Longenecker, Simonetti, and Mulias (1996) also identified interpersonal skills as among the most critical survival skill for information managers (28:28).

Summary. While the current literature reviewed as part of this research effort generally found one of the skill categories more important than the others, all of the skill categories were deemed important. This chapter summary will provide some overall comments taken from the reviewed material. In light of the fact that the required skills for IRM professionals are divided into three distinct groups, a well-rounded professional is still essential to successful performance.

The list of required skills identified by Young and Lee in 1997, attached at Appendix B, reveals the breadth of technical skills currently needed by new IS employees; they must be proficient both in mature technologies and emerging techniques and tools. As previously stated, interpersonal skills received the highest ratings and showed the highest level of agreement among respondents in Young and Lee's study. The ranking of hiring criteria identified deviates somewhat from the list of skills required, however, interpersonal skills (e.g. communicative skills to include speaking, listening, and writing) remain higher than technical skills:

Table 3. Hiring Criteria

Hiring Criteria
Grade point average (GPA)
Problem-solving skills
Written and oral communication skills
Leadership through extracurricular activities
Self-confidence and poise during the interview process
Internship or other full-time work experience
Technical skills

"New IS employees must have strong interpersonal skills, a sound background in business fundamentals, and an understanding of the types of computer applications used in the firm they join" (38:53).

The 1993 study completed by Trauth, et al offers the following: "In the respondent's view, as IS personnel move to the functional areas of the firm, fourth generation tools, packaged software, end-user computing, and business process analysis have grown in importance." Respondents also recommended "greater emphasis on "real world" experience, communication skills, analytical ability, and problem-solving" (36:294). The main theme that emerged from the survey was "the need for a "high-quality person" with general intellectual depth, solid interpersonal and communication skills, and some functional business knowledge" (36:294). And one final thought from Trauth, et al:

> The future IS professional will possess traditional IS skills but will be focused on integration rather than systems development. Integrating activities associated with joint ventures, mergers, downsizing, globalization, and the ever-present demand for cost control continue to be the most significant challenges faced by IS professionals. (36:294)

The 1995 study by Lee, Trauth and Farwell, "suggests that industry will demand a cadre of IS professionals with knowledge and skills in technology, business operations, management, and interpersonal skills to effectively lead organizational integration and process reengineering activities" (25:313). "There was a genuine belief among these practitioners (survey participants) that IS jobs were indeed becoming more demanding along multiple dimensions of knowledge/skill requirements" (25:327).

Longenecker, Simonetti, Mulias (1996) feel that balance is the key to success:

> Today's IS professionals must be a master craftsperson—balancing technical competency with a growing list of skills and characteristics that have frequently discounted or deemed less than critical for the technically competent IS professional. These skills clearly demonstrate the expanding business and customer orientation needed in the future. (28:28)

Conclusion

This chapter has reviewed the current literature to identify the critical skills required for someone performing the functions or activities associated with IRM. It also identified the Air Force perspective on IRM. As illustrated in the summaries from the articles, there is a "core" group of skills that IRM professionals feel are critical for successful completion of their professional responsibilities. The Air Force is equally interested in the IRM concept, however it has not identified the skills needed to perform the IRM functions. The entire DoD has spent valuable resources on IRM, IS, and information technology. The concept of information as a corporate resource is still evolving; however, as it matures organizations are beginning to recognize information as a valuable, critical resource.

III - Methodology

Overview

This chapter describes the methodology employed to answer the investigative questions in Chapter I. To reiterate, the purpose of this research effort is to ascertain what IRM skills are required as perceived by Air Force officers serving as IRM professionals, or performing IRM functions. Data gathered from a descriptive survey will identify the critical IRM skills, the primary source of training received corresponding to these skills, and how well this training prepared the officers to successfully accomplish their given tasks. The explanation of the method used in this study includes information pertaining to how the data was collected, the target population, the sample size, limitations, and what information was gathered.

Population

The target population of this research effort was comprised of Air Force Lieutenants and Captains currently serving in the Communications and Information career field (33SX). Lieutenants and Captains were chosen because they would be more familiar with current training (e.g. recent technical school attendees) and they link the enlisted technicians with the field grade policy makers. Due to time and cost considerations, the sample population was limited to 33S officers currently stationed at CONUS bases (plus Alaska and Hawaii). All officers meeting the criteria were considered, including those in joint duty and special duty assignments. Also, all shredouts were considered, as any Communications and Information officer is as likely to

serve in an IRM position as any other. Per Captain Dave Hluska, Air Force Personnel Center (AFPC) representative, there were 3,060 Communications and Information officers meeting these requirements at the time of this study (20). Current AFIT IRM students were excluded since they took part in the pilot test to validate the survey.

Sample

A stratified random sample was selected from the population listed above. The following steps were taken to obtain a list of eligible participants and to ensure random selection of the sample population.

1. AFIT Registrar's office provided the list of names and addresses of all officers meeting the specifications. The list contained 3,060 names.
2. Using a random number generator in Microsoft Excel, each person was given a number between 1 and 6, dividing the group into six sub-groups.
3. Again, using a random number generator in Microsoft Excel, an empty cell was given a random number between 1 and 6. The number 2 was identified as this random number; every person from the list of names that had been assigned a 2 (during step 2) was chosen for the sample population. There were 510 names identified by the number 2, however 9 individuals were eliminated because they are current AFIT students and could have participated in the pilot study.
4. Five hundred and one surveys were mailed out.

Sample Size. The reliability of the data depends on the size of the sample obtained, or surveys returned, not the number of surveys sent out (9:30). A power analysis was completed to determined the required sample size utilizing the following formula (22):

$$n = \frac{N(z^2)p(1-p)}{(N-1)(d^2) + (z^2)p(1-p)}$$

where: n = sample size
N = population
p = maximum sample size factor (.5)
d = desired tolerance (.05)
z = factor of assurance; 1.645 for a 90 percent confidence interval

Applying the formula to the data for this research effort, the following n was determined:

$$n = \frac{3060(1.645^2).5(1-.5)}{(3060-1)(.05^2) + (1.645^2).5(1-.5)}$$

$$n = 248$$

where: n = sample size (returned surveys required)
N = population (total target population)
p = maximum sample size factor (.5)
d = desired tolerance (.05)
z = factor of assurance; 1.645 for a 90 percent confidence interval

The power analysis revealed that 248 returned surveys were needed for this study based on the population size of 3,060 (N); this equates to a 46.7 percent return rate. While most survey research remits a response rate near 30 percent (9:35; 14:282), research analyzed by Pinsonneault and Kraemer indicated an adequate response rate for MIS related surveys was 52 percent (33:94). Based on past Air Force research, it is reasonable to expect a return rate of 52 percent or better. Two prior theses have shown

dramatically better results; Captains Dave Biros and Stewart Cole's thesis reported a response rate over 60 percent (11:30), and Captain Summer Scott reported a response rate of 72.4 percent (34:56).

Measures were taken to overcome a low response rate in the form of an explanatory letter and self-addressed return envelope. An additional measure taken to overcome the low response rate was to send out approximately twice the amount of survey's required to be returned.

Data Collection

In their 1993 article, Pinsonneault and Kraemer discuss their findings on the research methodology used in 122 survey-based MIS studies. They address several different methods of data collection:

> The choice of data collection method, such as mail questionnaire, telephone interview, or face-to-face interview, is significant because it affects the quality and cost of the data collected. For example, mail questionnaires are very good for gathering factual data, but they are less effective when sensitive or complex data are needed. (33:84)

The data required for this research is descriptive and factual, not complex or sensitive.

This research effort used a survey in the form of a questionnaire to gather data, which according to Pinsonneault and Kraemer is used;

> to find out what situations, events, attitudes, or opinions are occurring in a population. Survey research aimed at description asks simply about the distribution of some phenomena in a population or among subgroups of a population. Analysis stimulated by descriptive questions is meant to ascertain facts, not to test theory. (33:80)

A final comment from the article comparing five different data collection methods indicates that "mail questionnaires were the most frequently used method of data collection regardless of research purpose. There is almost no use of telephone interviewing and computer-imbedded questionnaires" (33:94). Based on the research of Pinsonneault and Kraemer, and the advantages listed below, a mail survey was deemed the most appropriate and effective method of data collection.

The Mail Survey

The mail survey was administered to collect the desired data pertaining to critical IRM skills. A mail survey was determined more advantageous than other data collection methods (e.g. qualitative) for several reasons, which apply to this study:

1. The composition, production, printing, and mailing of the questionnaire can often be done by one researcher and a smaller staff of external services. (9:34; 14:282)
2. The questionnaires received by those surveyed are identical to each other. Each respondent is presented with exactly the same instructions and tasks, eliminating the chance of interviewer bias. (9:34)
3. Mail surveys cost less to administer than most other data collection methods. (9:34; 14:282)
4. Also related to cost; for a given budget, mail surveys usually yield a much larger sample size than interviewing. (9:34)

5. Mail surveys enhance the opportunity to reach widely dispersed respondents inexpensively. Geographic dispersion of respondents is often the compelling reason for this data collection method. (9:34; 14:287)
6. Respondents that might otherwise be inaccessible can be contacted. (14:282)
7. Respondents can take their time, think about the questions, and complete the survey when it is convenient for them. (14:282)
8. Mail surveys provide more assurance of anonymity than other communication modes. (14:287)

Although the mail survey method of data collection has the many advantages listed above, it also has several disadvantages that are worthy of mention:

1. Mail surveys frequently facilitate a low response rate. A 30 percent response rate is often considered satisfactory. (9:35; 14:282)
2. Mail surveys do not allow the surveyor to secure large amounts of information as there is no way to probe deeply into questions. There is not an opportunity for interviewer intervention. (9:35; 14:283)
3. Whether the survey is completed and returned, set aside, or thrown away depends on the participants characteristics, attitudes, opinions, and interest in the topic. As a result some types of people are likely to be over or under represented, creating biased results. (9:35; 14:287)

4. Mail surveys cannot be long or complicated without risking confusion on the part of the respondent. (14:283)
5. Researcher must have an accurate mailing list. (14:287)

To offset the disadvantages of a mail survey, several proactive steps were incorporated into the method. First, to boost the low response rate, a self-address envelope was provided to the survey participants along with a detailed letter explaining the purpose of the study and a definition of IRM. Second, a point of contact was provided for any questions participants may have had while completing the survey. The survey included a specific area for additional comments for participants that desired to delve into more detail. To ensure certain portions of the population were not over or under represented, survey participants were chosen at random. Finally, a pilot test was administered to verify the validity, usefulness, and clarity of the survey. The pilot test is explained later in this chapter.

Instrument Development and Data Collection

A questionnaire was developed by reviewing several current articles discussing the critical skills required for successful IRM, MIS, or IS professionals. The skills were extracted from the articles and a consolidated list was refined, containing the 24 skills most frequently found in the literature. The questionnaire consisted of a five main parts and was designed to provide data to answer the research questions identified in Chapter I.

Part I was set up to gather demographic data including rank, AFSC, and time in the Air Force. The information gathered from these questions will categorize the

respondents in terms of rank, time in service, specialty code, years in specialty, education level, and Air Force technical training.

Part II was a list of 24 skills extracted from current literature on the concept of IRM, and asked the participants to rate the importance of these skills in performing IRM functions. The answers to this section will be used to identify the critical IRM skills as perceived by the officers in the field. The numerical answers to these questions will allow the skills to be ranked based on their median scores.

Part III repeated the list of 24 skills and asked the participants to indicate the primary source of training received in the critical skill areas. The results of these questions will identify where the officers have received their training. One of the choices to this question was "no training received in this area", which would indicate a gap in the training received and the skills required.

Part IV asked the participants how well the IRM training received, if any, prepared them to perform the duties associated with IRM functions. This information is valuable and would indicate if the training did or did not prepare the officers to perform their duties.

Five-point Likert scales were used in parts II and IV to standardize the answers, and gather the data. These scales can be utilized when the study is attempting to obtain someone's position on an issue; a form of opinion or attitude measurement. Likert scales are very useful in measuring the degree of agreement or disagreement on an issue, and provide the answers in the form of coded data that can be easily analyzed and compared (9:116-117).

Finally, Part V was an open section for participants to add comments or offer suggestions they felt were pertinent or could add value to the study.

Instrument Testing

According to Cooper and Emory, there are three major criteria for testing a measurement tool, in this case the survey--validity, reliability, and practicality.

> Validity refers to the extent to which a test measures what we actually wish to measure. Reliability has to do with the accuracy and precision of a measurement procedure....and practicality is concerned with a wide range of factors of economy, convenience, and interpretability. (14:148)

While designing the survey instrument, a panel of five AFIT IRM students, considered experts in the field, and two professors of the AFIT Graduate School of Logistics and Acquisition Management were consulted for suggestions and recommended improvements. Several revisions to the survey were necessary before it was finalized.

As an additional measure, a phone call was placed to the Air Education and Training Command (AETC) Occupational Measurement Squadron. The mission of this unique squadron is to perform task analysis and breakdowns to identify the necessary skills and required training for every Air Force specialty. They have not completed an analysis on the newly formed Communications and Information career field, and did not have one scheduled in the future. The last analysis on the Communications and Computer Systems career field was completed in 1989.

The pilot test, administered to 15 AFIT IRM students, was implemented to test the three criteria suggested by Cooper and Emory. The AFIT IRM students were instructed to complete the survey, comment on usability, and offer any suggestions to

improve the instrument. In aggregate, they determined the survey was valid and reliable in measuring the perceptions of Air Force Communications and Information officers in regards to the IRM concept. The pilot test also determined the survey was easy to understand and complete in a timely manner, and not too long or complex, thus practical. The constructive feedback obtained from the pilot test was incorporated into the survey. This feedback included adjustments and corrections to the anchors used on the Likert scales, question rewording, format, and correction of typographical errors. Per AFI 36-2601, Air Force Personnel Survey Program, the survey was approved by the AFPC Survey Branch and was issued a survey control number (SCN-97-57) prior to release to the sample population.

Survey Administration

The survey packages were sent to the 501 people randomly chosen from the population of 3,060. Each package contained; the survey, a cover letter which included instructions, a definition of IRM for clarification, a point of contact, and a pre-addressed return envelope. No suspense date was indicated on the cover letter, however, it was requested the surveys be returned as soon as possible.

The cut-off date for returned surveys was established 3 months after the mail-out date. At that time 242 useable surveys had been returned. Prior to entering the data into a spreadsheet, the cover letter and return envelope were discarded to ensure the respondent's identity remained anonymous.

Statistical Tests

The collected data was consolidated into one grouping. Answers were annotated, and a spreadsheet was built in Microsoft Excel for summarization.

The demographic information was analyzed through descriptive measures, (ie number of respondents, division into categories) to reveal the classification of the respondents. Tables were used to show the numbers, totals and percentages.

Part II of the survey analyzed and ranked the 24 skills for importance to the IRM mission by computing the mean score based on the individual responses. These skills were also analyzed by skill group; interpersonal, managerial, and technical.

Part III of the survey used frequencies to determine how many times a training source was selected as the primary source for each of the 24 skills. This information was utilized to ascertain the primary training source, in aggregate, per skill.

Part IV of the survey also ranked the skills by mean score (for training adequacy). This was completed two times; once for the formal skills, and once for the non-formal skills. A two-tailed t-test was performed to test the mean scores (formal training mean score versus non-formal mean score) for statistical significance. Crosstabulation determined how many times a training source was selected as the primary source and exactly how those selections were divided amongst the five choices on the Likert scale. For example, crosstabulation revealed how many people responded that Air Force OJT prepared them "extremely well" to perform any given critical IRM skill.

Part V of the survey, the open comments section, was analyzed by reviewing the comments, looking for specific complaints or constructive feedback, and for recurring issues.

The analysis of the data is presented in Chapter IV.

IV - Data Analysis

Introduction

As stated in prior chapters, the purpose of this thesis and the accompanying research was to ascertain the perceptions of 33SX Lieutenants and Captains concerning the core skills required to perform the IRM mission successfully. The data gathered through the questionnaire sought to answer the research questions, as restated here:

1. What does the literature say about the required skills needed to perform duties as IRM professionals?

2. What IRM skills do officers in the field perceive as being most important in performing the IRM mission?

3. What is the primary source of any IRM training received by the officers?

4. How well did this training prepare the officers for IRM duties?

Responses

A questionnaire consisting of 80 questions, divided into five sections, was administered to 501 Lieutenants and Captains from the 33SX career field. Thirty-nine surveys were returned unopened due to erroneous addresses or because the recipient had separated from the Air Force. Of the remaining 462 surveys, 251 were returned for a survey response rate of 54.3 percent. Nine of those surveys were determined unusable and eliminated because of multiple answers or errors. For example, the instructions stated to "pick the best answer" or "identify the primary source"; a few individuals gave

up to three responses for some questions. Also, several individuals chose a value from the Likert scale in Part III after choosing the answer 1, no training, in Part II. The instructions stated that if 1 was chosen in Part II, Part III should be answered "n/a". While the analysis in Chapter III determined 248 usable surveys were needed, this research came very close to that number, receiving 242 usable surveys. However, according to Pinsonneault and Kraemer this should not be a major concern, "gains in precision increase considerably with samples between 100 and 200, after which gains drop off" (33:92).

The questionnaire solicited information pertaining to demographics, the core skills identified in the literature review, primary training sources, and adequacy of any training received in the core skill areas. Part V of the survey was an open section for constructive comments on the research. Many comments were received, some of which will be discussed later in this chapter.

The remainder of this chapter will provide the demographic statistics and reveal the findings and data analysis of the returned questionnaires.

Demographic Information

Part I of the questionnaire solicited the demographic information about the individuals participating in the research. This section consisted of eight questions to identify the rank, time in service, AFSC, time in AFSC, education level, and whether the respondent had attended BCOT and/or ACOT.

Rank. As indicated in the following table, approximately half of the respondents were Captains. The next largest group was comprised of 1st Lieutenants, followed by 2nd Lieutenants and "other". While the questionnaire was only mailed to Lieutenants and Captains, three respondents identified themselves as "other". By reviewing the comments in Part V of the survey, it was determined that these individuals had recently pinned on the rank of major. Their input was included and analyzed in the research.

Table 4. Rank Distribution

33SX RANK DISTRIBUTION				
	This Study		**Air Force Wide**	
2nd Lieutenant	52	21.49%	615	18.82%
1st Lieutenant	67	27.69%	905	27.70%
Captain	120	49.59%	1747	53.47%
Other	3	1.24%		
Total	242	100%	3267	100%

The distribution of rank as illustrated in the above table corresponds with Air Force-wide demographics for the Communications and Information career field. According to the "Career Families Based on Duty AFSC" webpage, the career field has a total of 3,267 officers in the ranks of 2nd Lieutenant, 1st Lieutenant, and Captain Air Force wide (12). The relationship between the Air Force demographic information and the information derived from this study indicate that the sample used in the research has generality; it is representative of the Air Force-wide percentages.

Time in service. Table 5 identifies the responses returned concerning the amount of time the respondents had been in the Air Force. This information represents total time, no delineation was made to separate enlisted years of service versus commissioned years of service. As depicted in the table, the majority, 51 percent, of the respondents had been in the Air Force for more than 6 years. The remaining 49 percent is divided rather evenly amongst the six other groups. This is valuable information as it suggests that the pool of respondents had been in the Air Force beyond the initial training years, had sufficient time to develop as 33SX officers, and form perceptions on skills necessary to be successful.

Table 5. Time in Service

Time in Service (in years)		
Less than 1	19	7.85%
1 to 2	14	5.79%
2 to 3	26	10.74%
3 to 4	27	11.16%
4 to 5	18	7.44%
5 to 6	15	6.20%
More than 6	123	50.83%
Total	242	100%

Current Air Force Specialty Code (AFSC). The vast majority, 66 percent, of the respondents indicated a primary AFSC of 33S3. The second largest group of respondents were 33S1, followed by 33S4 and "other". Nine of the respondents (4 percent) identified themselves as other. Referring to the comments section, and notes on the survey itself, the "others" are Communications and Information officers who are currently serving in special duty assignments (ie, protocol, executive officers, etc).

Table 6. Air Force Specialty Code

Air Force Specialty Code		
33S1	45	18.60%
33S3	160	66.12%
33S4	28	11.60%
Other	9	3.72%
Total	242	100%

Shredout. A shredout is a suffix attached to an AFSC which identifies a specific area within that AFSC. The 33SX AFSC has three shredouts as identified in the following table: A, Electrical Engineer; B, Software Engineer; and C, Programmer/Analyst. There are also 33SX officers without a shredout. As portrayed in the table, the C shredout and no shredout categories combined encompass 85 percent of the AFSC.

Table 7. 33SX Shredouts

Shredout		
A, Electrical Engineer	25	10.33%
B, Software Engineer	12	5.00%
C, Programmer/Analyst	94	38.84%
No shredout	111	45.87%
Total	242	100%

Years in current AFSC. The following table reveals years in the current AFSC for the participating individuals. There is no majority (group) in this demographic category. The largest group, 33 percent, contains personnel who have been in the career field for more than 4 years.

Table 8. Years in Current AFSC

Years in Current AFSC		
Less than 1	49	20.25%
1 to 2	45	18.60%
2 to 3	44	18.18%
3 to 4	24	9.92%
More than 4	80	33.01%
Total	242	100%

Education. The respondents were also asked to identify the highest level of education they had completed. The table below shows that the respondents were divided into three roughly equal groups: completed a bachelor's degree (a requirement to become an officer), 39 percent; completed some master's degree level courses, 31 percent; and completed a master's degree, 30 percent. One respondent has completed courses at the doctoral level, but had not attained a doctoral degree.

Table 9. Education Level Attained

Education		
Bachelor's Degree	95	39.26%
Master's courses	74	30.60%
Master's Degree	72	29.75%
Phd courses	1	.41%
Total	242	100%

Basic Communication Officer Training (BCOT). The questionnaire solicited responses pertaining to formal technical Air Force training. The BCOT course, held at Keesler AFB, MS is the official technical training course for Communications and Information officers. This training has been specifically designed for entry-level 33SX officers. The training teaches the fundamental requirements for these officers and is more technically oriented then the following ACOT course (10:1). As indicated in the

table, approximately 82 percent of the individuals responding to the survey had completed BCOT.

Table 10. BCOT Attendance

BCOT Attendance		
Yes	198	81.82%
No	44	18.18%
Total	242	100%

Advanced Communication Officer Training (ACOT). This advanced training course, also held at Keesler AFB, MS is the second and final formal technical training provided to Air Force Communications and Information officers. Whereas BCOT teaches the fundamentals, ACOT teaches less specific, more general, higher level courses dealing with strategies, planning, and management (1:1). As indicated, 13 percent of the individuals had completed ACOT.

Table 11. ACOT Attendance

ACOT Attendance		
Yes	31	12.81%
No	211	87.20%
Total	242	100%

Attended both BCOT and ACOT. Finally, the information provided from the two previous questions was analyzed to ascertain how many of the respondents had attended both the ACOT and BCOT courses. Twelve percent had attended both of the formal Air Force technical training courses.

Table 12. BCOT and ACOT Attendance

BCOT and ACOT		
Yes	28	11.57%
No	173	71.49%
Neither BCOT nor ACOT	41	16.94%
Total	242	100%

Summary of Demographic Information

The demographic information reveals many facts about the individuals responding to the questionnaire. To summarize this information, the typical respondent was a Captain with more than 6 years time in service, possessing the 33S3 AFSC without a shredout. There was a good mix of respondents in the categories "years in current AFSC" or "level of education"; none of the choices received a majority of the responses. In regards to formal Air Force technical school training, 82 percent of the respondents had attended the entry-level training, BCOT, while the inverse is true for ACOT, 87 percent had not attended the advanced-level training.

Questionnaire Results

Part II - Critical IRM Skills. Part II of the questionnaire was designed to answer the research question, "what IRM skills do officers in the field perceive as being most important in performing the IRM mission?" This section asked the participants to rate the importance of various IRM skills (extracted from the literature) using a five-point Likert scale. The anchors on the scale ranged from 1, the skill is not important to IRM; to

5, the skill is extremely important to IRM. Based on this Likert scale and the responses received, 19 of the 24 skills (79 percent) were identified as being "very important"; a mean score of 3.0 or higher. The remaining 5 skills had slightly lower mean scores between "somewhat important" and just short of "very important", ranging from 2.3460 to 2.8950. "Ability to work closely with customers and maintain a productive user or client relationship" had the highest mean score, 4.4896. It is interesting to note that four of the top five skills belonged to the interpersonal skill group, while the technical skill group had the lowest eight mean scores. The skill with the lowest mean score was "expert systems/artificial intelligence" which had a mean score of 2.3460. Table 13, below, illustrates the ranking of the 24 skills based on their mean score. The table headings include:

Rank: The skills are listed in the descending order of importance as determined by the mean scores computed from the responses received from the participating officers.

Mean: The mean score for each skill was derived by averaging the responses from the participating individuals. As mentioned earlier, the Likert scale developed for the responses ranged from 1 to 5. The closer the mean score is to 5, the more important the skill is in performing IRM functions, based on the perceptions of the officers surveyed.

Standard Deviation: "A computed measure of spread or dispersion in a distribution of data...that can be used to indicate the proportion of data within certain ranges of scale values when the distribution conforms closely to the normal curve"

(9:455). The larger the standard deviation, the more variance between the individual data item and the mean score of the data set (30:75).

Min/Max: The minimum and maximum measurements chosen by participants for that particular skill.

Group: The skill category. This research and the questionnaire divided the skills derived from the literature into three distinct groups: interpersonal (I) skills; managerial or business (M) skills; and technical (T) skills.

Skill: The actual skill being evaluated or rated.

Table 13. Core IRM Skills Ranked by Mean Score

Rank	Mean	Stnd Dev	Min/Max	Group	CORE SKILL
1	4.4896	0.6838	2/5	I	Ability to work closely with customers and maintain a productive user or client relationship
2	4.3817	0.7328	2/5	I	Ability to communicate verbally, one-on-one and group briefings
3	4.3444	0.7258	2/5	I	Ability to plan, organize, and lead projects (project management)
4	4.2324	0.8241	2/5	I	Ability to write clearly, succinctly, and purposefully
5	4.1625	0.8978	1/5	M	Ability to learn and implement new technologies
6	4.1083	0.8991	1/5	M	Information and system security
7	4.0958	0.8935	1/5	M	Ability to understand technological trends and potentials
8	4.0250	0.9459	1/5	M	Ability to plan and set standards for corporate-wide information system technology plan
9	3.9916	1.0433	1/5	T	Networks (LAN, WAN, Corporate-wide, etc)
10	3.9544	0.8956	1/5	I	Ability to train/teach others to include end-users
11	3.8750	0.8969	1/5	M	Ability to interpret and solve business problems
12	3.7637	1.0552	1/5	T	Office automation (e-mail, schedulers, etc)
13	3.7542	1.0400	1/5	M	Contingency planning/disaster recovery
14	3.6203	1.0164	1/5	T	Systems integration
15	3.5252	1.1351	1/5	T	Telecommunications (hardware, phones, modems, cables, satellites, etc)
16	3.3933	1.0105	1/5	M	Establish/monitor corporate data structure
17	3.3655	1.1273	1/5	T	Systems life cycle management
18	3.0297	1.0931	1/5	T	Systems analysis/structured analysis (formal method)
19	3.0168	1.1324	1/5	T	Operating systems for mainframe, minis, micros, networks
20	2.8950	1.0482	1/5	T	Relational databases
21	2.8723	1.0463	1/5	T	Distributed processing
22	2.7966	1.1113	1/5	T	Decision support systems
23	2.4231	0.9959	1/5	T	CASE methods or tools
24	2.3460	1.0846	1/5	T	Expert systems/artificial intelligence

The method of ranking skills based on their mean scores, derived by utilizing a Likert scale, was used in several prior studies including those completed by Young and Lee, 1997, Trauth, et al, 1995 and 1993, Lewis et al, 1995, and Leitheiser, 1992.

The following table and graph depict the three skill areas (interpersonal, managerial, and technical) by aggregate mean score. The interpersonal skill category has the highest aggregated mean score, which correlates with the current literature indicating that interpersonal skills are the most important skill group to an IRM professional. Technical skills had the lowest aggregate mean score, which also corresponds with the current literature (e.g. see Young and Lee, 1997; Lee et al, 1995; Leitheiser, 1992; and Longenecker, 1996).

Table 14. Aggregate Mean Scores by Skill Group

Aggregate Mean Scores	
Interpersonal Skills (IP Skills)	4.308
Managerial Skills (Mgmt Skills)	3.905
Technical Skills (Tech Skills)	3.072

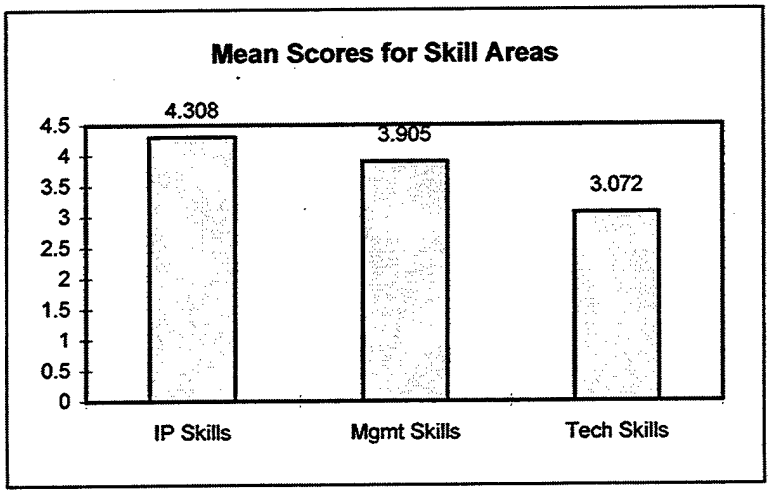


Figure 3. Mean Scores for Skill Areas

The following table was generated to reveal exactly how many individuals responded for each Likert measurement to each of the 24 skills. The column labeled "Blk" represents cells that were left blank.

Table 15. Response Frequency per Core Skill

CORE SKILL	Response Frequency					
	Blk	1	2	3	4	5
Ability to work closely with customers and maintain a productive user or client relationship	1	0	3	17	80	141
Ability to communicate verbally, one-on-one and group briefings	1	0	2	30	83	126
Ability to plan, organize, and lead projects (project management)	1	0	3	27	95	116
Ability to write clearly, succinctly, and purposefully	1	0	5	45	80	111
Ability to learn and implement new technologies	2	2	11	35	90	102
Information and system security	2	1	9	52	79	99
Ability to understand technological trends and potentials	2	2	11	40	96	91
Ability to plan and set standards for corporate-wide information system technology plan	2	4	9	53	85	89
Networks (LAN, WAN, Corporate-wide, etc)	4	3	23	43	73	96
Ability to train/teach others to include end-users	1	3	9	57	99	73
Ability to interpret and solve business problems	2	1	16	59	100	64
Office automation (e-mail, schedulers, etc)	5	3	30	58	75	71
Contingency planning/disaster recovery	2	8	16	70	79	67
Systems integration	5	8	23	67	92	47
Telecommunications (hardware, phones, modems, cables, satellites, etc)	4	9	42	56	77	54
Establish/monitor corporate data structure	3	7	40	76	84	32
Systems life cycle management	4	13	41	73	68	43
Systems analysis/structured analysis (formal method)	6	17	63	75	58	23
Operating systems for mainframe, minis, micros, networks	4	21	62	72	58	25
Relational databases	4	19	67	92	40	20
Distributed processing	7	17	76	80	44	18
Decision support systems	6	26	77	71	43	19
CASE methods or tools	8	38	100	63	25	8
Expert systems/artificial intelligence	5	54	93	56	22	12

The above table is represented graphically in the following figures.

Figure 4 through Figure 6 illustrate the average number of measurement selections per skill group. For example, in the first chart "extremely important" was selected an average of 113.4 times across the interpersonal skill group. Likewise, "highly important" was selected an average of 87.4 times across the interpersonal skill group. Figure 5 and Figure 6 illustrate the same information for managerial and technical skills.

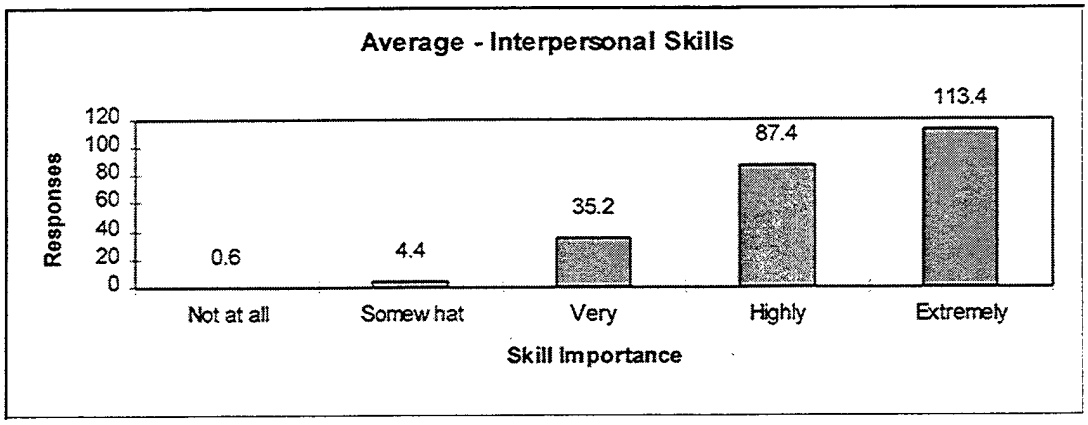


Figure 4. Average, Interpersonal Skills

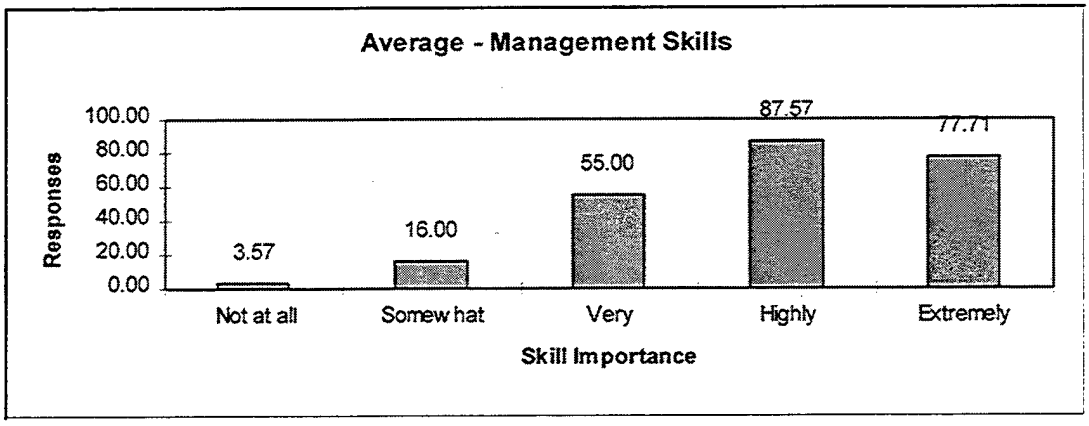


Figure 5. Average, Managerial Skills

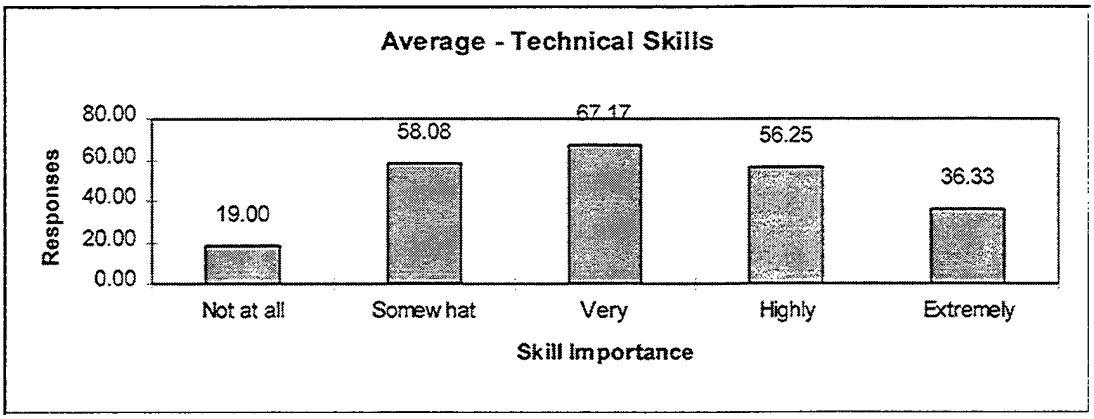


Figure 6. Average, Technical Skills

The above charts are significant because they represent the average number of "importance" selections by aggregate for the skill groups. A comparison of the three charts reinforces the results illustrated in Figure 3 and also reveals that the perceptions of the participating Air Force officers correspond with the studies recently completed on IRM core skills--adding validity to the findings of this study. The research conducted by Young and Lee (1997), Lee et al (1995), Leitheiser (1992), and Longenecker (1996) found interpersonal skills to be the most important skill group to an IRM professional, followed by managerial skills and technical skills, respectively. Bar charts indicating the numbers of measurement selections (ie, the number of "extremely important" selections) for each of the 24 skills, derived from the literature and incorporated into the survey, can be seen in Appendix C.

Summary - Part II. This section of the chapter identified the findings ascertained by Part II of the questionnaire. As mentioned earlier, the officers surveyed perceived the skill "ability to work closely with customers and maintain a productive user or client relationship" as the most important skill from the list of 24 skills provided in the

survey. As a group, the set of interpersonal skills was perceived to be the most important, in fact four of the top five skills, ranked by mean scores, belonged to the interpersonal skill group. Managerial skills were perceived as the second most important group, followed by technical skills. Not only was the technical skills group ranked last, but 10 of the 11 lowest ranking skills belonged to the technical skills group. These findings correlate with several of the literature articles reviewed which found the skill group order of importance to be, interpersonal skills, managerial skills, and technical skills.

Part III - Primary Source of IRM Training. Part III of the questionnaire was designed to answer the research question, "what was the primary source of any IRM training received?" Although many sources of training may have been applied in developing the necessary skills, this research asked the participants to chose one source as the primary source of training for each skill. The survey provided a list of eight possible training sources for the respondents to use in answering the questions.

From an overall perspective, which includes all eight training sources, the majority of the respondents indicated they had taught themselves to perform the majority of the critical IRM skills. Of the formal training methods (Air Force OJT, Air Force technical schools, undergraduate degree, and master's degree programs) included in the survey, the majority of the respondents indicated OJT as the primary training source. Although the categories of "no training" and "self-taught" were separate on the survey, they were combined during part of the analysis phase for the following reason. One of the goals of this research was to ascertain the adequacy of Air Force training provided for

IRM skills. While it is recognized that self-taught personnel may be highly proficient, they would lack standardization and uniformity (ie, 10 self-taught people may have 10 different ideas on a particular subject).

The following table identifies the primary training source for each of the critical IRM skills by illustrating the exact count of responses for each of the core skills. The primary training source for each skill is highlighted in the table.

Options for primary training source included:

1. No training in this area
2. Self-taught
3. On the job training (Air Force)
4. Correspondence courses
5. Air Force technical training program
6. Undergraduate degree program
7. Master's degree program
8. Other

Table 16. Primary Training Source Response Frequency

Core Skill	Blk	1	2	3	4	5	6	7	8
Ability to work closely with customers/ maintain a productive user or client relationship	1	19	48	83	1	55	20	11	4
Ability to communicate verbally, one-on-one and group briefings	3	25	53	68	2	40	23	21	7
Ability to plan, organize, and lead projects (project management)	2	67	38	77	2	15	25	12	4
Information and system security	3	78	12	27	2	15	68	31	6
Ability to write clearly, succinctly, and purposefully	1	58	11	42	3	60	36	27	4
Ability to learn and implement new technologies	1	72	31	32	2	9	63	23	9
Ability to understand technological trends and potentials	2	94	30	33	1	18	33	23	8
Ability to plan and set standards for corporate-wide information system technology plan	3	116	16	29	2	17	30	24	5
Ability to train/teach others to include end-users	2	120	13	23	1	12	27	42	2
Networks (LAN, WAN, Corporate-wide, etc)	1	127	8	11	1	7	41	43	3
Ability to interpret and solve business problems	2	28	60	63	1	22	48	8	10
Contingency planning/disaster recovery	2	6	126	92	0	2	12	0	2
Office automation (e-mail, schedulers, etc)	2	26	95	76	1	9	17	10	6
Systems integration	1	35	109	45	0	8	20	19	5
Telecommunications (hardware, phones, modems, cables, satellites, etc)	2	80	43	67	1	13	13	20	3
Establish/monitor corporate data structure	1	25	39	122	2	21	15	14	3
Systems life cycle management	2	68	32	99	1	18	11	5	6
Operating systems for mainframe, minis, micros, networks	2	125	27	52	1	6	17	8	4
Systems analysis/structured analysis (formal method)	1	46	61	55	1	6	29	34	9
Relational databases	1	13	99	90	2	8	11	9	9
Distributed processing	1	23	88	84	2	11	16	5	12
Decision support systems	1	12	61	84	2	23	27	24	8
CASE methods or tools	1	3	41	47	3	23	104	12	8
Expert systems/artificial intelligence	1	1	63	56	3	43	62	5	8

Further analysis of the responses to the question of a primary training source revealed crucial information. No training/self-taught was identified as the primary training source, or lack thereof, for 19 of the skills (79 percent). Four skills show Air Force OJT as the primary source of training, while one skill shows undergraduate degree programs as the primary training source, as illustrated in Figure 7 below. The sources not listed as the primary training source for any of the 24 skills have been omitted from the graph.

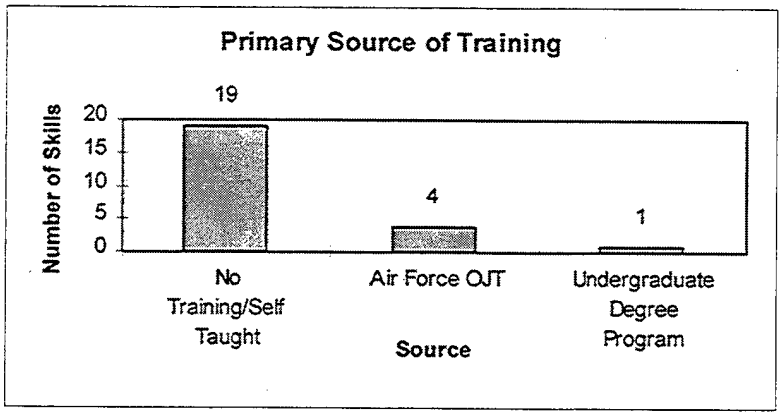


Figure 7. Primary Source of Training

The officers participating in this research indicated Air Force OJT as the primary training source for the most important IRM skill as ranked in the study--"ability to work closely with customers and maintain a productive user or client relationship". Table 16 indicates the methods of training utilized as perceived by the officers participating in the study. As Table 16 and Figure 7 illustrate, 19 of the 24 skills correspond with no training/self-taught, (combined). If this analysis did not combine the no training and self-taught categories, 15 of the 24 skills (63 percent) would fall into one of the two separate categories.

The following graphs depict the primary training source per skill category (interpersonal, managerial, and technical).

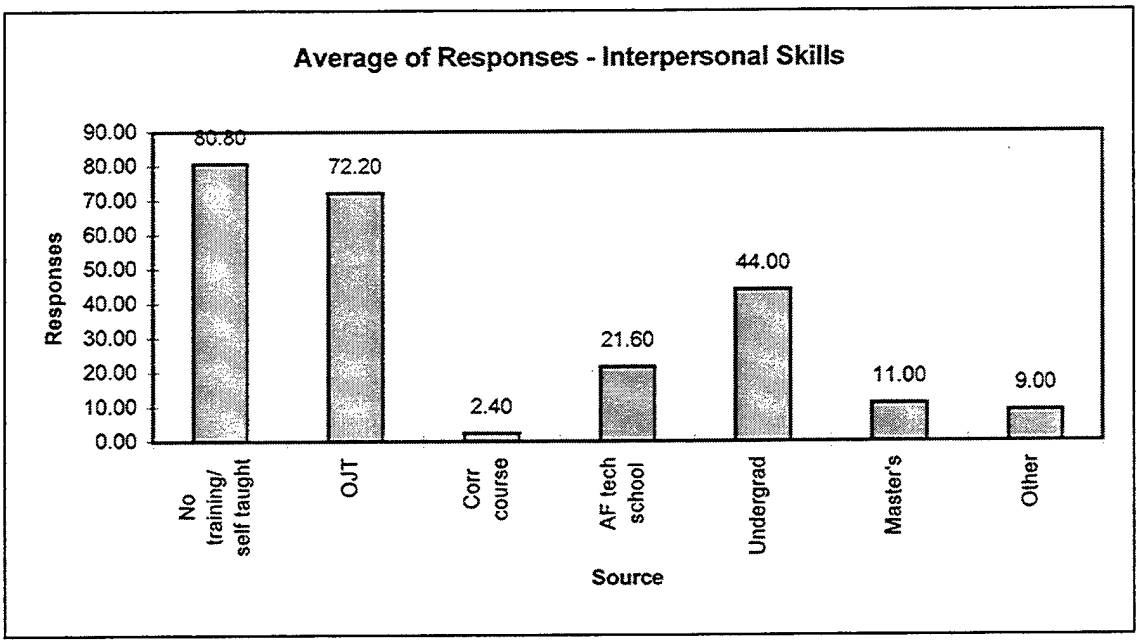


Figure 8. Average of Responses - Interpersonal Skills

As indicated, the primary training source for the interpersonal skills was no training/self-taught.

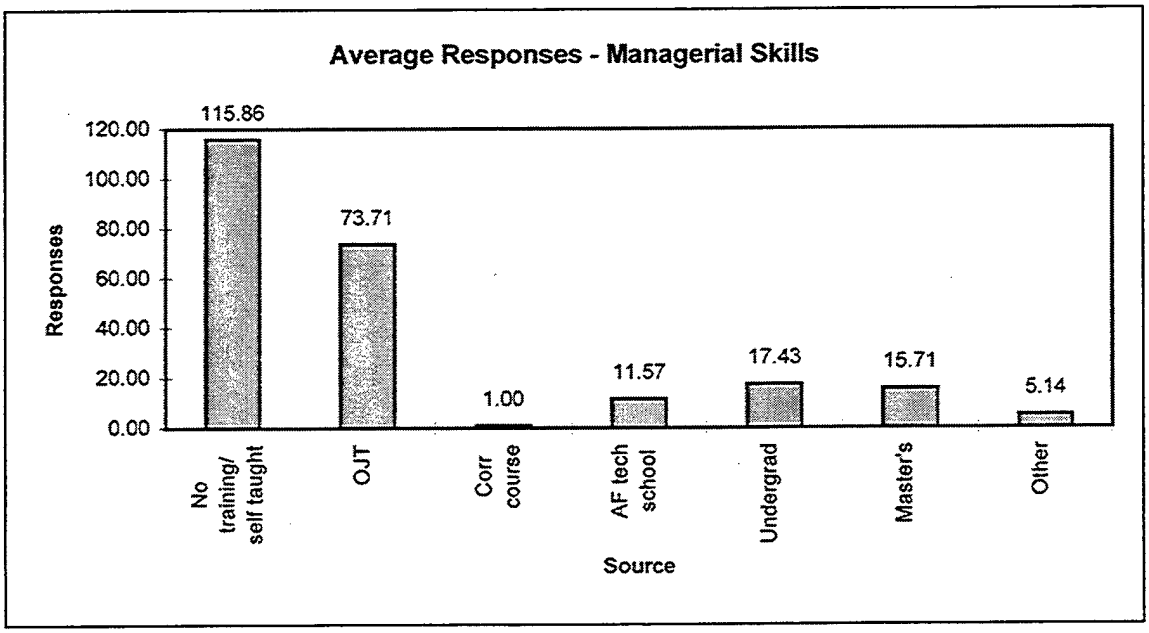


Figure 9. Average Responses - Managerial Skills

As indicated, the primary training source for the managerial skills was also no training/self-taught.

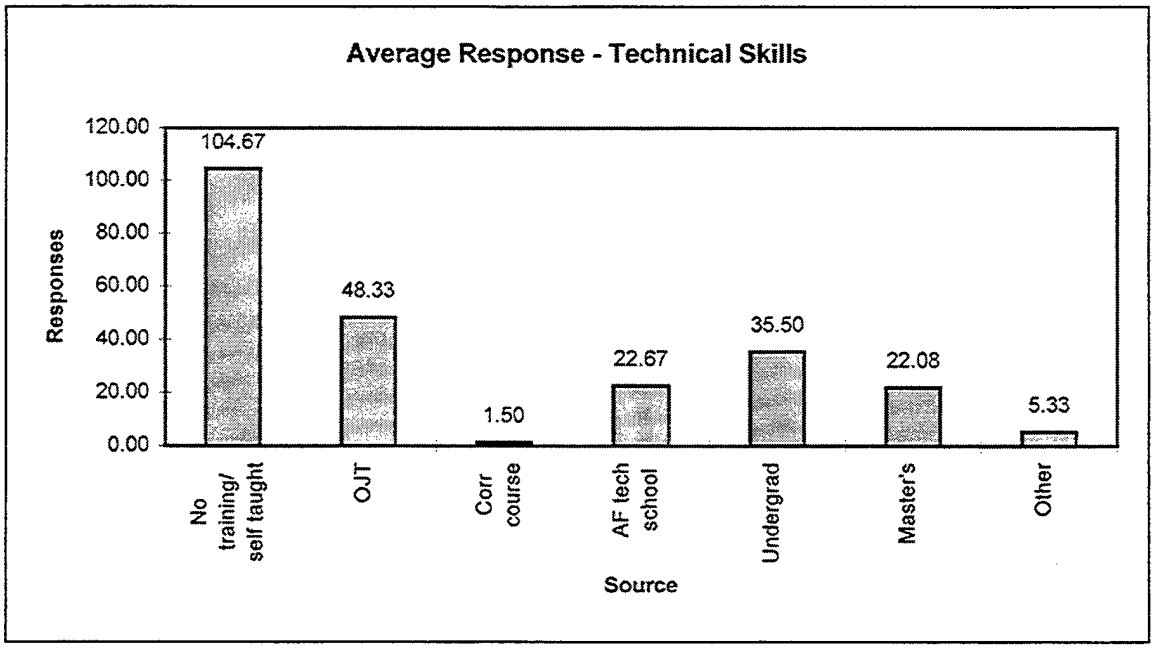


Figure 10. Average Responses - Technical Skills

The primary training source for the technical skills was also determined to be no training/self-taught.

No training/self-taught is the primary training source for all three of the skill groups. This confirms the findings that the formal methods of training are not as prevalent as the informal methods. This study did not consider self-taught a viable training method as it has the potential to lack uniformity and standardization.

Summary - Part III. Part III of the questionnaire sought to identify the primary source of training for the 24 critical IRM skills. As the analysis indicated, 19 of the 24 skills listed no training and self-taught (combined) as the primary training source. When these skills were analyzed in their respective skill groups, all three groups identified the

no training/self-taught category as the primary training source. However, the individuals participating in this study indicated that at least some formal training had been provided for each of the 24 core IRM skills listed. Based on the number of no training/self-taught responses, the analysis indicates a gap in the training needed and the training received.

Part IV - Adequacy of Training. Part IV of the questionnaire was designed to answer the research question, "how well did the training prepare the officers to perform their IRM duties?" A five-point Likert scale was used in soliciting the responses with 1 meaning the training did "not prepare the individuals at all", and 5 meaning they were trained "very well". This part of the survey was analyzed twice; once using the results from only the non-formal (self-taught) sources of the training, and once using only the formal sources of training. The results of the analysis for the formal sources of training are important to this research effort, as they demonstrate how effective the Air Force training resources are in preparing the officers. The results of the non-formal sources of training (no training and self-taught) are also meaningful to this study, as they indicate how many people have not been trained formally. It should be noted that while the self-taught method of training is included in the ensuing analysis, it is only being considered methodologically for effectiveness, not in content. As previously mentioned, self-taught methods have the potential to lack standardization and uniformity.

Adequacy Mean Scores. The mean scores derived when only the formal sources of training were used in the analysis are slightly higher than the mean scores derived for the non-formal sources of training. The following table illustrates the mean scores

derived for the formal, as well as the non-formal sources of training. The skills are ranked by mean score (formal methods) within their respective skill groups. Mean scores shown in the table were derived from the responses to how well the respondents perceive they had been trained in each skill. The mean scores illustrated for the "Non-formal" sources of training were calculated from the responses which indicated self-taught as the primary training source. The column entitled "Formal" represents the formal sources of training (all sources minus no training and self-taught) only and is presented to reveal how well the formal training methods are preparing people to complete the IRM mission.

The table headings are identified as follows:

Skill Rank: This column identifies the skill ranked on importance of criticality to IRM as determined in Part II of the survey--not the rank associated with the mean score for adequacy of training.

Mean score: The mean score is the average score (for adequacy of training) of the responses received for each skill. It is a representation of the adequacy of training for that particular skill. The closer the mean is to 5, the more effective the training.

Mean score (non-formal): This represents the mean score for each skill using the category self-taught as the training method.

Mean score (formal): This represents the mean score for the formal methods of training only. No training and self-taught have been removed for this computation. The purpose of this category is to ascertain the adequacy of the formal training, when it is provided.

Highlighted cells: The cells highlighted in the columns entitled non-formal and formal indicate which category was selected most often by the respondents as the primary training source for that skill. For example, if the respondents indicated no training or self-taught was the primary training source, the non-formal column is highlighted adjacent to that particular skill. This demarcation is important; the purpose of this table is to illustrate how effective the formal training was, if it was received. As stated in the analysis for Part III of the survey, 19 of the 24 skills correlate to no training/self-taught as the primary training source.

Table 17 Mean Scores for Adequacy of Training (Ranked within Skill Groups)

Skill Rank	Mean Non-Formal	Mean Formal	Core Skill
			Interpersonal Skills
2	3.5714	4.0452	Ability to communicate verbally, one-on-one and group briefings
5	3.4390	4.0355	Ability to write clearly, succinctly, and purposefully
1	3.6364	3.8915	Ability to work closely with customers and maintain a productive user or client relationship
3	3.4590	3.8274	Ability to plan, organize, and lead projects (project management)
9	3.3218	3.6846	Ability to train/teach others to include end-users
			Managerial Skills
11	3.1803	3.4254	Ability to interpret and solve business problems
7	2.9450	3.4227	Ability to understand technological trends and potentials
6	2.9474	3.3950	Ability to learn and implement new technologies
4	2.6410	3.2373	Information and system security
8	2.7442	3.1197	Ability to plan and set standards for corporate-wide information system technology plan
12	2.8387	3.0786	Contingency planning/disaster recovery
16	2.7037	3.0568	Establish/monitor corporate data structure
			Technical Skills
13	3.4444	3.7685	Office automation (e-mail, schedulers, etc)
18	2.8167	3.2171	Operating systems for mainframe, minis, micros, networks
19	1.9167	3.1879	Systems analysis/structured analysis (formal method)
17	2.3636	3.1453	Systems life cycle management
15	2.7083	3.1429	Telecommunications (hardware, phones, modems, cables, satellites, etc)
10	3.1154	3.1056	Networks (LAN, WAN, Corporate-wide, etc)
20	2.7097	3.0073	Relational databases
14	2.6216	2.9185	Systems integration
21	2.4333	2.8362	Distributed processing
24	1.5000	2.6604	Expert systems/artificial intelligence
22	2.6154	2.6204	Decision support systems
23	2.0625	2.5981	CASE methods or tools

As indicated in the table, only one skill, "Networks (LAN, WAN, Corporate-wide, etc)", has a non-formal mean score higher than the mean score of its formal counterpart. The participants in this study, who identified formal sources of training as the primary source, indicated the training prepared them adequately or better for 19 of the 24 skills. The remaining 5 skills, all in the technical skill group, ranged from 2.5981 to 2.9185 on the adequacy scale, indicating the training was perceived as preparing the officers between "very little" and "adequate".

The aggregate mean scores derived by separating the skills into their respective skill groups are not drastically different between the formal and non-formal sources of training, as illustrated in Table 18 and Figure 11.

Table 18. Aggregate Mean Scores

	Non-formal	Formal
Overall (all 24 skills)	3.0542	3.3065
IP Skills	3.4929	3.9139
Mgmt Skills	2.9062	3.2489
Tech Skills	2.7487	3.0381

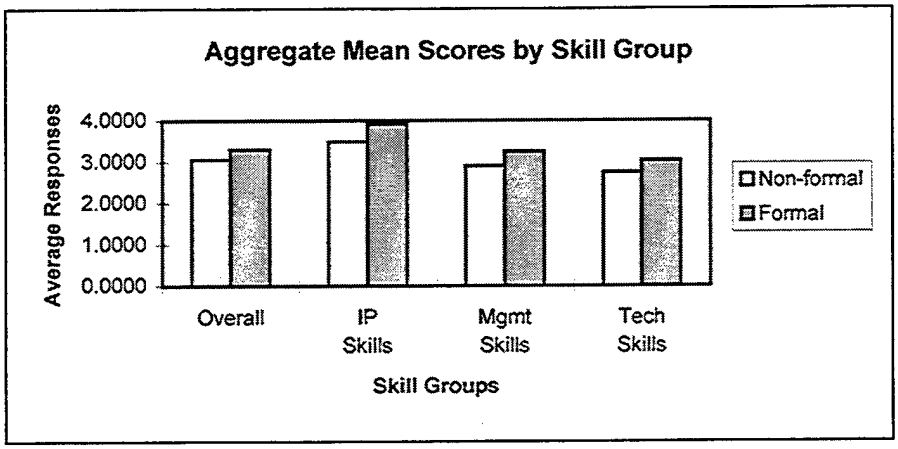


Figure 11. Graph of Aggregate Mean Scores

It was important to analyze the mean scores from the formal sources of training separately from the non-formal sources of training mean scores. The information obtained from this separate analysis reveals the effectiveness of the formal training sources. As illustrated in Table 18 and Figure 11, the aggregate mean scores by skill group, as well as the mean scores for the individual skills are higher when the formal sources of training were analyzed, than the non-formal sources. However, remember that non-formal training sources are the primary source for 19 of the critical skills. As previously stated, the non-formal aggregate mean score is 3.0542, while the aggregate mean score of the formal methods of training is 3.3065. Both of these aggregate mean scores are above the "adequate" score of 3.0 on the Likert scale used in this part of the study.

As a measure to verify if the source of training was a determining factor in the adequacy mean scores between the formal and non-formal sources of training, a t-test was performed to test for statistical significance. These tests, performed with a 95 percent confidence interval (alpha = .05), illustrate that 14 of the 24 skills have mean scores that are significantly different (the training source makes a difference in the adequacy of training). There are no significant differences in the mean scores of the remaining 10 skills, which would indicate the method of training (source) did not effect the adequacy mean score. In other words, for the 10 skills whose means are not significantly different, self-teaching is not an inferior training source to the formal sources. However, as mentioned earlier, self-taught was only considered on its merit as a training method, not as an accepted training source in content.

Table 19 illustrates the t-test results. The core skills are shown in rank order, as identified in Part II of this study, and separated into their respective skill groups. The skills whose mean scores are significantly different have been highlighted in the table for easy identification.

Table 19. Results of t-tests

Skill Rank	Frml Trn Better?	t-stat	crit-t	p-value	Core Skill
					Interpersonal Skills
1	No	-1.5862	1.9730	0.11	Ability to work closely with customers and maintain a productive user or client relationship
2	Yes	-2.3711	1.9893	0.02	Ability to communicate verbally, one-on-one and group briefings
3	No	-1.9340	1.9901	0.06	Ability to plan, organize, and lead projects (project management)
5	Yes	-2.7903	2.0129	<.01	Ability to write clearly, succinctly, and purposefully
9	Yes	-2.1339	1.9752	0.03	Ability to train/teach others (e.g. end-users)
					Managerial Skills
4	Yes	-3.3371	2.0017	<.01	Information and system security
6	Yes	-2.6650	1.9720	0.01	Ability to learn/implement new technologies
7	Yes	-3.1130	1.9718	<.01	Ability to understand technological trends and potentials
8	Yes	-2.1270	1.9897	0.04	Ability to plan and set standards for corporate-wide information system technology plan
11	No	-1.3012	1.9820	0.2	Ability to interpret and solve business problems
12	No	-0.9375	2.0195	0.35	Contingency planning/disaster recovery
16	No	-1.5216	2.0281	0.17	Establish/monitor corporate data structure
					Technical Skills
10	No	0.0708	1.9876	0.94	Networks (LAN, WAN, Corporate-wide, etc)
13	Yes	-2.1187	1.9704	0.04	Office automation (e-mail, schedulers, etc)
14	No	-1.4581	2.0032	0.15	Systems integration
15	Yes	-2.1784	1.9930	0.03	Telecommunications (hardware, phones, modems, cables, satellites, etc)
17	No	-1.8566	2.2281	0.09	Systems life cycle management
18	Yes	-2.1926	1.9850	0.03	Operating systems for mainframe, minis, micros, networks
19	Yes	-3.9094	2.1788	<.01	Systems analysis/structured analysis (formal method)
20	No	-1.3283	2.0181	0.19	Relational databases
21	Yes	-2.3986	2.0017	0.02	Distributed processing
22	No	0.1693	2.1448	0.87	Decision support systems
23	Yes	-2.3498	2.0860	0.03	CASE methods or tools
24	Yes	-6.5096	2.2281	<.01	Expert systems/artificial intelligence

Crosstabulation was used to disclose the breakdown of primary training source versus the adequacy of the training. The crosstabulation is significant because it demonstrates exactly how many individuals responded to the adequacy of each training source. For example, in the crosstabulation table below, 90 people indicated Air Force OJT was the primary training source for that particular skill. Of these 90 people: 4 felt the training did "not prepare them at all"; 10 felt the training prepared them "very little"; 16 felt the training was "adequate", 31 felt the training prepared them "fairly well"; and 29 felt the training prepared them "very well". The crosstabulation tables for all 24 skills are shown in Appendix D.

As an example of a crosstabulation table (source of training compared to adequacy of training), the skill "ability to work closely with customers and maintain a productive user or client relationship" is illustrated in Table 20. The following scales used in the survey are restated here for use in interpreting the table:

Adequacy of training:

1 = not at all, 2 = very little, 3 = adequate, 4 = fairly well, and 5 = very well

Table 20. Crosstabulation Table (source of training versus adequacy of training)

Ability to work closely with customers and maintain a productive user or client relationship

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	No Trng	13						13
	Self-tght		13	4	19	33	30	99
	AF OJT		4	10	16	31	29	90
	Corres crs					2		2
	AF tch trng				2	2	4	8
	Und grad			1		4	6	11
	Mast crs				4	3	2	9
	Other				2	4	3	9
Total		14	17	15	43	79	74	242

Summary - Part IV. Part IV of the questionnaire sought to determine how well IRM training received is preparing the officers surveyed to complete the IRM mission. The results from analyzing the formal sources, which does not include no training and self-taught, are significant to this research effort as they help paint the picture of the officer's perceptions of formal training sources. The formal sources are segregated for the purpose of determining their effectiveness, when they are utilized. Mean scores based on the adequacy of training were used throughout this section to illustrate the effectiveness of IRM training. It is interesting to note that "Networks (LAN, WAN, Corporate-wide, ect)" is the only skill with a "non-formal" mean score higher than its "formal" mean score. However, both mean scores are in the adequate range and the t-test identified no significant difference. Judging from the results illustrated in Figure 11, the adequacy of training is consistent across the skill groups--adequate (formal training sources). The

crosstabulation results are shown to illustrate the effectiveness of each training source, based on the perceptions of the participants. From the chart presented, it is clear how the individuals responded on the adequacy of each training source.

Part V - Comments. Part V of the questionnaire was an open section for the participating individuals to comment on the issue of IRM within the Air Force or on this research effort. Of the 242 usable surveys returned, 75 had comments in Part V. Many of the comments received indicated that personnel in the field do not feel they are being properly or adequately trained for performing IRM functions. Analysis of the comments unveiled four main themes, which are stated in the following paragraphs. These comments are representative of the comments received and were chosen to support the main themes.

Main theme 1: Air Force training for Communication/Information officers, in general, received by the participants was inadequate.

> "The technologies are changing so quickly that our "training systems can't keep up. It is absolutely essential that the training people develop an agile, flexible, and focused training program for technology, and invest the time, money, and manpower to ensure that it's available where it's needed."
>
> "We focus too much on the quick hit - ie, field new hardware and/or software without much consideration for long term strategies, logistics support, and configuration management."
>
> "If this survey were based solely on AF training, we are poorly preparing communication officers for their duties."
>
> "People are always complaining that they don't receive enough training, then they complain BCOT is boring or out of date. I think more effort should be directed at sending people to civilian taught courses."

"The Air Force on the whole trains individuals for technology that has been outdated for 10 years. A greater emphasis needs to be placed on how to integrate and effectively utilize new technologies to improve responsiveness and usefulness of current systems."

"There is currently little or no training AF-wide, not just in the 33SX career field, to plan for the "Information Age.""

"Over the three years I have been in, I have found there to be inadequate training leading to on-the-job training and hence a larger learning curve than is necessary to be able to perform the functions of your job."

Main theme 2: BCOT is ineffective, inefficient, and needs to be reorganized.

"The Air Force ill-equips their communications officers. While some training is available, funding is limited. ACOT/BCOT is next to worthless. Don't abolish the training. Rather, revamp the courses..."

"BCOT was almost a complete waste of time and money, we skimmed over a lot of technologies and concepts, but this "training" was so shallow, I still can't see how to practically use any of it."

"BCOT was a waste of time! It did very little to prepare me for the job I was assigned to accomplish."

"I would say the training I received from BCOT was inadequate and did not prepare me for the Communications and Information field on active duty. I find myself scrambling now to train myself in the necessary areas of LANs and Network OSs."

"If you want to get to the root of the training problems, you should take a look at BCOT... It was all theory and haphazard theory at that. I have never used my BCOT training for my job as a flight commander or as a program manager. From talking with my old BCOT classmates or peers on the job, there is very little confidence in BCOT."

Main theme 3: As a result of 1 and 2 above, the officers feel they must train themselves to become proficient in their jobs.

"If you want to be effective, you must learn on your own. I learn a lot by reading *InfoWorld*."

"I need more training! I'm taking the free computer classes and they are great. We need to encourage more people to take advantage of the free classes."

"The training I have received in the Air Force as a whole has been poor. I have had to dig deeply to find out how things work in this field to gain competence. The two schools I find the largest problems or weakest are ACOT/BCOT."

"I've received good on the job training, and I've learned a lot on my own. However, my formal training has been negligible."

"As a supervisor/manager I receive very little to no formal training. Most of what I learn is in meetings with my personnel and reading tech news."

Main theme 4: More training is needed following career field mergers.

"The Air Force has continued an alarming trend--combine dissimilar career fields with little to no formal training provided. Since I have been in the service my career field has went from computers to communication-computers...to communications-computers-information management. I wouldn't begin to have a clue of what to do if I have the misfortune of being assigned to an IM functional position."

"Good luck in your quest to make things better. I hope you never have to go through an integration whereby your core AFSC is abolished with no hope of attending a basic course in what position you're currently in."

"This survey would be more beneficial if administered to real communication officers and not IM crossovers like myself who have to beg for a slot to BCOT and convince someone to hire you when you have absolutely no experience in the communication arena."

"The merger of IM/SC has created a shortage of training slots available. Individuals have to rely on themselves to get the training and can't rely on the Air Force to provide them the training."

Some other reasons given for the inadequacy of training included: the speed at which technology is changing, making it hard for the Air Force to keep up; the Air Force technical training system is not teaching what people need to do their jobs; the threat of

outsourcing this career field; time in service (many of the respondents are new to the service or the career field), no senior leadership support.

Chapter IV - Summary

Chapter IV presented the data as received from the returned questionnaires. The first part of the chapter revealed the demographic information. This information was presented textually and in tabular form.

Part II of the questionnaire was analyzed and a ranked list of the 24 skills derived from the literature was compiled. Interpersonal skills were determined to represent the most important skill group, followed by managerial skills and technical skills. Four of the top five skills on the ranked list belonged to the interpersonal skill group. The technical skills were determined to be the least important skill group. Ten of the bottom 11 skills, as ranked by the participating officers, belonged to the technical skill group.

Appendix C illustrates exactly how many "importance" votes were given to each of the 24 critical IRM skills.

Part III of the survey was developed to ascertain the primary source of training the individuals had received in relation to the critical IRM skills. The analysis revealed that the majority of the respondents had been self-taught or had not received any training. Dividing the list of skills into three skill groups did not prove beneficial to this study, as there was not a discernible difference between the groups and the primary source of

training. T-tests were administered to indicated if there was a statistical difference in the formal verse non-formal sources of training.

Part IV of the questionnaire sought to identify the adequacy of the training received. Mean scores were derived for the skill groups as well as the individual skills. There was no discernible difference between the skill groups and the adequacy of the training. The formal training sources were analyzed to look at the effectiveness of the formal training received.

Part V of the questionnaire was an open section for respondents to place comments that may be constructive to the study or expressed their feelings on the issues. There were many different comments, however, four main themes recurred most often: (1) Air Force training, in general, is poor, (2) BCOT is not adequate and needs to be reorganized, (3) Air Force officers are resorting to self training so they can function on the job, and (4) Post merger training is non-existent.

This chapter sought to present the data as it was received and analyzed. Chapter V will provide a discussion of these results and interpret what they mean for the Air Force.

V - Conclusions, Recommendations, and Suggestions for Future Research

Introduction

The Air Force is investing a great deal of time, money, and other resources to ensure that decision makers have the right information, in the right place, at the right time. At the same time, the importance of information as a resource is beginning to be realized. Information Resource Management is much more than managing information and managing computer systems. As defined in Chapter I of this thesis, IRM is

> ...a comprehensive approach to planning, organizing, budgeting, directing, monitoring, and controlling the people, funding, technologies, and activities associated with acquiring, storing, processing, and distributing data to meet a business need of the entire enterprise. (27:199)

Several AFIT theses have addressed the issues of: computer literacy, (Coleman, 1988); information officer undergraduate degrees and training, (Scott, 1990); and the effectiveness of information management officer training, (Biros/Cole, 1992). While these prior studies concentrated on the technical aspects of the Information Management career field, this study investigated the current skill requirements for IRM professionals.

This chapter will offer conclusions to the research by relating the findings presented in Chapter IV to the specific research questions. Recommendations concerning future Air Force training and suggestions for future research will also be presented.

Conclusions

Research Question 1. *"What does the literature say about the required skills needed to perform the duties of an IRM professionals?"*

Chapter II of this thesis contains an extensive literature review directed at identifying the core IRM skills as determined through research completed by leaders in the IRM field. The articles divide the critical IRM skills into three distinct skill groups: interpersonal, managerial, and technical. Table 2 illustrates the skills identified in the articles, and indicates which articles mentioned that particular skill.

Ascertaining the critical IRM skills identified by leaders in the field is an important step in determining the status of IRM within the Air Force. If the Air Force knows what leading researchers and leaders in the industry are doing and saying about IRM, it gives the them someone to benchmark against. The Air Force may discover that they are on track, or may use this information to identify deficiencies. If deficiencies are identified, resources can be concentrated to overcome them by fixing the problem or rebuilding a program.

Research Question 2. *"What IRM skills do officers in the field perceive as being the most important in performing the IRM mission?"*

As illustrated in Chapter IV, the participating officers indicated which skills were important to performing the IRM functions, both individually and by skill group. The following table is a partial duplication of Table 13 and lists the ranking of the skills used in the survey based on importance to IRM as perceived by officers in the field.

Table 21. Ranked List of Core IRM Skills

Rank	Group	CORE SKILL
1	I	Ability to work closely with customers and maintain a productive user or client relationship
2	I	Ability to communicate verbally, one-on-one and group briefings
3	I	Ability to plan, organize, and lead projects (project management)
4	I	Ability to write clearly, succinctly, and purposefully
5	M	Ability to learn and implement new technologies
6	M	Information and system security
7	M	Ability to understand technological trends and potentials
8	M	Ability to plan and set standards for corporate-wide information system technology plan
9	T	Networks (LAN, WAN, Corporate-wide, etc)
10	I	Ability to train/teach others to include end-users
11	M	Ability to interpret and solve business problems
12	T	Office automation (e-mail, schedulers, etc)
13	M	Contingency planning/disaster recovery
14	T	Systems integration
15	T	Telecommunications (hardware, phones, modems, cables, satellites, etc)
16	M	Establish/monitor corporate data structure
17	T	Systems life cycle management
18	T	Systems analysis/structured analysis (formal method)
19	T	Operating systems for mainframe, minis, micros, networks
20	T	Relational databases
21	T	Distributed processing
22	T	Decision support systems
23	T	CASE methods or tools
24	T	Expert systems/artificial intelligence

It is important to know the perceptions of Air Force officers in the field to determine the status, level of awareness, and training needs of officers subject to performing IRM within the Air Force.

The analysis of the questionnaires returned leads to the conclusion that the perceptions of the Communications and Information officers surveyed are congruent with the recent IRM studies and current literature as shown in Table 21 above. Interpersonal

skills are obviously considered the most important, followed by managerial skills, then technical skills, which is consistent with the results of Young and Lee (1997), Lee et al (1995), Leitheiser (1992), and Longenecker (1996). Combining research question 1 with research question 2, provides important information. If the Air Force can assess the current level of awareness or understanding on the concept of IRM, a parallel can be drawn to industry leaders in IRM for comparison purposes. The findings of this research indicate that the Air Force officers have a grasp on the IRM concept and are in sync with the findings of the current research literature.

Research Question 3. *"What is the primary source of any IRM training received by the 33SX officers surveyed?"*

As indicated in Chapter IV, the majority of the respondents answered no training and self-taught as the primary training source for 19 of the 24 skills. This is a disturbing finding and illustrates the Air Force is failing to properly train personnel in the core IRM skills. There has been research conducted, both in the Air Force and in the private sector to determine what skills are required to be successful as an Information Resource Manager. The technical training centers should apply this research and the findings to develop their curriculum. By incorporating the results of this study into the training plans, the trainers could pinpoint the training towards the specific needs of the career field. While the individuals participating in this study indicated that at least some formal training had been provided for each of the 24 core IRM skills listed, a review of the Basic Communications Officer Training (BCOT) course curriculum reveals coursework almost

entirely geared towards technical skills. The following table contains the instructional blocks currently taught at BCOT (10). The additional blocks required for software engineers, programmers and system analysts are not included in the table.

Table 22. BCOT Core Coursework

BCOT Core Coursework	
Block I	Communications and Information Fundamentals
Block II	Budget and Acquisition
Block III	Computer Fundamentals
Block IV	Computer Systems
Block V	Communication Fundamentals (technical)
Block VI	Information Transfer Systems
Block VII	Network Fundamentals and Applications
Block VIII	Network Laboratories
Block IX	Deployable Communications and Information

As established in this research and the literature from recent IRM studies, technical skills are the least important skill group for an IRM professional. However the comments received in the open comments section of the questionnaire contradict this information. For example, several comments mentioned that the technical schools did not provide enough hands-on technical training. Based on where technical skills ranked, this presents a conflict. On one hand the respondents are saying technical skills are the least important, and on the other hand they are saying they need more technical training. With the limited budget for training, it is imperative that the important skills are covered first. This could also be interpreted to mean that the respondents feel they can get the managerial and interpersonal skills training elsewhere and perceive the technical schools as the proper place and the hands-on technical training.

The Advanced Communications Officer Training (ACOT) course is geared towards officers at a higher managerial level than the BCOT students, and thus addresses managerial as well as technical issues. While based on the results of this thesis, this

represents a step in the right direction, there remains a lack of instruction in interpersonal skills. It should also be noted that less than 13 percent of the officers surveyed had attended ACOT. Table 23 represents a sample of the managerial/IRM courses currently taught at ACOT.

Table 23. Advanced Communications Officer Training Courses

ACOT Curriculum		
Block	**Title**	**Courses include:**
Block I[2]	Communications and Information Fundamentals	Unit 1: Fundamental concepts of computers, communications, networks, resource management and information resource management Unit 2: Fundamentals of planning processes
Block II	Communications and Information Strategies and Networks	Planning processes Interpret strategies Analyze strategies Functional process improvement
Block III	Communications and Information Warfighter Support	Standards Life cycle management

Research Question 4. *"How well did this training prepare the officers to perform IRM duties?"*

There are actually two answers to this research question:

First, 19 of the 24 skills are shown to have no training/self-taught as the primary source of training. This finding makes the computation for effectiveness and adequacy relatively simple; the training for 19 of the 24 skills is ineffective and inadequate. As

[2] The courses listed under Block I in this table are nonresident courses and are to be completed prior to ACOT class start date.

previously mentioned, this study does not recognize self-taught as an approved method of learning new skills.

Of the five remaining skills, two were perceived to have inadequate formal training. This in itself does not present a major flaw in training, as the skills are ranked 22 and 23 in importance. Less attention and resources should be spent on the less important skills. Two more, of the five skills shown to have formal sources as the primary training source indicate adequate or better training.

In contrast to the preceding information, the skill ranked highest of the 24 on the questionnaire, is shown with Air Force OJT (a formal source) as the primary training source with a mean score for adequacy of training of 3.8915 (the third highest mean score). Assimilating this finding with the others would indicate that this is an exception to the findings presented thus far. While there is no "official" OJT program for Air Force officers, this method has been shown to be effective and should be utilized when appropriate and necessary.

Second, the results presented in Chapter IV indicate that the formal training, when it is received, is adequate or better. Again, 19 of the 24 skills have mean scores on 3.0 or higher. This finding indicates that we need to get more people through the schools and formal sources of training, and is echoed in the comments from Part V of the questionnaire. Many of the comments received indicated that people wanted to go to BCOT and ACOT, but there are just not enough slots. Since the recent IM/SC merger, the career field has grown considerably and the schools are not able to handle the number of students that need to attend.

The people who have attended BCOT and ACOT have strikingly different opinions. Many of the comments from officers who had attended BCOT, alluded to its ineffectiveness and the fact that it did not prepare them to perform their primary duties. A sampling of these comments can be read in Chapter IV.

Recommendations

To ensure IRM is successful within the Air Force, it must continue to be studied and benchmarked against the industry leaders. Air Force personnel must stay current by reviewing current literature and keeping up with technological advances. Studies similar to this one should be completed periodically to ascertain where the Air Force stands of IRM and related issues, and where it needs to be.

The Air Force also needs to reorganize the formal training programs for IRM. As information increases in value as a corporate resource, it will be paramount to have training programs in place to ensure it is treated effectively and efficiently. As this study found, 79 percent of the critical IRM skills are either not taught at all to the officers or have to be self-taught. A better training system is needed to reverse this trend. This study also found that formal training was effective and adequate when it was received. The recommendation of this thesis is either to (a) create more ACOT/BCOT slots, or reorganize to get more people through the school, (b) establish training that goes into the field and teach at various locations, or (c) recruit personnel who already have the required training. This should not be interpreted to mean that the Air Force should "push"

students through the schools but rather, it should be concentrating on the current training to render it more effective and useful.

Another recommendation is for the technical training center, BCOT and ACOT, to adjust their curriculum to reflect what is needed in the profession today--more interpersonal and managerial/business skills and less technical skills.

Recommendations for Further Research

While this research examined critical IRM skills and training, there appear to be important and interesting avenues for further research in this domain. For example, this study sought to acquire the perceptions of 33SX officers (Lieutenants and Captains) currently serving in the field. It would be interesting to duplicate this study, but at different levels--assessing the perceptions of the supervisors of 33SX officers, or even communication squadron commanders. Different levels would provide an another perspective on the skills needed and the effectiveness of training for IRM professionals.

Several years have passed since the research completed by Biros and Cole (1992), and Scott (1990), and a current study could prove beneficial. Biros and Cole sought to determine the effectiveness of the Information Management Officer technical school. While this school and career field no longer exist, it would be valuable to complete a similar study on the effectiveness of the Communications and Information Officer technical schools, BCOT and ACOT. There were indications in the research for this thesis that the schools may be ineffective, and a study may reveal exactly where the

inefficiencies and inadequacies lie. Once the problems are identified, the solutions can be found and implemented.

The research completed by Scott investigated the undergraduate degrees of officers serving in the Information Management career field. If a study similar to this were completed for the Communications and Information career field, deficiencies could be identified, and new recruiting techniques could be developed or training could be altered to fill in the gaps.

A final recommendation for further research is to investigate what effect the SC/IM merger has had on the career field, the training problems that have resulted and how the merger has affected the officer involved and their careers. Now that some time has past since the merger, most of the smoke should have cleared and valuable research could be accomplished.

Conclusion

This study was aimed at identifying three main issues concerning IRM within the Air Force. For the most part the findings were interesting and satisfying. Based on these findings it is apparent that Air Force officers have a grasp of IRM concepts. They know what skills are necessary to perform the mission successfully. This study also revealed that the formal training received by the officers is, in general, adequate or better. We now have two pieces of the puzzle: (1) We know what skills are needed to complete the

mission, and (2) The formal methods of training are effective and adequate (when received).

The third piece of the puzzle has not been realized. More people need to have access to formal training sources. It doesn't matter how good the training is if no one has the opportunity to attend. If the Air Force is going to lead the way into the information age, the criticality of information as a corporate resource must be understood. The results of this research indicate that only by enhancing the effectiveness and efficiency of formal Air Force training can the current generation of 33SX officers be prepared to successfully complete their challenging mission of managing one of the most vital corporate resources--information.

Appendix A - Civil Service Commission Training Courses

Courses from training catalogs of the civil service commission:

Management Introduction to Microcomputers
Operating Computer Peripheral Equipment
Survey of Data Entry/Computer Output Devices
Management of Data Communications
Fundamental Telecommunications Concepts
Automated Financial Systems
ADP for Administrative, Clerical and Secretarial Personnel
Introduction to Parallel Processors
Library Automation
Storage and Retrieval Techniques
Design of a Computerized Management Information System
Management Introduction to Automated Data Bases
Management Introduction to ADP
Introduction to ADP Systems Analysis
An Introduction to ADP
Government Property and Recordkeeping Procedures
Computer File Structures and Data Base Design
Scientific Computing with Digital Computers
Introduction to State Variables
Analyzing Data: Non-parametrics Statistical Approaches
Successful Implementation of the Freedom of Information and the Privacy Acts
Workshop in Performance Analysis
Reviewing Other People's Writing
Effective Briefing Techniques
Writing Effective Letters
Report Writing Workshop
Fundamentals of Writing
Basic Communications Skills
Effective English Workshop
Word Processing - A Clerical Orientation
Creative Problem Solving
The Management of Information
Middle Management Institute
Management Analysis and Review
Advanced Management Analysis
Statistics for Paraprofessionals
Statistics for Paraprofessionals II
Administrative Systems and Procedures Analysis

Graphs, Charts, and Tables
Paperwork Management - Analysis and Improvement
Data Collection and Analysis
Statistical Sampling in Government Operations
Managerial Statistics
Federal Financial Management Information Systems

Appendix B - IRM Core Skills Extracted from Literature

Corporate Hiring Criteria
(Young and Lee, 1997)

INTERPERSONAL SKILLS
Verbal Skills
Cross-functional group work
Written communication skills
Work group software

OPERATING SYSTEMS
32-bit operating systems
Mainframe operating systems
16-bit operating systems
UNIX operating systems
Apple/MAC operating systems
Low-level language

DEVELOPMENT AND MANAGEMENT OF APPLICATIONS
System development methods
Client/Server tools
Object-oriented programming
Data file structures
CASE software
Project management tools
IS management

NETWORKS AND COMMUNICATIONS
Networks (local/wide-area)
Network software
Telecommunications

LANGUAGES
High-level language
Object-oriented languages
Mainframe query languages
Mainframe 4th generation languages
Expert system languages

PERSONAL COMPUTER TOOLS

PC data base tools
PC spreadsheet tools
Business graphics
Multimedia Computing
Desktop Publishing

The IS Expectation Gap:
Expectations Versus Academic Preparations
(Trauth, Farwell, and Lee, 1993)

IS TASKS

Analyze IS Solutions to Business Problems
Analyze Business Problems
Integrate Networks
Integrate Existing Business Applications
Develop Databases
Integrate New with Existing Business Applications
Implement New/Changed Computer-Supported Business Processes
Manage/Plan Systems Development/Project Implementation
Manage/Plan Feasibility/Approval for New Systems and Technology

TECHNICAL SKILLS

Network
Telecommunications
Relational Databases
Fourth Generation Languages
Systems Integration
Distributed Processing
Data Management
Other (executive IS, image processing, UNIX, end-user computing)
Structured Programming/CASE Methods or tools
Decision Support Systems
Systems Analysis/Structured Analysis
System Life Cycle Management
Operating Systems: Micros
A specific programming language (C, Basic, Pascal)
Expert Systems/AI
COBOL/Other third generation language
Operating Systems: Mini
Operating Systems: Mainframe
Assembly Language

ABILITIES

HUMAN

Maintain Productive User/Client Relationships
Accomplish Assignments
Plan/Executive Work in a collaborative environment
Be self-directed and proactive
Work cooperatively in a one-to-one and project team environment
Deal with ambiguity
Plan, organize, and lead projects
Plan, organize, and write clear, concise, effective memos, reports and documentation
Develop and deliver effective, informative and persuasive presentations
Teach others

BUSINESS

Understand the business environment
Learn about business functions
Knowledge of a specific business function
Be sensitive to organizational culture and politics

TECHNICAL

Interpret business problems and develop appropriate technology solutions
Focus on technology as a means, not an end
Ability to learn about new technology
Ability to understand technology trends.

Critical Skills and Knowledge Requirements of IS Professionals
(Lee, Trauth, Farwell, 1995)

TECHNICAL SPECIALTIES KNOWLEDGE
COBOL, or other third generation language
Telecommunications
Networks
Operating Systems: Mainframes
Operating Systems: Minis
4th generation languages
Systems Integration
Operating Systems: Micros
Systems analysis/structured analysis
Systems life cycle management
Relational databases
Distributed processing
A specific programming language
Data management (ie data modeling)
Structured programming/CASE methods or tools
Decision Support Systems
Assembly language
Expert systems/artificial intelligence

TECHNOLOGY MANAGEMENT KNOWLEDGE
Ability to learn new technologies
Ability to focus on technology as a means, not an end
Ability to understand technological trends

BUSINESS FUNCTIONAL KNOWLEDGE
Ability to learn about business functions
Ability to interpret business problems and develop appropriate technical solution
Ability to understand the business environment
Knowledge of the business functions

INTERPERSONAL AND MANAGEMENT SKILLS
Ability to work cooperatively in a one-on-one and project team environment
Ability to plan and execute work in a collaborative environment
Ability to deal with ambiguity
Ability to work closely with customers and maintain productive user or client relationship
Ability to accomplish assignments

Ability to teach others
Ability to plan, organize, and lead projects
Ability to develop and deliver effective, informative and persuasive presentations
Ability to plan, organize and write clear, concise, effective memos, reports, and documentation
Ability to be self-directed and proactive
Ability to be sensitive to organizational culture/politics

MIS Skills for the 1990's
A Survey of MIS Manager's Perceptions
(Robert L. Leitheiser, 1992)

ANALYSIS AND DESIGN
Design cost/benefit analysis
Feasibility study
Package cost/benefit analysis
IRD methods
Semantic Modeling
O-O analysis
Conceptual design
CASE

PROGRAMMING
Structured design
Documentation
Quality assurance
Data structures
Security/Privacy
SD methodology
Prototyping
Algorithms

INTERPERSONAL
Listening
Work with others
Writing
Work alone
Persuasion
Presenting
Respond to emotions
Training

BUSINESS
Project planning
Business functions
Industry
Ethics
MIS planning
Technology problems
Competitive advantage
Technology usefulness

ENVIRONMENT
Mainframe
Personal computer
Multiple
Minicomputer
SNA
SAA
UNIX

LANGUAGE
COBOL
JCL
Fourth-generation languages
SQL
C
O-O language
AI language
ADA

APPLICATION
Relational databases
Hierarchical and network databases
Distributed applications
DSS
EIS
Collaborative systems
Expert Systems

Top Ten Survival Skills for the IS Professional
(Longenecker, Simonetti, and Mulias, 1996)

TEN KEY SURVIVAL SKILLS FOR IS PROFESSIONALS

Ability to balance technical and nontechnical skills
Strong interpersonal and communication skills
An orientation toward business solutions
Ability to be an effective team member
Strong project management skills
Effective planning and organizational skills
Strong analytical and creative skills
Flexibility and adaptability to change
Responsiveness and a customer orientation
Ability to function as a teacher and coach

CUSTOMER EXPECTATIONS

Technical expertise in understanding languages
Help in identifying project requirements and needs
Direction, leadership, and guidance on technical applications
Practical applications that support strategic direction and business decisions
Shared ownership of a project
Ongoing communication and accessibility
Flexibility in responding to changes
Innovative and creative solutions and applications
Realism and honesty regarding commitments
Quality assurance and commitment to the end product
Prompt response to aid in resolving problems
Cost effectiveness and timely delivery of products and services

An Empirical Assessment of the
Information Resource Management Construct
(Lewis, Synder, and Rainer, 1995)

PLANNING
Information systems/technology plan
Planning process for information systems and technology
User supported distributed IT facilities
Plan for corporate-wide information systems and technology
Formal support for end-user computing
Training programs for end-users
Information systems/technology plan reflects business goals
Assessment of potential for new technologies

SECURITY
Assess control security
Data security
Security awareness program
Business continuity/disaster recovery plan

TECHNOLOGY INTEGRATION
Distributed facilities
Office automation
Communication integration
Network integration
Information technology integration

ADVISORY COMMITTEES
Information systems and technology advisory
Senior management participation
Users participate in advisory committees

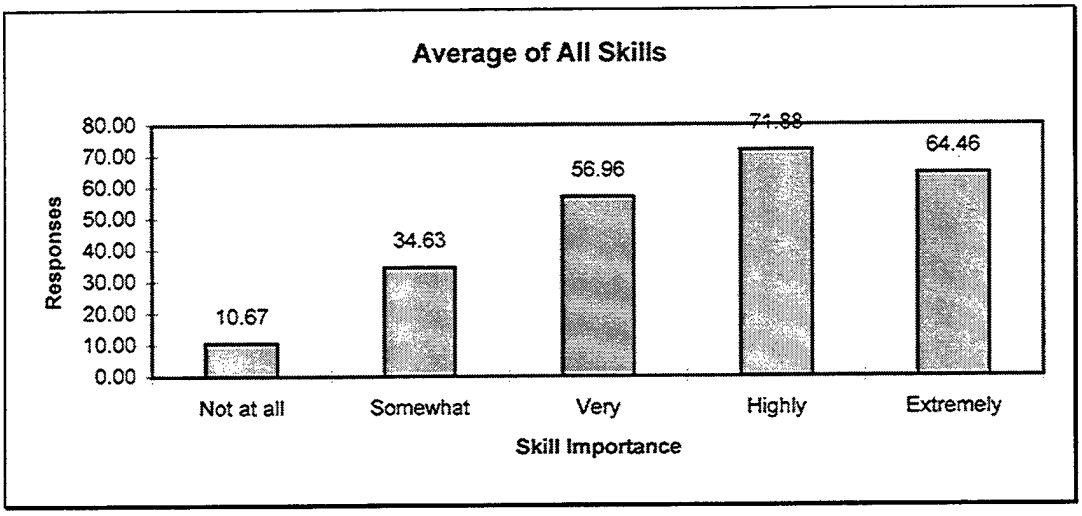
ENTERPRISE MODEL
Data communications between central and distributed facilities
Inventory of company IT facilities
Formal methodology for systems development
Inventory of corporate data and information
Standards for distributed information systems and technology
Documentation for corporate-wide information flow
Use of automated development tools
Corportate-wide adherence to information systems and technology standards

INFORMATION INTEGRATION
Application systems integration
Data integration between applications

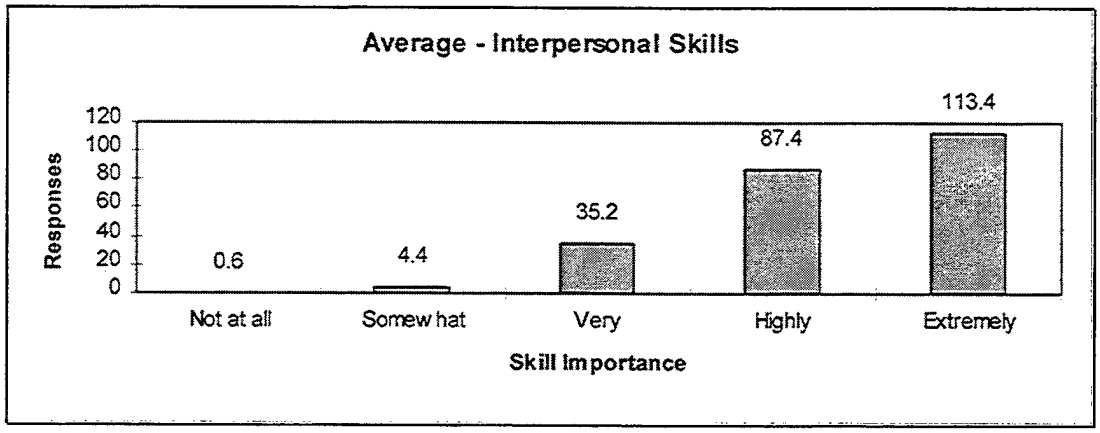
DATA ADMINISTRATION
Data administration
Corporate data architecture
Quality assurance program for information systems and facilities
Data dictionary

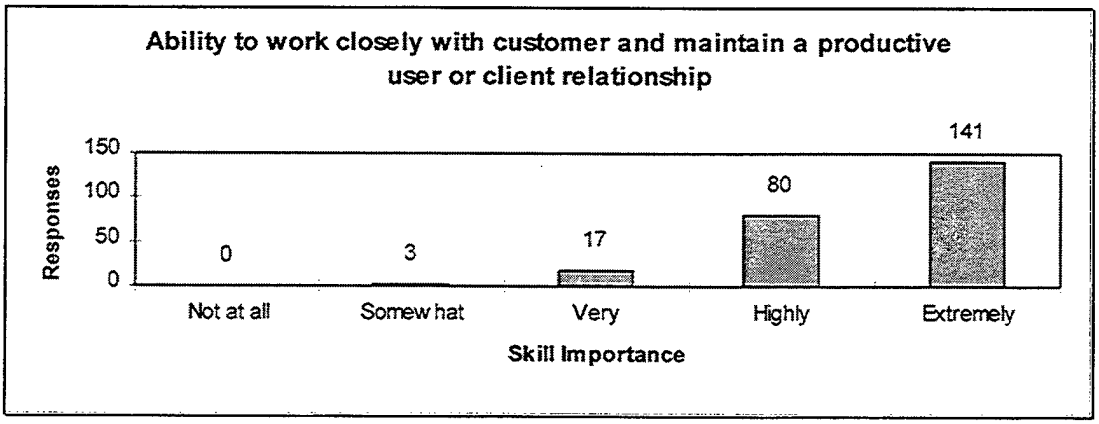
Appendix C - Graphs of Response Frequencies (Importance)

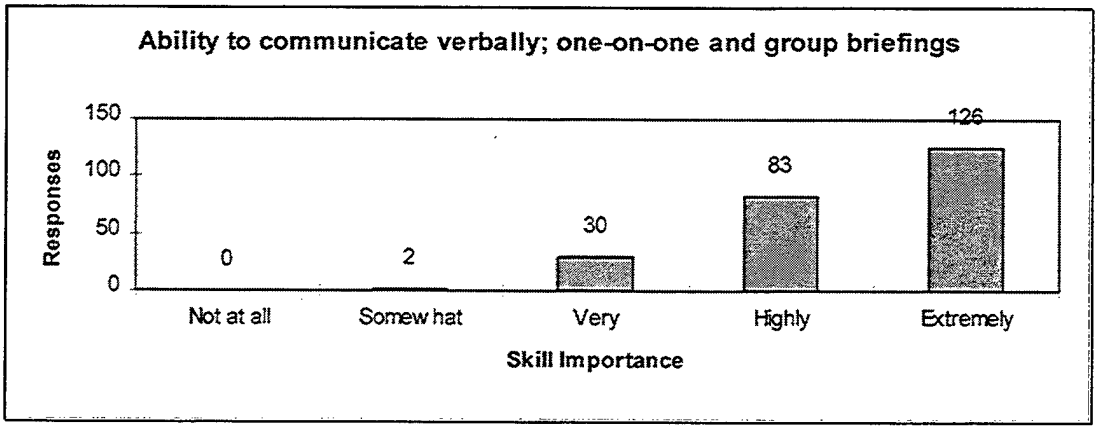
Graph of the aggregate average of all skills.

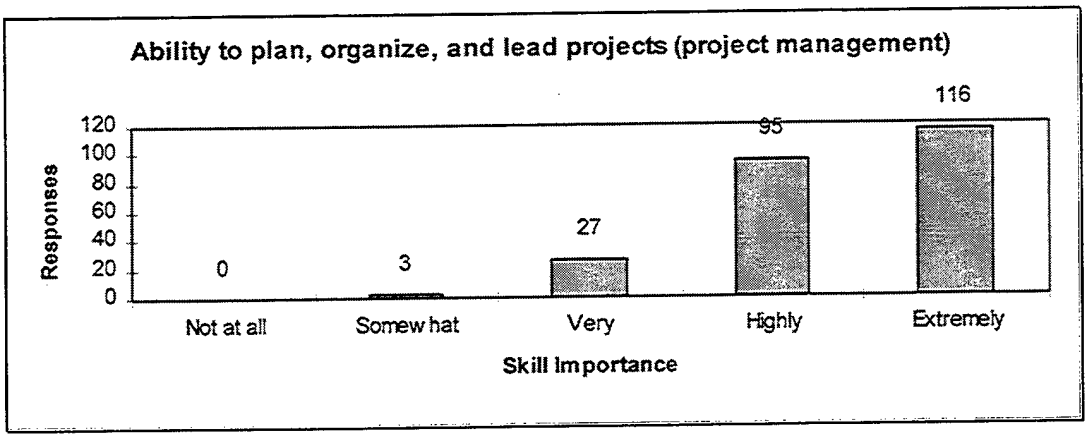


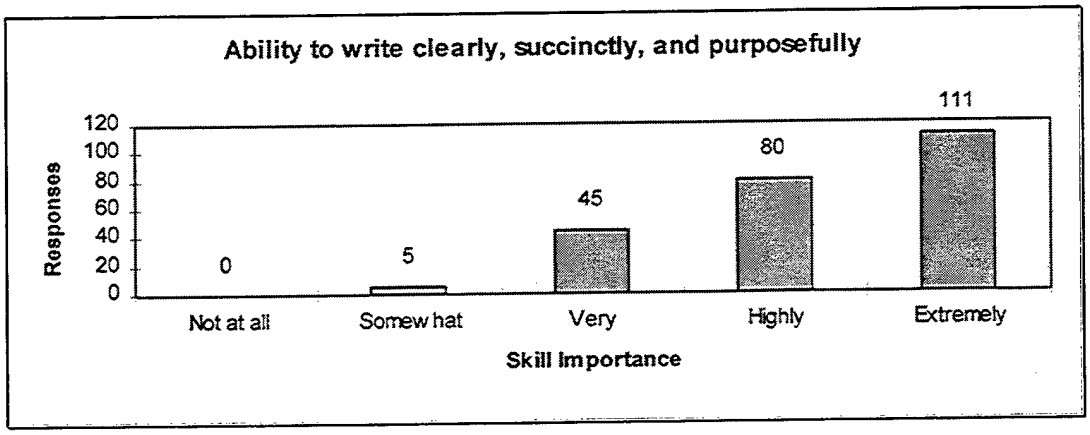
Graphs of interpersonal skills. First, an average of the interpersonal skills in aggregate, followed by each individual skill.

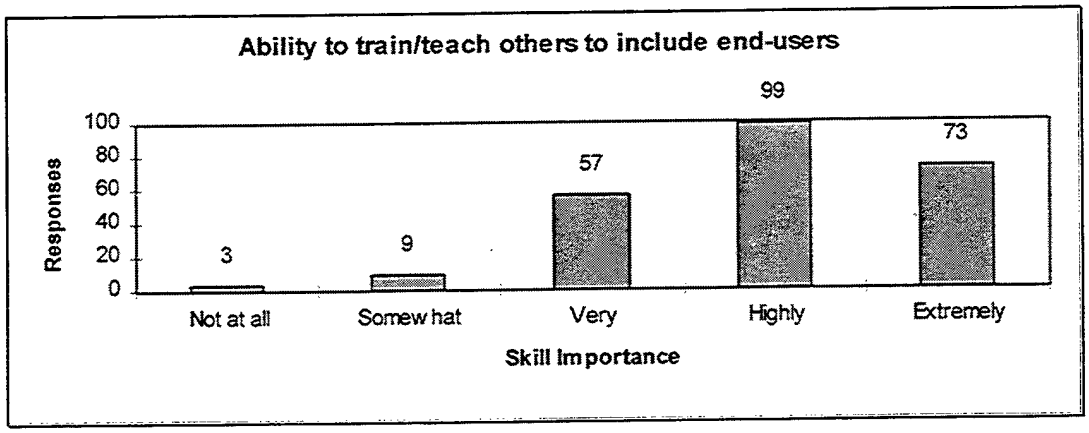




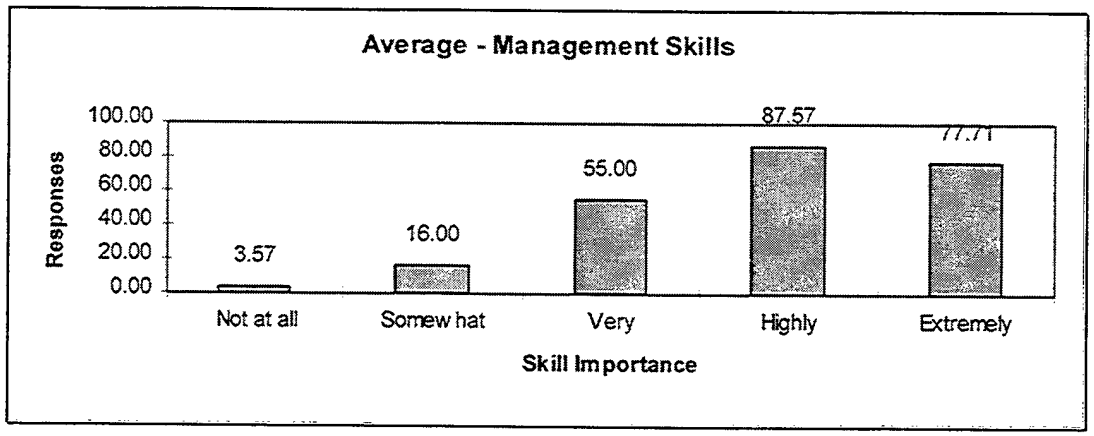


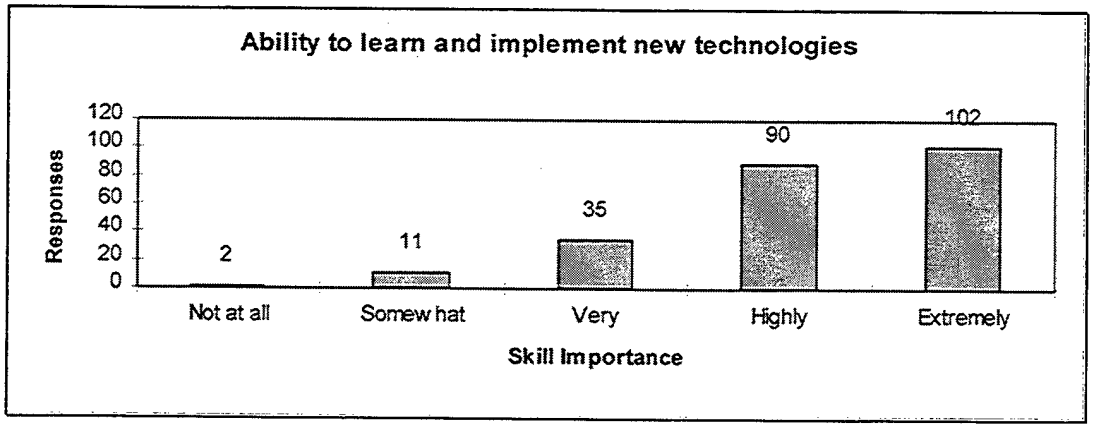

Ability to plan, organize, and lead projects (project management)
Responses
120
100
80
60
40
20
0
0
3
27
95
116
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

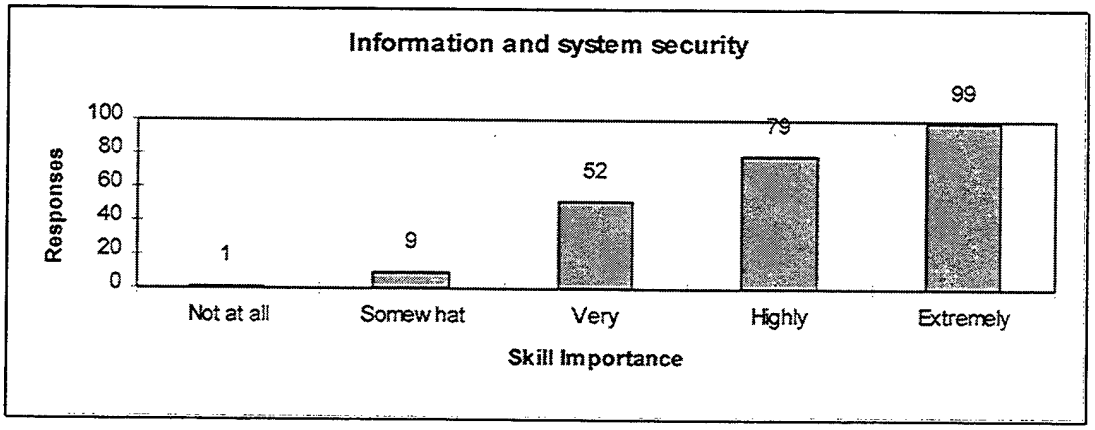

Ability to write clearly, succinctly, and purposefully
Responses
120
100
80
60
40
20
0
0
5
45
80
111
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

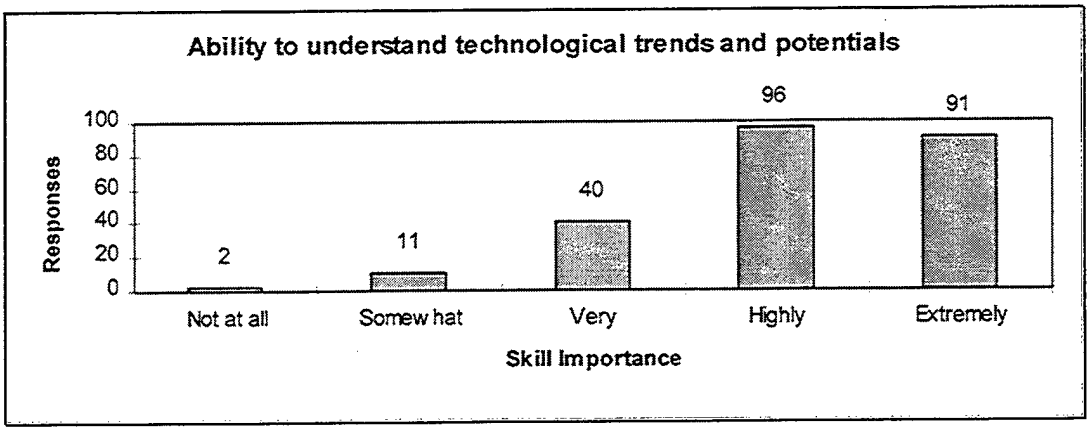

Ability to train/teach others to include end-users
Responses
100
80
60
40
20
0
3
9
57
99
73
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

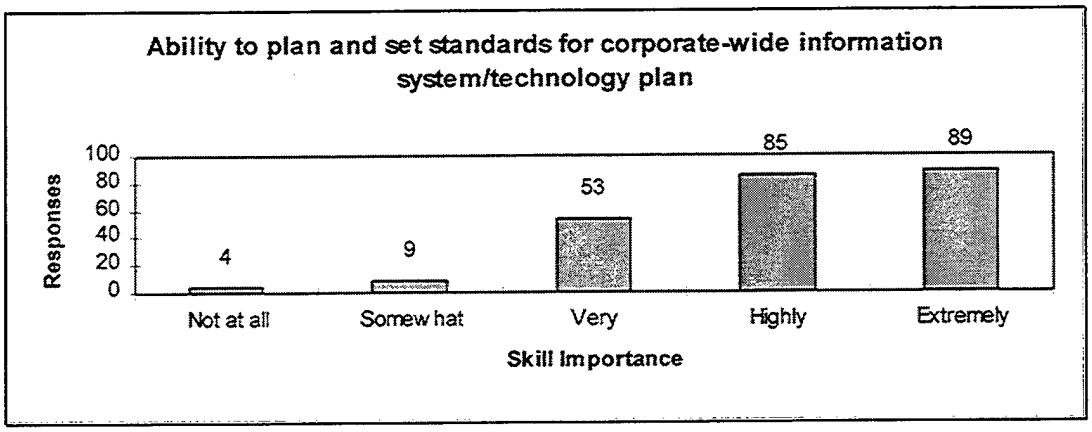
Graphs of management skills. First, a graph of the average managerial skills in aggregate, followed by each individual skill.

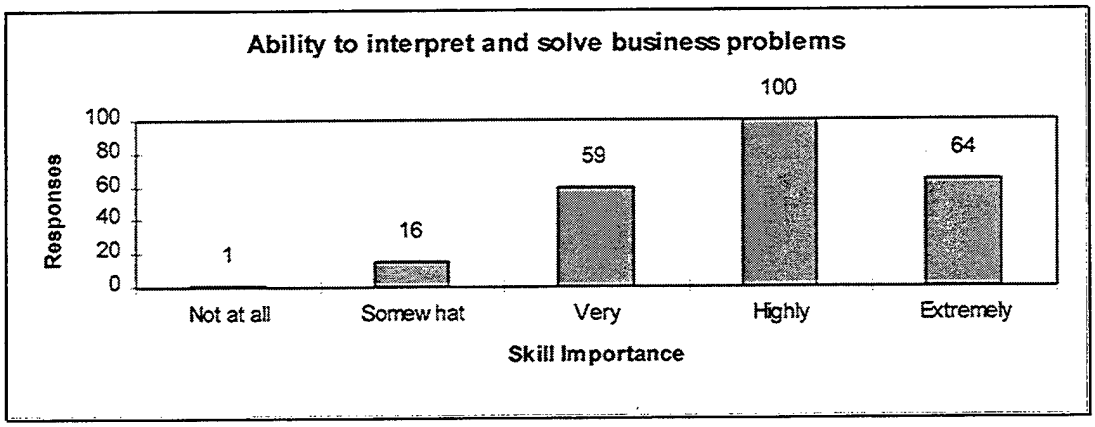


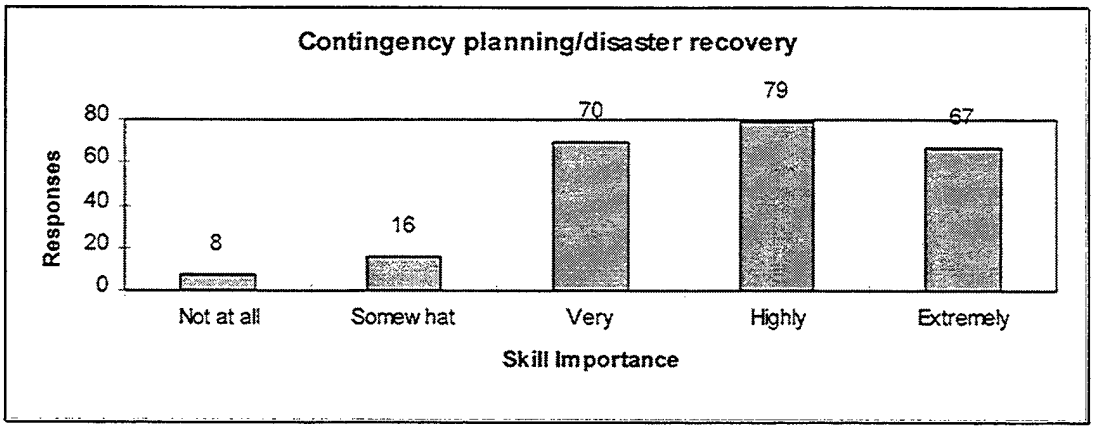


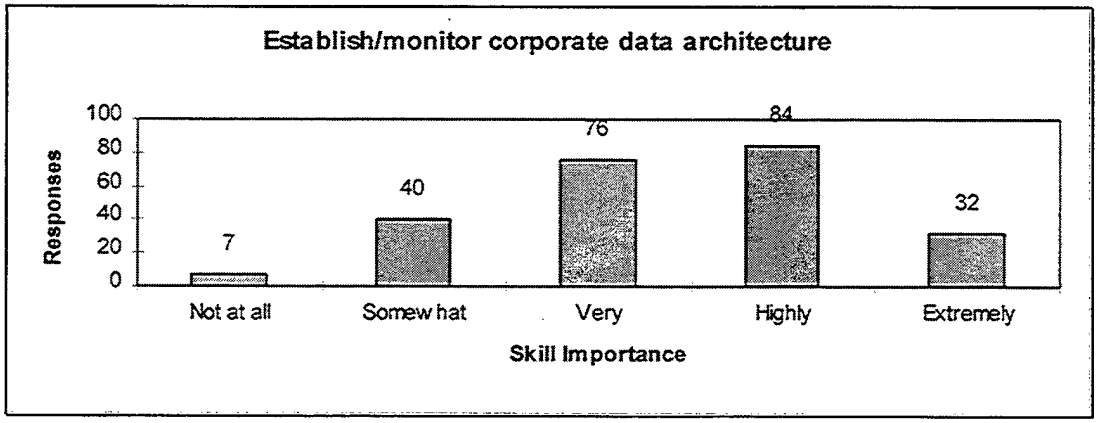



Ability to understand technological trends and potentials
Responses
100
80
60
40
20
0
2
11
40
96
91
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

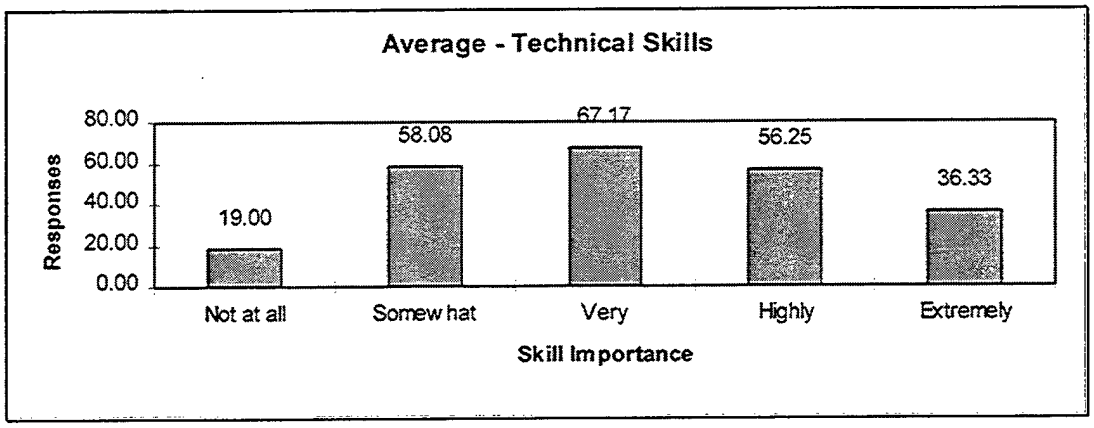

Ability to plan and set standards for corporate-wide information system/technology plan
Responses
100
80
60
40
20
0
4
9
53
85
89
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

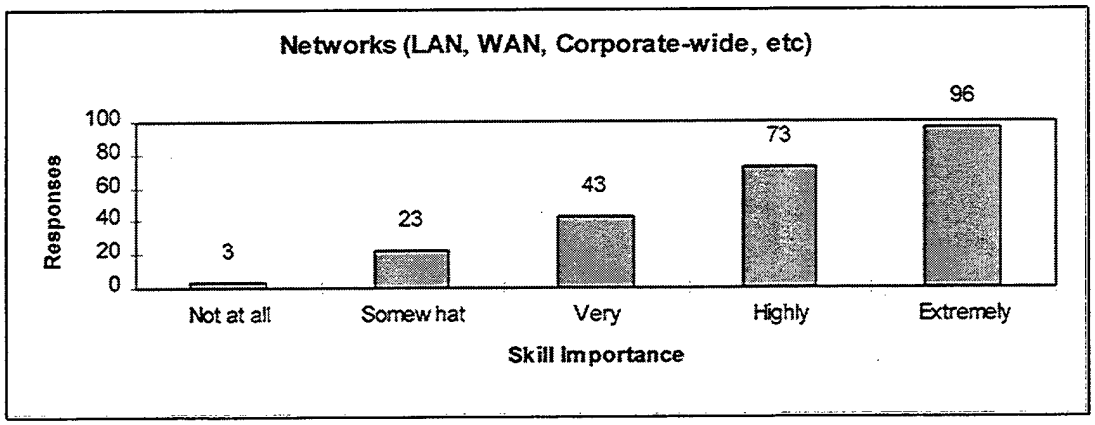

Ability to interpret and solve business problems
Responses
100
80
60
40
20
0
1
16
59
100
64
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

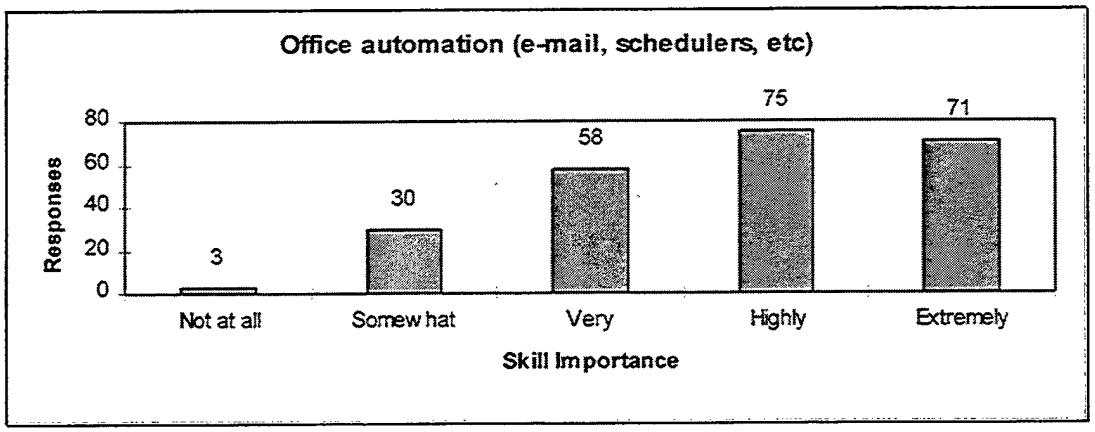

Contingency planning/disaster recovery
Responses
80
60
40
20
0
8
16
70
79
67
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

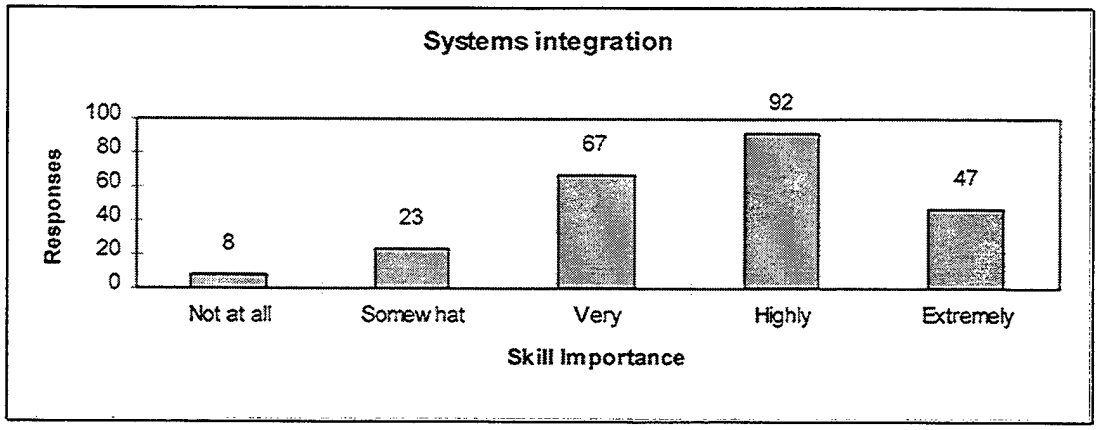

Establish/monitor corporate data architecture
Responses
100
80
60
40
20
0
7
40
76
84
32
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

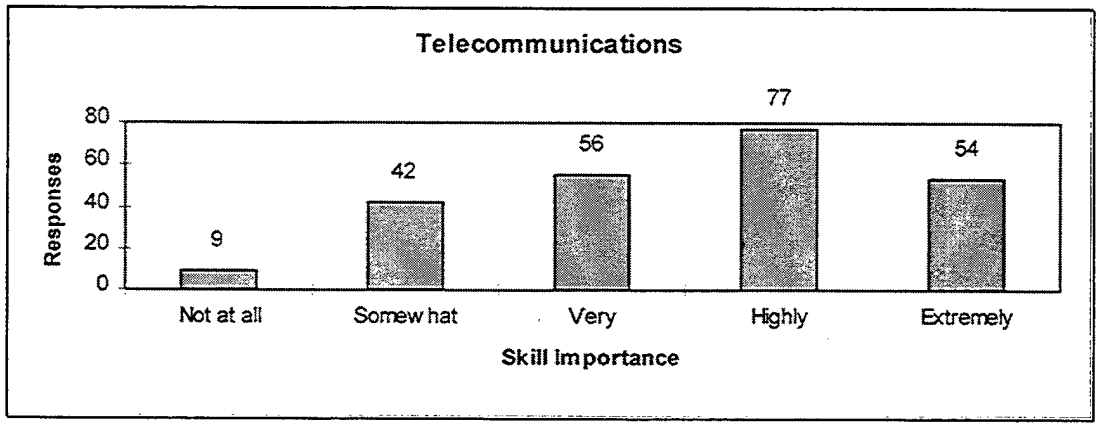
Graphs of technical skills. First an average of the technical skills in aggregate, followed by a graph of each individual skill.

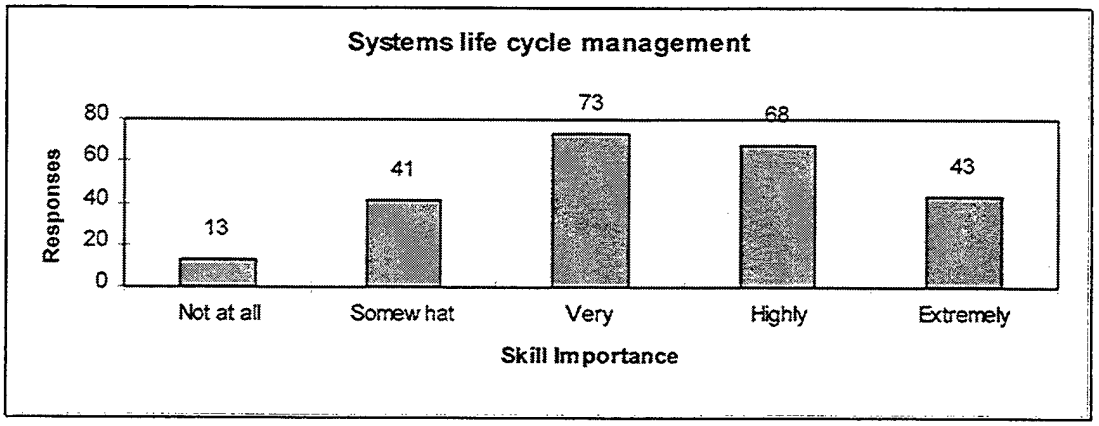


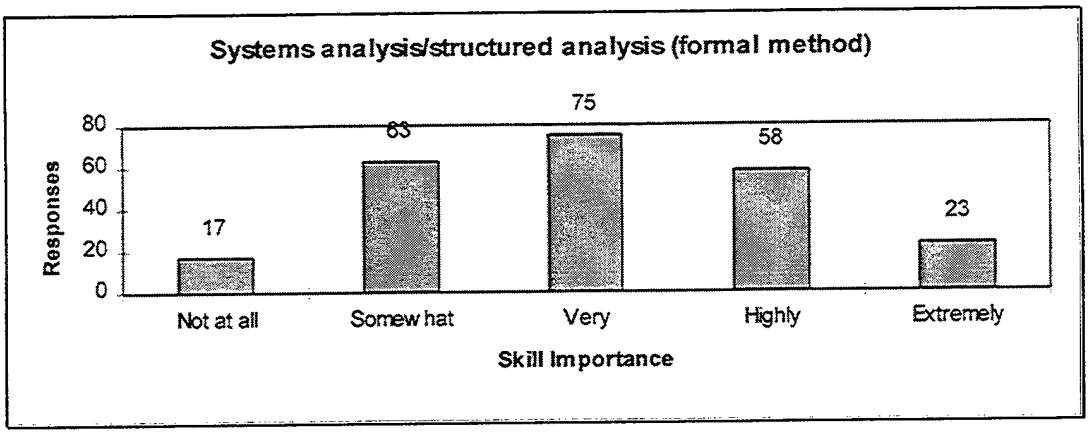


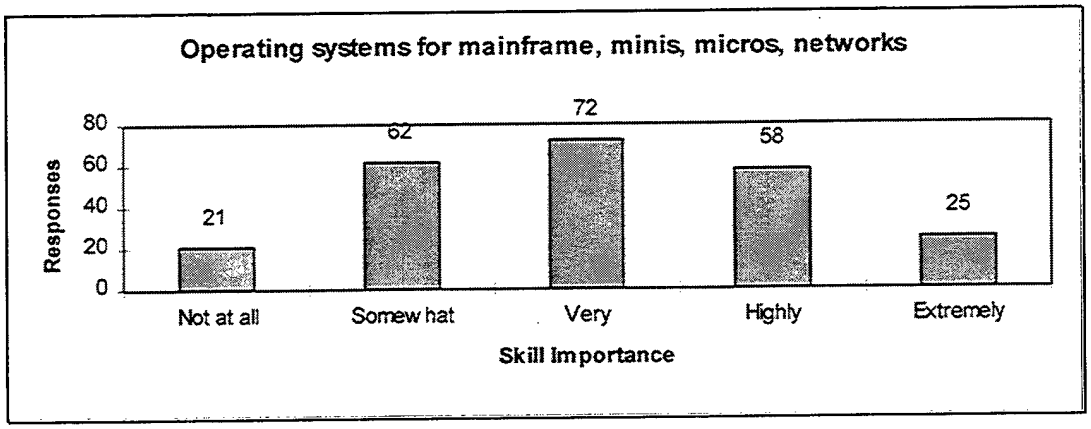


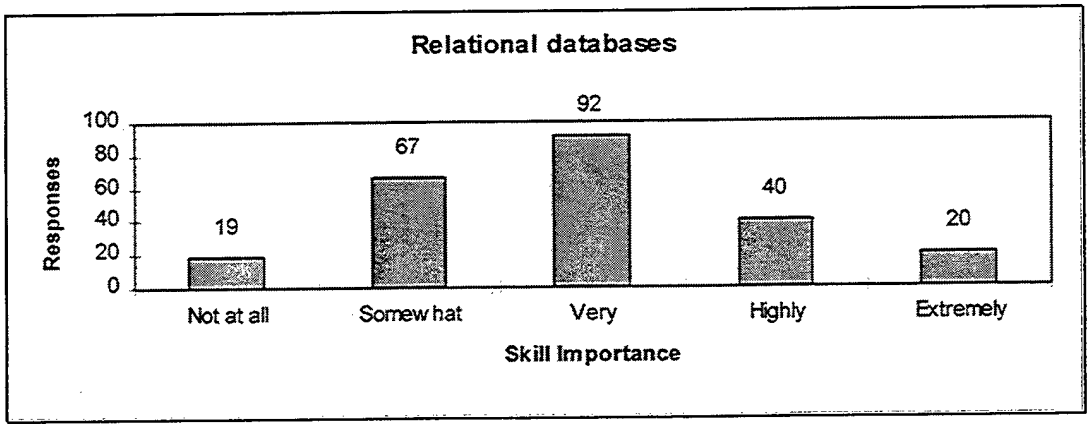

Systems integration
Responses
100
80
60
40
20
0
8
23
67
92
47
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

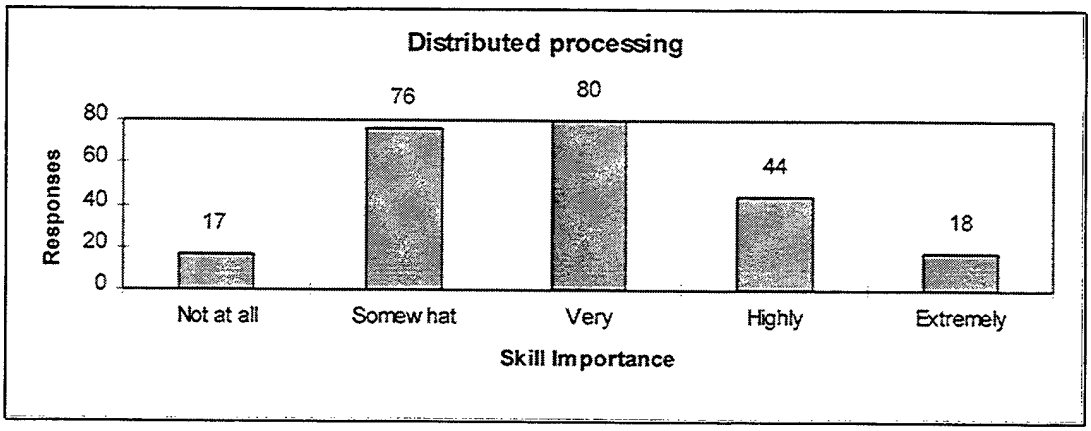

Telecommunications
Responses
80
60
40
20
0
9
42
56
77
54
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

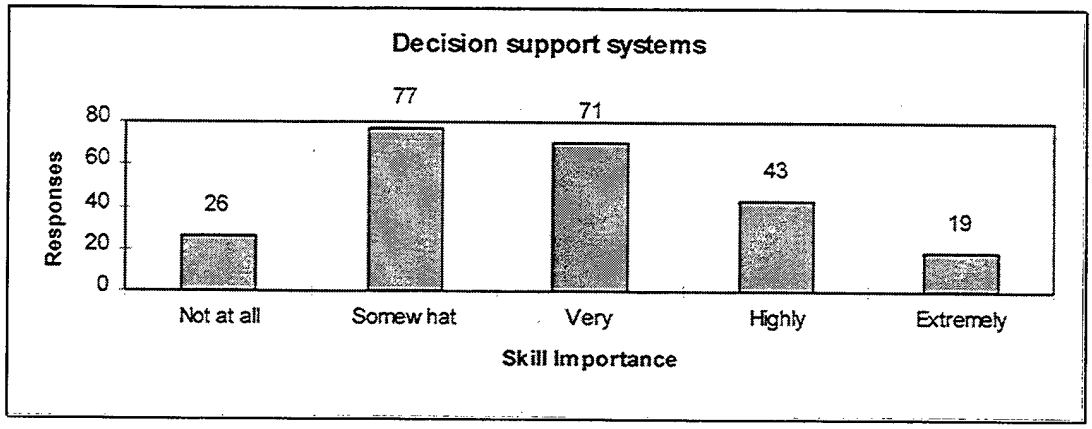

Systems life cycle management
Responses
80
60
40
20
0
13
41
73
68
43
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

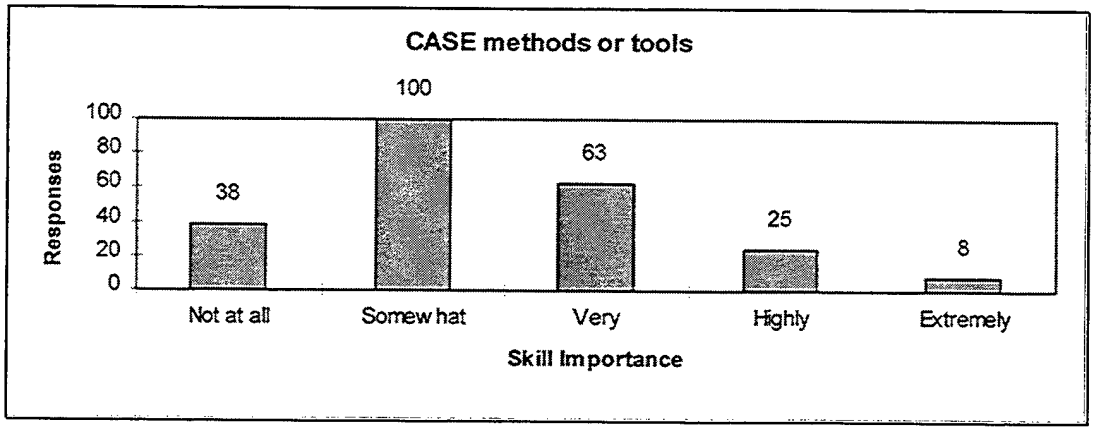

Systems analysis/structured analysis (formal method)
Responses
80
60
40
20
0
17
63
75
58
23
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance

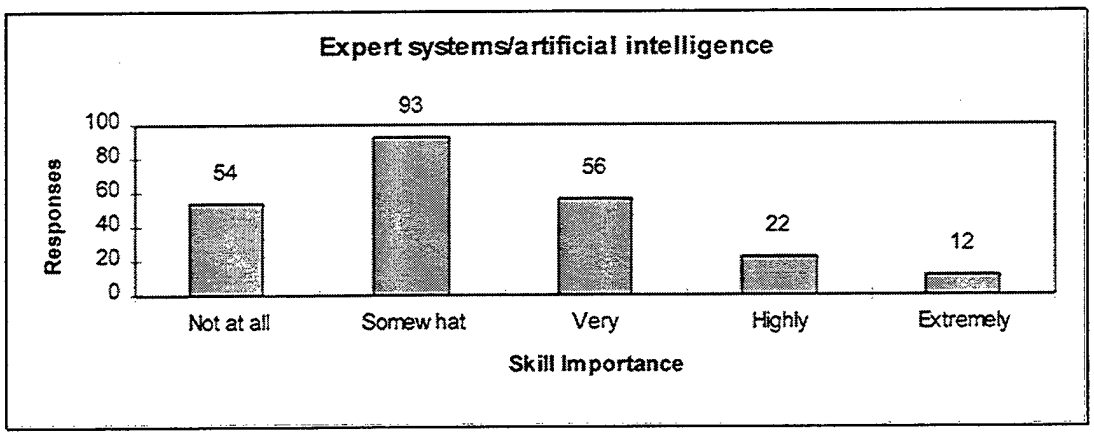

Operating systems for mainframe, minis, micros, networks
Responses
80
60
40
20
0
21
62
72
58
25
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance


Relational databases
Responses
100
80
60
40
20
0
19
67
92
40
20
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance


Distributed processing
Responses
80
60
40
20
0
17
76
80
44
18
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance


Decision support systems
Responses
80
60
40
20
0
26
77
71
43
19
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance


CASE methods or tools
Responses
100
80
60
40
20
0
38
100
63
25
8
Not at all
Somew hat
Very
Highly
Extremely
Skill Importance


Expert systems/artificial intelligence
Responses
100
80
60
40
20
0
54
93
56
22
12
Not at all
Somewhat
Very
Highly
Extremely
Skill Importance

Appendix D - Crosstabulations

Ability to work closely with customers and maintain a productive user or client relationship

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	13						13
	2.00		13	4	19	33	30	99
	3.00		4	10	16	31	29	90
	4.00					2		2
	5.00				2	2	4	8
	6.00			1		4	6	11
	7.00				4	3	2	9
	8.00				2	4	3	9
Total		14	17	15	43	79	74	242

Ability to communicate verbally, one-on-one and group briefings

Count

		Adequacy of Training						
		Blank	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	1						1
	2.00		8	5	15	13	22	63
	3.00		2	6	8	25	15	56
	4.00				1	2		3
	5.00			1	10	22	10	43
	6.00		2		8	25	27	62
	7.00					1	4	5
	8.00					3	5	8
Total		2	12	12	42	91	83	242

Ability to plan, organize, and lead projects (project management)

Count

		Adequacy of Training						Total
		Blank/na	1.00	2.00	3.00	4.00	5.00	
Source of Training	Blank	1						1
	1.00	12						12
	2.00		9	5	14	15	18	61
	3.00		1	11	16	33	23	84
	4.00					2		2
	5.00			1	6	9	7	23
	6.00		2		5	16	4	27
	7.00			1	4	12	7	24
	8.00			2	2	2	2	8
Total		13	12	20	47	89	61	242

Ability to write clearly, succinctly, and purposefully

Count

		Adequacy of Training						Total
		Blank/na	1.00	2.00	3.00	4.00	5.00	
Source of Training	Blank	1						1
	1.00	3						3
	2.00		6	3	12	7	13	41
	3.00		1	3	6	23	14	47
	4.00					3		3
	5.00			1	5	10	7	23
	6.00		3	2	17	46	36	104
	7.00				3	5	4	12
	8.00		1			3	4	8
Total		4	11	9	43	97	78	242

Ability to learn and implement new technologies

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	26						26
	2.00		15	15	33	24	8	95
	3.00		7	12	27	19	11	76
	4.00						1	1
	5.00		1	1	2	3	2	9
	6.00			2	4	8	3	17
	7.00			1	2	3	4	10
	8.00			1	2	1	2	6
Total		28	23	32	70	58	31	242

Information and System Security

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	25						25
	2.00		5	11	18	3	2	39
	3.00		9	26	42	31	14	122
	4.00		1			1		2
	5.00			6	7	6	2	21
	6.00			2	2	8	3	15
	7.00			2	5	5	2	14
	8.00					1	2	3
Total		26	15	47	74	55	25	242

Ability to understand technological trends and potentials

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	35						35
	2.00		14	19	43	25	8	109
	3.00	1	3	7	15	13	6	45
	5.00			1	2	4	1	8
	6.00			3	5	8	4	20
	7.00			3	7	4	5	19
	8.00			2		2	1	5
Total		37	17	35	72	56	25	242

Ability to plan and set standards for corporate-wide information system/technology plan

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	80						80
	2.00		5	9	23	4	2	43
	3.00		7	12	23	19	6	67
	4.00			1				1
	5.00			4	5	3	1	13
	6.00		2	1	3	5	2	13
	7.00			4	8	7	1	20
	8.00			2			1	3
Total		82	14	33	62	38	13	242

Networks (LAN, WAN, Corporate-wide, etc)

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	3						3
	1.00	22	3					25
	2.00	1	2	14	17	14	5	53
	3.00		5	20	21	15	7	68
	4.00				1		1	2
	5.00			19	11	7	3	40
	6.00		1	3	8	8	3	23
	7.00			4	6	8	3	21
	8.00		1	1	1	2	2	7
Total		26	12	61	65	54	24	242

Ability to train/teach others, to include end-users

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	23						23
	2.00	1	14	7	21	27	18	88
	3.00		5	12	20	35	12	84
	4.00					1	1	2
	5.00				1	6	4	11
	6.00		1	1	1	6	7	16
	7.00			1		2	2	5
	8.00			1	2	4	5	12
Total		25	20	22	45	81	49	242

Ability to interpret and solve business problems

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	46						46
	2.00		7	9	20	16	9	61
	3.00		5	8	18	19	5	55
	4.00			1				1
	5.00				3	2	1	6
	6.00		4		6	12	7	29
	7.00		4	2	8	13	7	34
	8.00			1	1	5	2	9
Total		47	20	21	56	67	31	242

Office automation

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	6						6
	2.00		15	12	34	32	33	126
	3.00		3	9	17	42	21	92
	5.00				1		1	2
	6.00				5	3	4	12
	8.00				1	1		2
Total		8	18	21	58	78	59	242

Contingency planning/disaster recovery

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	68						68
	2.00	1	4	8	10	7	2	32
	3.00		4	22	40	24	9	99
	4.00		1					1
	5.00		1	7	6	3	1	18
	6.00			2	4	4	1	11
	7.00		2		1	1	1	5
	8.00		1	1	1	1	2	6
Total		71	13	40	62	40	16	242

Systems Integration

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	63	1	3				67
	2.00	1	3	17	10	5	2	38
	3.00		6	21	31	15	4	77
	4.00			1			1	2
	5.00		1	9	4	1		15
	6.00		2	3	10	8	2	25
	7.00		1	3	4	2	2	12
	8.00			1	1	1	1	4
Total		66	14	58	60	32	12	242

Telecommunications (hardware, phones, modems, cable, satellites, etc)

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	17	1	1				19
	2.00		8	13	14	11	2	48
	3.00		6	15	26	21	15	83
	4.00					1		1
	5.00		3	23	21	6	2	55
	6.00			2	8	6	4	20
	7.00			3	2	3	3	11
	8.00			2	1	1		4
Total		18	18	59	72	49	26	242

Establish/monitor corporate data structure

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	125						125
	2.00		6	5	9	5	2	27
	3.00		1	17	17	14	3	52
	4.00			1				1
	5.00			2	1	3		6
	6.00		2	3	7	3	2	17
	7.00		1	1	4	2		8
	8.00				1	1	2	4
Total		127	10	29	39	28	9	242

Systems life cycle management

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	58						58
	2.00		2	5	3		1	11
	3.00		1	15	12	10	4	42
	4.00			1	2			3
	5.00		3	17	22	13	5	60
	6.00		1	7	12	9	7	36
	7.00		2	3	6	12	4	27
	8.00		1		3			4
Total		59	10	48	60	44	21	242

Systems analysis/structured analysis (formal method)

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	3						3
	1.00	76	1	1				78
	2.00		5	4	2	1		12
	3.00		1	11	10	5		27
	4.00				2			2
	5.00		1	8	5		1	15
	6.00		4	9	20	26	9	68
	7.00		1	7	6	10	7	31
	8.00			1	3	1	1	6
Total		79	13	41	48	43	18	242

Operating systems for mainframe, minis, micros, networks

Count

		Adequacy of Training						Total
		Blank/na	1.00	2.00	3.00	4.00	5.00	
Source of Training	Blank	2						2
	1.00	28						28
	2.00		11	11	19	16	3	60
	3.00		1	16	27	15	4	63
	4.00				1			1
	5.00			8	6	3	5	22
	6.00		3	3	22	10	10	48
	7.00			3	4	1		8
	8.00		1	1	3	3	2	10
Total		30	16	42	82	48	24	242

Relational databases

Count

		Adequacy of Training						Total
		Blank/na	1.00	2.00	3.00	4.00	5.00	
Source of Training	Blank	1						1
	1.00	72						72
	2.00		3	12	11	1	4	31
	3.00	1	3	10	10	6	2	32
	4.00			2				2
	5.00		1	5	2	1		9
	6.00		5	6	28	16	8	63
	7.00		4	5	6	6	2	23
	8.00		1	3	1	1	3	9
Total		74	17	43	58	31	19	242

Distributed processing

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	94						94
	2.00		4	10	15	1		30
	3.00		1	9	17	5	1	33
	4.00			1				1
	5.00		4	10	2	1	1	18
	6.00	1	2	4	14	10	2	33
	7.00		2	6	7	5	3	23
	8.00	1	2	1	2	1	1	8
Total		98	15	41	57	23	8	242

Decision support systems

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	2						2
	1.00	119		1				120
	2.00		1	5	5	2		13
	3.00		1	11	7	3	1	23
	4.00			1				1
	5.00		2	4	6			12
	6.00		2	11	7	6	1	27
	7.00		7	11	15	7	2	42
	8.00			2				2
Total		121	13	46	40	18	4	242

CASE methods or tools

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	3						3
	1.00	116						116
	2.00		4	7	5			16
	3.00		1	14	8	5	1	29
	4.00			2				2
	5.00		2	8	5	2		17
	6.00		4	11	9	5	1	30
	7.00		2	10	6	5	1	24
	8.00		1	1	3			5
Total		119	14	53	36	17	3	242

Expert systems/artificial intelligence

Count

		Adequacy of Training						
		Blank/na	1.00	2.00	3.00	4.00	5.00	Total
Source of Training	Blank	1						1
	1.00	127						127
	2.00		5	2	1			8
	3.00			5	4	2		11
	4.00					1		1
	5.00			6	1			7
	6.00		3	12	16	9	1	41
	7.00		11	8	12	10	2	43
	8.00		2	1				3
Total		128	21	34	34	22	3	242

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Permanent Address: [redacted]

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13. ABSTRACT (*Maximum 200 Words*)

This study explores what Information Resource Management (IRM) skills are required as perceived by the Air Force officers performing IRM duties. The following questions set the stage for this research: (1) What does current literature say about the required skills needed for IRM professionals? (2) What IRM skills do officers in the field perceive as important to the IRM mission? (3) What is the primary source of any IRM training received by the officers? (4) How adequate was this training, if any?

The results suggest that Air Force officers have a grasp of IRM concepts and know what skills are necessary to perform the mission successfully. This study also revealed that formal training received by the officers is adequate or better. This completes two pieces of the puzzle: (1) What skills are needed to complete the mission, and (2) The formal methods of training are effective and adequate.

The third piece of the puzzle has not been realized. More people need access to formal training sources. It does not matter how good the training is if no one has the opportunity to attend. As the Air Force leads the way into the information age, people must be trained to manage the criticality resource--information.

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