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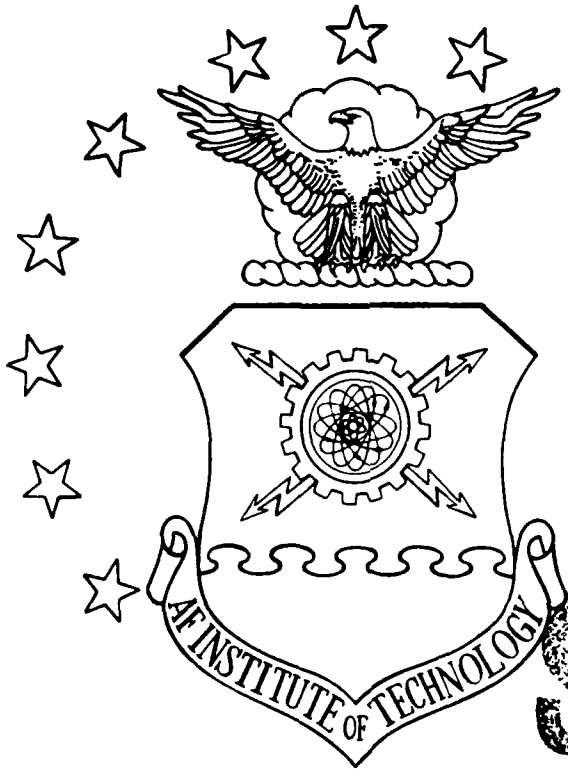

EXECUTIVE INFORMATION SYSTEMS FOR USAF HOSPITAL ADMINISTRATORS: A FEASIBILITY ASSESSMENT

THESIS

Alan R. Constantian, BA, MBA
Captain, USAF, MSC

AFIT/GIR/LSC/90D-2

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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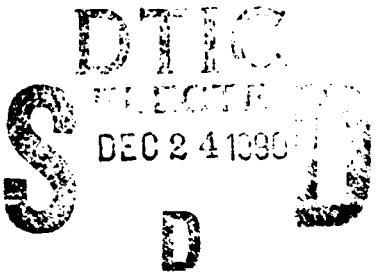

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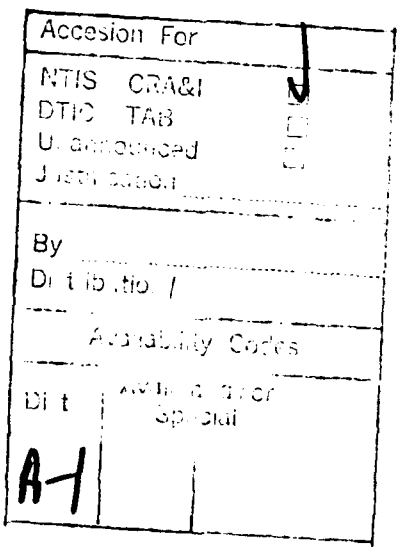

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A FEASIBILITY ASSESSMENT

THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Information Resource Management

Alan R. Constantian, BA, MBA

Captain, USAF, MSC

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Preface

The purpose of this study was to determine to what extent Air Force inpatient medical facilities were ready to support an executive information system (EIS) for hospital administrators. EISs have only recently begun to infiltrate into the civilan health care sector from the general corporate world. The EIS concept is fascinating and promises to be an excellent tool for the manager; I hope it will have been implemented in Air Force hospitals when I become the administrator of such a facility.

Several individuals provided me with considerable assistance in the thesis project and deserve to be acknowledged. Major James Campbell of the Air Force Logistics Command Surgeon General's Office provided both encouragement and factual information on the background of a variety of medical systems initiatives in the Air Force. Major Donald Shields of the USAF Medical Center Wright-Patterson provided additional help by acting as a sounding board for ideas and making excellent suggestions for improving the survy instruments used. I am also indebted to Dr. Guy Shane and Dr. Dan Reynolds of the Air Force Institute of Technology (AFIT) for helping me with the measurement of reliability assessment tools used in this project. Their assistance enabled me to run all required statistical procedures in SAS and saved me from investing countless hours in learning the SPSSX program language. Still another AFIT professor, Lt Col Phil Miller, always

about a statistical procedure. Last but not least, I would like to thank my thesis advisor, Lt Col Larry Emmelhainz, who spurred me on to perform to the best of my abilities. More than once, his insights served to catalyze my thoughts or to avoid egregious errors in the research process.

I will do all I can to advocate the adoption of executive information systems in my future assignments. The knowledge gained about EIS is bound to be ephemeral, however. Fortunately, the thesis process resulted in some insights which I believe will be more lasting.

Foremost among the lasting lessons learned is the importance of family. My wife, Pam, provided countless hours of support by typing and copyediting this document. In addition, she and my son, Peter, provided the tangible reminders of the world outside of academics and the Air Force. Their presence helped me maintain balance and perspective in my life. I couldn't have gotten through the program without them.

Alan R. Constantian

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Abstract

This ~~study~~ investigated the feasibility of implementing an executive information system (EIS) for hospital administrators at CONUS-based USAF inpatient medical facilities. A literature search determined that successful system implementation would require that such an EIS be found technically, economically, operationally, and motivationally feasible. Failure to meet any of these feasibility factors would jeopardize successful implementation. Surveys were mailed to each of the administrators and medical systems officers of CONUS-based USAF inpatient medical facilities in order to gather data on these feasibility issues. Approximately eighty percent of the survey population of 66 in each group responded to the survey. There was strong support for an EIS among the target user population, hospital administrators, thus making EIS feasible from a motivational perspective. However, other aspects of feasibility were less positive. Indicators of technical and economic feasibility brought mixed results and EIS did not appear feasible from an operational perspective at the present time. The information system infrastructure and the technical expertise and size of local medical systems sections must be augmented for an EIS for USAF hospital administrators to become a fully feasible option.

EXECUTIVE INFORMATION SYSTEMS FOR USAF HOSPITAL ADMINISTRATORS: A FEASIBILITY ASSESSMENT

I. Introduction

General issue

Today's health care administrator craves information. In the current health care environment, life and death issues often are decided on the basis of information gathered, processed, or stored by medical information systems. This is true both in the literal sense, where sophisticated medical diagnostic decision support systems help physicians to make diagnoses of illnesses with great speed and accuracy, as well as in the metaphorical sense, where information systems for administration potentially can make the difference between organizational survival and collapse. Organizational failure in the civilian health care industry has become a stark reality in the 1980's. In 1988 alone, 175 hospitals closed in the United States. The number of hospital closures is expected to rise well into the 1990's (50). These desperate conditions have created a market for management information systems which promise to help health care executives manage their resources more effectively.

Air Force health care executives also are under pressure to increase efficiency and reduce costs. Recent initiatives, such as the Catchment Area Management Program, which gives hospital commanders and administrators jurisdiction over and responsibility for CHAMPUS dollars spent in their area, have given Air Force health care executives an increased challenge for effectively managing Air Force health care expenditures. These initiatives have made the Air Force health care executive's ability to use allocated resources efficiently more important than ever before.

In recent years, the medical share of the total Air Force budget has been approximately 9 per cent (32). Deep cuts in the defense budget are likely in the era of superpower detente which we have entered (46). The Air Force will expect its medical service personnel to be diligent in identifying and implementing programs which can reduce costs without reducing the level of service provided (46). As a result, the need to get the most out of every dollar appears to be as strong for military health care executives as it is for their civilian counterparts.

A 1987 Delphi study of 1600 national leaders in health care, conducted by Arthur Andersen and Company and the American College of Healthcare Executives, concluded that "Good management will require more effective monitoring of actual performance against standards" (2:163). According to Austin, "no industry is more information intensive than the

health care industry, where timely and accurate information is essential for high quality patient care and strategic management" (2:158). Therefore, executive information systems (EISs), which promise to relieve information overload by turning raw data into summarized information easily understood by executives, would seem to be a perfect solution (11:55).

Faced with their own mounting challenges and requirements, USAF medical treatment facility administrators also might be able to reap benefits from an executive information system (EIS). Some Air Force hospital administrators have voiced a desire for some type of information system which could help them manage their responsibilities more efficiently and effectively (12; 38). This desire for system support may have been influenced by professional journals touting the importance of high quality information systems for institutional survival, or may be attributable to the increase in the number of responsibilities and programs to be managed by the administrator and his staff. Whatever the reason, a desire for automated system support seems to exist on the part of at least some administrators. An executive information system for USAF hospital administrators would seem to be an ideal solution for overcoming the problems resulting from the fragmented and inefficient hodgepodge of information gathering mechanisms currently used by USAF hospital administrators (42:74-75).

Executive information systems were introduced to the marketplace in the mid-1980's by software companies as a solution to the problem of information overload. Beginning in 1988, Comshare, the leading EIS developer and market leader, began a collaborative effort with consulting firms active in health care, most notably Price Waterhouse of Chicago and Medicus of Ann Arbor, to develop an EIS for the hospital market (13). These commercial systems are expensive, costing between $75,000 and $250,000 initially (9:81) with an annual fee of 15 per cent of the original price for continued maintenance and enhancement (19:19). EISs also require a high level of information systems integration to function properly. Besides these economic and technical issues, an EIS can only be successful if its potential users actively desire it. If the intended users do not want the EIS, it is unlikely that the system's potential will be realized. Furthermore, it is important to be relatively certain that once installed, an EIS's operations can be sustained and supported by the local management information systems staff. Prior to expending a large amount of resources in developing an EIS for USAF hospital administrators, it seems prudent to determine whether the prerequisites necessary to sustain such a system are in place.

Parker's research in 1987 identified several key management indicators common among USAF hospital administrators. In her research, she discovered that most

of this critical information was obtained through manual reports or through face to face contacts. Based on this discovery, Parker recommended that an information system be developed to automate the dissemination of these critical management information indicators commonly used by USAF hospital administrators at the time (42:77-78).

Specific Research Problem

Parker's research notwithstanding, it is not clear that an information system built to quickly and easily convey key management indicator information to USAF hospital administrators is feasible or desirable at the present time. It is necessary to determine whether such an executive information system can and should be implemented in USAF hospitals and whether such a system would be considered a valuable asset by most hospital administrators.

Research Objective

Recent research trends in the civilian hospital administrative environment and the increasing complexity of the management of military hospitals suggest that an EIS may be a useful tool for USAF hospital administrators. This thesis will investigate whether the development of an administrative EIS at Air Force hospitals would be both feasible and desirable. This objective will be achieved by answering the following research questions: To what extent are the critical elements necessary to support an executive

information system for USAF hospital administrators present in USAF hospitals and are there any discernable correlations between administrator attitudes toward an EIS system and demographic or facility attributes of those surveyed?

Investigative Questions

The following specific questions need to be answered in order to achieve the research objective outlined above.

Question 1. What are the factors necessary to support an executive information system?

Question 2. To what extent do USAF hospital administrators desire an executive information system?

a. What is the level of satisfaction among USAF hospital administrators with their current methods of obtaining critical management information?

b. To what extent do administrators believe that their effectiveness and efficiency would be improved by an EIS?

Question 3. To what extent can a stable set of critical management indicators for USAF hospital administrators be identified?

Question 4. To what extent are the medical systems staff personnel at USAF hospitals capable of providing local technical support to administrators in the operation of an EIS?

Question 5. To what degree has the integration of management information data in USAF hospitals been achieved?

Question 6. To what extent do administrators desire the type of executive information system which also supports the decision-support system elements of database manipulation and exploration of hypothetical scenarios?

Question 7. To what extent is the computer hardware in use by Air Force medical facilities similar?

Question 8. To what extent is the technical and motivational support for an EIS associated with the following variables?

a. Facility size.

b. Experience level of the administrator.

c. Administrator confidence in the local medical systems staff.

d. Level of satisfaction with current methods of obtaining information.

Definitions

The reader and the researcher must share a common understanding of key terms and concepts used in this thesis in order to avoid misinterpretation and confusion on the part of the reader. Critical terms used in this thesis are defined below in an effort toward eliminating possible obstacles to the reader's clear understanding of the discussion and arguments presented in this study.

USAF Medical Treatment Facility (MTF). Air Force operated health care organizations which include all sizes of Air Force hospitals and clinics.

Air Force Hospital. An Air Force Hospital is an Air Force operated medical treatment facility, which has the capability of caring for inpatients. Air Force hospitals are hierarchically organized into three categories - medical centers, regional hospitals, and hospitals, depending on the number of inpatient beds and the level of staff specialization and ancillary services sophistication. Air Force hospitals of all sizes also support outpatient clinics, which treat patients who do not require an overnight stay as an inpatient in the hospital. There are currently 6 medical centers, 9 regional hospitals and 51 USAF hospitals located in the continental United States (16:2-6).

USAF Medical Centers. Air Force Medical Centers are the type of Air Force hospitals which operate the largest number of inpatient beds. They also support a number of medical subspecialties with sophisticated ancillary services. These facilities receive referral patients from lower level USAF hospitals; provide specialized care and consultation services; and sponsor residency programs for professional staff members in post graduate specialty training (16:2-9a).

USAF Regional Hospitals. Air Force Regional Hospitals are smaller in size than medical centers and support fewer specialists. However, they provide consultation support and accept patients from smaller USAF hospitals and independent USAF clinics (16:2-9b).

USAF Hospital. USAF Hospital is the designation for the smallest, least complex Air Force operated inpatient medical facility. These facilities support between 2 and 80 inpatient beds and have a very limited number of specialties: typically family practice, general surgery, obstetrics, and gynecology.

USAF Clinic. A USAF operated medical facility which does not provide inpatient care and, therefore, operates no beds, is termed a clinic.

Hospital Administrator. In the civilian health care sector, hospital administrator is the title traditionally given to the Chief Executive Officer (CEO) or president of the organization. This term is becoming less common in the civilian health care sector, which is aligning its position titles with those of industry and changing the title of executives in this position to president or CEO. In the military health care arena, the hospital administrator is the equivalent of the Chief Operating Officer. The Commander of an Air Force medical facility, traditionally a physician, is the equivalent of the CEO in a civilian health care facility. The military hospital administrator works directly for the commander and is in charge of managing organizational resources, and providing logistical and administrative support to the operation of the medical facility. An Air Force hospital administrator is not the chief decision maker in the organization, but is responsible for the management of the organizational resources and

activities of the organization short of decisions directly related to the clinical care of patients. Except for this difference, the responsibilities of the USAF hospital administrators are roughly equivalent to those of civilian sector hospital CEOs.

Information System (IS). An information system is a computer-based, user-machine system which processes inputs and provides outputs, regardless of the type of application (15:7-8).

Decision Support System (DSS). A decision support system is an IS designed specifically to aid the decision making and decision implementation process. A system which facilitate's the decision maker's ability both to retrieve data and to test alternatives during the problem solving process (15:368).

Management Information System (MIS). According to Davis, an MIS is "an integrated user-machine system for providing information to support operations, management, analysis, and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedures, models for analysis, planning, control and decision making, and a database" (15:6).

Executive Information System (EIS). There are two primary types of EIS. One type is built only to ease data access for executives and present a battery of summarized key indicator information, typically in graphical form, to assist the executive in identifying key trends impacting the

organization. The other type of EIS adds the alternative testing capability typical of decision support systems (45:84-85). This kind of EIS is sometimes termed an Executive Support System (ESS). This thesis will use the term EIS for both forms of EIS and will explicitly distinguish between the two types of EIS whenever necessary.

Scope

The scope of this research is limited both by the availability of a wide range of literature on the topic and the population under study. It is also limited to an empirical assessment of feasibility using a theoretical foundation adopted from Davis and Olson, whose research and its relevance to this study will be discussed in the following chapter. It makes no claim to test or challenge this theoretical foundation.

The scope of the literature review of executive information systems is limited mostly to practitioner-oriented books and journals. Little specific information regarding the benefits of, and support required by an EIS is currently available in academic journals. This is probably caused by the relative newness of the EIS concept. In contrast, there is a wealth of information of theories of decision making in organizations, and the taxonomy of information systems. Exhaustive reporting of the literature available on these topics is not included. Such a study would require an investment of time by the author and the

reader that would not add significantly to the understanding of the specific research problem of this thesis. Therefore, only a representative sample of this literature is presented, with the intent of providing perspective and a counterweight to balance the enthusiasm reflected by many of the authors who discuss executive information systems in the practitioner-oriented journals.

This research effort is also limited to a study of the opinions of CONUS-based Air Force hospital administrators. The principle reason for this limitation of research scope is that a key objective of this study is the uniqueness of Air Force hospitals as a group. These are the only inpatient medical care facilities operated in accordance with Air Force directives. Therefore, one would expect that their management indicators would be unique. The relative stability of management indicators is a requirement for an EIS. Parker's population of interest was CONUS-based USAF hospital administrators; therefore, a comparative analysis can only be done by including this population. However, the inclusion of larger USAF hospitals in the study, those facilities known as regional hospitals and medical centers, does seem reasonable. The differences between these facilities and the smaller USAF hospitals are not in what is accomplished but in breadth and quantity of mission. There is no need to exclude these facilities from consideration. Other Air Force operated facilities logically must be excluded from the study, however. Clinics are excluded

because no EIS has been developed to support facilities of this size. Given the current cost of EIS, it is highly unlikely that an EIS could make improvements which would provide any reasonable level of return on the investment. Installation of an EIS in these facilities is, therefore, highly unlikely and surveying these administrators would serve little purpose. Overseas hospitals are also excluded. These facilities operate in environments and circumstances very different from CONUS-based facilities. Many decision options available to CONUS-based administrators are not available to an administrator operating a facility in a foreign country. Therefore, these facilities represent one or more populations distinct from CONUS-based Air Force hospitals, and for this reason, will not be included.

Limitations of the Research

Key limitations of this research include the potential for bias and the limited applicability of the results.

The portion of the literature review which describes the benefits of an EIS are potentially biased. As stated in the previous section, most of the available literature on this topic is found in practitioner-oriented literature. For the most part, it is generated by groups who have a direct or indirect personal stake in the marketing success of EIS and whose opinions on the topic may be less than totally objective.

The limited scope of the research will in turn limit the breadth of conclusions. Conclusions can only be made regarding the feasibility of an EIS for CONUS-based USAF hospitals. Drawing conclusions based on this research for other populations of interest, such as Veteran's Administration hospitals, would be a matter of speculation.

Finally, since EISs for medical organizations are very new, it is unlikely that any surveyed hospital administrator will have seen an EIS in operation. Therefore, a determination of whether an EIS would improve their decision-making, and to what degree, will be based on the respondents' replies to descriptions of the capabilities and attributes of the hypothetical system. However, avoiding this risk results in a limitation on the strength of the final conclusion, since a system is not necessarily the sum of its attributes. Therefore, the level of enthusiasm expressed for an EIS as reflected by responses to its attributes can be considered only a rough estimate of the true support level for an EIS.

Assumption

This research is based on conceptual foundations for feasibility established by Davis and Olson (15). The relevant details of Davis and Olson's feasibility concepts will be presented in Chapter II. The constructs they use for identifying various aspects of feasibility are assumed to be valid by this researcher.

Thesis Structure

The remainder of this research effort will seek to answer the specific investigative questions. By answering the investigative questions, the researcher will be able to assess the various aspects of EIS feasibility for USAF hospital administrators. A literature review in Chapter II will describe the current state of development of executive information systems in healthcare facilities and their requirements, as well as the general advantages and disadvantages of sophisticated management information systems. Chapter III will describe and justify the design of the survey instrument used to elicit the data needed to answer the investigative questions. Chapter IV will analyze the data comprehensively and answer the investigative questions. Finally, Chapter V will discuss the findings with regard to various aspects of feasibility, make recommendations for action and further research and will draw an overall conclusion based on the literature review and the data collected and analyzed in previous parts of the thesis.

II. Literature Review

Introduction

An Executive Information System theoretically holds some promise to help Air Force hospital administrators better manage their responsibilities. At present, USAF medical systems officials have no plans to develop or purchase an executive information system for hospital administrators (5). This is to be expected, given the newness of EIS for healthcare facilities. Indeed, according to the American Hospital Association's Mr. Richard Currell, only three Executive Information systems were in place in US hospitals nationwide in the summer of 1989, and not all of these were fully operational (13). Most new medical systems applications intended for Air Force-wide use are developed or acquired as a result of interest voiced by personnel working in medical facilities (40), and the idea of an EIS for USAF hospital administrators has not yet percolated to the Medical Systems Directorate of the Air Force Surgeon General.

This literature review will first explore the place of EIS in the general taxonomy of information systems. Next, it will describe EISs and outline its proven and postulated benefits. Limitations of EISs will then be discussed and, finally, these limitations will be weighed against the promised benefits. Following this discussion, the specific

support requirements for EIS will be discussed. The requirements identified in this review will form the basis for evaluating the extent to which Air Force hospitals are ready to support an EIS. The intent of this literature review is not to prove or disprove the validity of any particular point of view, but simply to provide the reader with a reference point to assess the validity of the conclusions resulting from a comparison of the information already known about EIS with the data obtained through analysis of the survey responses. In order to better understand the place of EIS in an organization, it is useful to discuss the attributes of other, similar types of information systems from which EIS evolved.

Organizational Information Systems

Information systems in organizations vary in structure based on the tasks relevant to their users. The most basic information systems in organizations are transaction processing systems. These systems automate the detailed, routine actions that are the basis of the organization's business. For example, a transaction processing information system for a bank would be the system which showed a deposit and adjusted the balance of a customer depositing funds to a bank account. Mundane as these systems are, they are the basis upon which all other organizational information systems are based (15:47). The data collected by the transaction processing systems are aggregated by category

and summarized into information useful to management at various levels.

Management Information Systems. Management information systems (MISs) take the raw data collected by the transaction processing system and structure it to make it meaningful to a manager. MISs can exist at all levels of management. Davis and Olson suggest three distinct levels of MIS. First-line supervisors use MISs for operational planning and control in an effort to efficiently and effectively use allocated resources. Middle managers use MISs for tactical planning and executives use MISs to support their strategic planning activities (15:35). Table 1 shows the differences of information characteristics according to the intended user of MISs.

According to Sprague and Carlson, Management Information Systems (MIS) traditionally have focused on gathering the data from the transaction processing system, producing pre-defined reports, and permitting users to access and view aggregated information on request (51:7). As interpreted by Sprague and Carlson, a MIS relies on the user to make management sense of the information. As a result, Keen and Scott Morton argue that such a system does not fully attain its goal to aid management. In order truly to aid the manager, an Information System (IS) must not only summarize information, but take an active role in helping

Table 1.

Information Requirements be Level of Management (15:35-36)

Dimension	Information Characteristics For Executives	First-Line Supervisors
Source	External	Internal
Scope	Very wide	Well-defined
Level of aggregation	Aggregate	Detailed
Time horizon	Future	Historical
Currency	Old	Highly current
Accuracy required	Low	High
Frequency of use	Infrequent	Very frequent

the manager accomplish his principal task, that of making organizational decisions (27:57-58).

Decision Support Systems. Decision support systems differ from other management information systems by explicitly integrating management information data bases with a decision model data base. In tandem, this information helps the user make a decision. Zmud's review of the literature identified six characteristics of a DSS. First, a DSS must reflect the way a decision maker thinks. Next, it must have the flexibility to support a variety of decision processes and styles. Third, a DSS must be convenient to use and easy to learn. Fourth, it must be adaptable and user-friendly. Fifth, a DSS must allow a decision-maker to adapt it as he becomes more familiar with its capabilities. Finally, a DSS must help the manager structure situations and information into an appropriate

decision model (57:203-205). Minch and Sanders operationally define a DSS as an information system which supports decision-makers and consists of data, user-interface and model components (37:411). This modeling attribute is the principle feature which distinguishes the DSS from other management information systems which purport to support high-level decision makers in the organization.

Executive information systems, built for an organization's senior executive staff, share the first four attributes of decision support systems listed above. However, not all EIS add the modeling component characteristic of a decision support system. As a result of the absence of this key characteristic and the presence of some other unique features, it is not correct to classify an EIS as a sophisticated DSS for top level managers. Instead, it is a new type of information system with its own set of distinguishing characteristics which are outlined in the following section.

Description of an Executive Information System

An executive information system (EIS) is a collection of programs which has as its goal ease of access, summarization of relevant indicators and the capability of "drilling down" into lower levels of the database to attempt to draw conclusions or hypotheses regarding cause and effect or interaction among variables which yield the results displayed at the top level EIS summary (24).

Ease of access can be achieved with multiple methods. Touch screens and mouse driven selection of options from multiple levels of menus serve to separate the executive from the keyboard and its connotation of clerk status widely held by many executives (22:130). Speed of data access is another element of the ease of access issue of primary concern, since a highly paid executive's time is poorly spent in waiting for the computer to respond. EIS systems now in operation have been built to return desired information in less than 3 seconds to accommodate the need for rapid access (24).

Summarization of relevant indicators is another critical element surrounding the EIS concept. Since the purpose of an EIS is to reduce the risk of executive information overload, it is imperative that only that information which is useful in assisting the executive in carrying out his responsibilities is included. Adding unnecessary data to the system increases the cost and complexity of the system and lessens the value of the system by threatening to waste the executive's time and diverting his attention from relevant issues (44:28-29). Therefore, a large part of the success of an EIS is dependent on the ability to isolate a stable set of the organization's most significant indicators of performance and include it in the EIS (22:130). Having identified these key indicators, summarization includes at least the option to view the

trends and patterns of selected indicators in a graphical depiction.

The final critical element necessary in an EIS and one which distinguishes it from a sophisticated on-screen, report generator is its ability to allow the executive to "drill down" beneath the summarized information to explore for himself relationships which he uncovered from his review. This feature allows the executive to review and compare data provided by different sources within the organization. It enables the executive "to have a broad range of information that is unfiltered - information that is data-driven" (9:80). It need not be able to manipulate these numbers according to the executive's desires, but an EIS must allow the executive to view the data at lower levels of refinement.

Rockart and Treacy's study of Executive Information Systems uncovered common attributes shared by all EIS systems. First, all have a common purpose. Those organizations which have implemented EIS systems have executives who have determined that they need flexible access to a broad range of information accessible immediately on their request. This capability of rapid information access enables the executive to understand and control his organization better. EIS's contain business management indicators, both quantitative and qualitative. This information is held in a historical data base typically containing data for the preceding five years. This large

amount of historical data is necessary to illuminate trends fully. According to Rockart and Treacy, EIS systems come in two varieties, those which allow executives only to view data and those with a DSS flavor which permit a degree of data manipulation to support "what-if" examinations of business alternatives. Finally, all observed systems depend on a support staff to train and coach the executives in how to get maximum benefit from the system (45:83-85).

This section describing the EIS concludes with a brief discussion of what an EIS is not and what it does not do. First of all, an EIS does not create new data; it simply summarizes, presents and, sometimes, transforms data already available in a centralized data base, to create information in a form of greater value to the user. Second, an EIS is not a stand alone system, but a system that must be built on an existing infrastructure of technology, including a centralized databank and repository for all organizational data. Finally, an EIS is not a large, monolithic integrated system, but a collection of systems driven by the EIS concept. Therefore, unlike some systems in which one must acquire the entire package or have a series of useless parts, an EIS can be modularized on the basis of a unit as small as a single critical success factor or organizational subsection.

This section has provided the reader with an understanding of what an EIS is and does; the next section

of this review will consider what benefits an EIS promises to deliver to its users.

Benefits of an Executive Information System

The benefits of EIS can be divided between the tasks it helps the executive perform and the influence it has in making positive changes in organizational behavior. Many of the benefits extolled by users of EIS focus on the intangible benefits which executives attribute to the existence of EIS in their organizations. This section will explore both types of benefits of EIS systems.

Improving Executive Task Efficiency. The tasks of the executive and of hospital administrators are the classical managerial roles of planning, controlling, organizing, coordinating and staffing. Executive information systems assist executives in performing all of these tasks to some degree.

An EIS assists the planning function by allowing the administrator to see and assess the impact of changing a data element contributing to the result of a critical success factor. Planning questions can be answered better using simulations and "what-if" scenario building. Such methods can be supported by an EIS (53:31).

Controlling is made much easier for the executive through the EIS, which can be programmed to search for and identify to the executive any anomalies in organizational operations which require his action and intervention

(53:31). Without the EIS, problem areas might go unnoticed or not get reported to the executive by subordinates. Early problem identification improves the chances that corrective measures can be taken before the problem burgeons into an obvious threat of considerable significance to the organization requiring a large expenditure of resources to correct.

EIS systems also help the executive to organize. These systems, by improving the clarity of the executive's view of the organization's situation, permit him to organize activities which better address the needs of the organization. Coordinating can be enhanced by EIS by ensuring that all key executives have access to the same facts. Executives at Xerox Corporation find that meetings go much smoother than prior to EIS. A likely reason for this result is given by William Jeffery of United Research, who states that trying to develop a consensus on the facts often takes 80 per cent of the time of a typical meeting. It follows that if the EIS becomes the organization's central repository of facts, executives will spend much less time determining the facts and more time in planning effective strategies in response to the facts (33:80).

An EIS can also influence staffing decisions of executives. Personnel productivity can be analyzed effectively using an EIS, and human resources can be shifted in order to maximize the marginal benefits of individuals in contributing to the organization's mission. This benefit

would be extremely important in organizations where the services of highly paid individuals have a major impact on profitability and productivity. Such situations could arise in law firms, consulting agencies, or hospitals. In these organizations, an EIS can make a significant impact on efficient staffing
decisions (22:130).

Executive information systems can provide benefits to executives in executing their responsibilities. However, many of the significant contributions of the EIS cannot be categorized into a particular area of management responsibility. Instead, these additional benefits of EIS make a contribution by improving the total performance of the organization and executive by influencing behavior. These benefits of EIS will now be considered.

Other Benefits of EIS. EIS Systems can contribute to the improved operation of an organization in ways more difficult to measure, but potentially of greater importance than those benefits mentioned in the previous section. Among these benefits are: increased executive confidence, greater organizational focus on results, and more effective use of staff.

EIS systems increase executive confidence in the correctness of their decisions. This added confidence comes from an intimate familiarity with the data upon which decisions are made. Confidence is also built because the data can be examined directly by the CEO in raw form, thus

strengthening the confidence that the conclusions based thereon are reasonable. Rockart and Treacy quote several CEO's, one of whom expressed this benefit of an EIS:

> The system has been of infinite help in allowing me to improve my mental model of the company and the industry we are in. I feel much more confident that I am on top of the operations of our company and its future path. (45:86)

Another benefit of an EIS seems to be the signal it sends throughout the organization that results speak for themselves. An EIS lessens the importance of presentation and increases the importance of contributions which lead to improvements in key corporate indicators. Rockart and Treacy quote another executive who offers this perspective:

> Frankly, a secondary, but very real advantage of the use of the system by me is the signal it gives to the rest of the company that I desire more quantitatively oriented management of the organization. I want my subordinates to think more analytically, and they are. I feel we're on the way to becoming a significantly better company. (45:86)

Finally, an EIS can overcome inefficiencies which can result from ineffective communication between the executive and his staff in requests for information. Two executives are quoted below who address this problem:

> Your staff really can't help you think. The problem with giving a question to the staff is that they provide you an answer. You learn the nature of the real question you should have asked when you muck around in the data. (45:80)

> It saves a great deal of the time spent in communicating with functional staff personnel. Today, for an increasing number of problems, I can locate the data I want, and I can develop it in the form I want, faster than I could describe my needs to the appropriate staffer. (33:86)

An EIS promises a number of benefits, some of which are more easily identifiable than others. There are some, however, who are less enthusiastic about the potential of the EIS and harbor reservations regarding the real benefits of the system. A consideration of EIS would be incomplete without reviewing and considering the opinions of the critics of the EIS concept.

Limitations of Executive Information Systems

An executive information system achieves many of its efficiencies and benefits by allowing the executive to examine organizational data privately. Are the information summarizing efficiencies of EISs bought at the price of decreased executive effectiveness? Some argue that this is the case, contending that an EIS only lures the executive into a morass of alluring information details and distracts him from his primary task of establishing direction and policy for the organization. Others have a fundamental problem with the EIS concept, saying that business decisions made at the executive level, particularly in the health care arena, are so unique and complex that an executive information system cannot possibly be built to address the varied and changing information requirements for executives. Finally, there are those who argue that decision makers trust and prefer verbal, non-computerized information sources, and particularly value information they gather through informal sources. Since executive information

systems as they are currently available lack these features, the implication is that an EIS adds little value to the organization since it simply provides a greater volume of less desirable information. These arguments are made by creditable individuals like Ray Brown, a widely known and well regarded pioneer of the hospital administration profession, and warrant the reader's consideration. Having organizational data available at a terminal has a surface appeal, but may lessen the administrator's overall effectiveness. Brown makes the following point regarding the hospital administrator and his relationship to information:

> It is not the possession of facts that is important in administration, but rather the acquisition of them when they are needed. Actually, there are times when the administrator needs the benefit of an ignorance that causes him to ask questions. Along with the facts he can also catch the nuance that might be more important than the facts. He can also gain the high favor and regard of the person of whom he asks the information. Few things seem to flatter people as much as being asked for information, and even fewer things seem to provide as much pleasure as the chance to tell someone something. (3:55)

Brown makes two points. First, he reminds one that more is conveyed in the verbal passing of information than the information itself. Nonverbal communication adds significantly to the total message. These subtleties cannot be captured by an automated information system. Second, he forces one to recall that organizations are comprised of people as well as facts and that the possibility of motivating one's staff by the simple act of asking questions

of them may reap far greater rewards than using an EIS to analyze organizational data for many long hours.

Those who fault Executive Information Systems on the basis of their inability to address key organizational issues usually find themselves criticizing management for failure to be involved in designing the EIS. C.L. Packer, President of Shared Data Research, finds that hospital executives sometimes display a lack of enthusiasm for information systems because they fail to communicate key information (41:100). Ernest Williamson of Medicus Systems, a healthcare consulting firm and a partner with Comshare in a development of EIS for hospitals, states that information systems fail when the management passively accepts the option of making the by-products of the organization's transaction processing system available to executives on EIS. This approach inevitably yields poor results. Instead, the organization's informational inputs should be based on the executive's needs first (56:23). User involvement in the design and development of any information system is important and irrefutable. However, this rule of thumb for system development is not a direct critique of EIS in particular. Moreover, both Packer and Williamson strongly believe that greater executive involvement in systems development can overcome the obstacle of unresponsive systems.

Finally, there is the objection championed by MacLeod and Jones, whose empirical research conducted in 1986 seemed

to substantiate assertions of Mintzberg and others that computer based information lacked the richness of direct verbal communication and, therefore, was not highly valued by senior executives. Their case studies of five senior executives in four different industries (insurance, retail, energy, and banking) revealed a distinct preference for the verbal media for gathering information. In fact, information from informal verbal media in the form of unscheduled meetings, tours, and social activity were all rated as having greater value than all forms of written communication, including that of computer reports (25:233). Although executive information systems were not included in the study, one suspects that since it definitely is not a verbal based medium of information transfer, it would not have been highly rated. These findings do not negate the potential value of an EIS, but do suggest that it is important to determine whether information received via an EIS would be valued at least at the same level as the current method of passing information. Unless information provided by the EIS can displace current methods of some instances of information-transmitting activities with no marginal loss of quality, making a case for the need of an EIS in an organization would be a very difficult task.

It is possible to challenge the conclusions reached by MacLeod and Jones in several ways. First, the size of the sample they use, five, is extremely small. Second, their paper does not address questions of external validity at

all. Finally, one suspects a potential for bias because the executives agreed to in-depth verbal interviews which, therefore, could result in a self-selection of an opinionated minority on the topic of information medium preference. Despite these flaws, their study represents empirical support of theories of information requirements championed by Mintzberg and Brown; these perspectives should be considered in order to ensure a balanced study in this research effort.

Benefits and Limitations Weighed

The caveats to the benefits presented here beg some sort of resolution. The thesis that the EIS is a management panacea is probably overstated to some extent, as one might expect since most of the proponents of this position seem to be those people who have the most to gain from a rapid proliferation of EIS. The antithesis to the position is weakened because it does not address the unique EIS media directly. Most likely, the middle ground suggested by Charles Austin, a Professor of the Department of Health Services Administration at the University of Alabama, is closer to the truth. Austin states:

> ... administrators and their subordinates (should) be trained in the intelligent use of information, to develop the ability to identify those problems in which additional information can be of real value in seeking solutions and also to be sensitive to those situations in which information would add very little to deliberations ....(1:5)

As sophisticated as an EIS is, it is no replacement for the executive; the EIS has a role, but the executive retains his. As Ray Brown said,

> Information only implies. It invites administration to find out. Administration must take it from there and develop the information into a definitive course of action. Despite all the magic of electronics in the processing of information, a human mind is still needed to read the information and judge what to do about it. (3:215-216)

An EIS can have an important role in an organization; the role of indicating areas for possible administrative action. It can not, however, supplant all other forms of communication and information gathering and is no replacement for an administrator's judgement. Cast in its proper role, an EIS is a flexible and powerful tool to enhance an administrator's effectiveness.

EIS Requirements

A comprehensive feasibility assessment for a proposed computer system is recommended by Davis and Olson as a necessary step which must occur prior to system design. A feasibility assessment determines whether or not a particular system seems to have a reasonable chance for eventual success and, therefore, warrants the expenditure of considerable time and effort in the design phase (15:574-575).

Feasibility studies described in the literature are typically multifaceted in their approaches. Mathews suggests that a feasibility study should consider not only

technical and economic factors, but also should investigate whether the proposed system has value to the organization and whether implementation deadlines can be met (35:27-28). Krauss cites Glaser who stated that the feasibility study must answer three questions: Is the task technically possible; should the task be undertaken from a cost/benefit or economic perspective; and, finally, can the system be put into operation successfully (28:62)? Ein-Dor and Segev also include consideration of technical and economic factors in their design of a comprehensive feasibility study, but add the aspect of organizational feasibility (20:218). They define organizational feasibility to be "the degree to which an organization is ready to accept and use a particular information system," and consider it to be no less important than the technical and economic aspects of feasibility (20:218-219). Burch and others expand the list of feasibility dimensions to five. They add legal feasibility to the mix of aspects and conclude with a recommendation for a feasibility study which considers the following areas: technical, economic, legal, operational and schedule (4:259-260). Ligon's meta-analytical research of contemporary feasibility studies identified seven factors included in feasibility studies (29:29). The representation of the various aspects of feasibility in the studies which she investigated are shown in Table 2 below:

Table 2. Factors Included in Feasibility Studies (29:30)

Factor	Percentage Discussing Factor
Economic Feasibility	83
Management Involvement	60
Statement of Objectives	60
Study of Present System	47
Technical Feasibility	43
Consideration of Alternatives	17
Operational or Time Feasibility	13

Implicit in all the studies mentioned in this paragraph is the assumption that someone in the organization wants this system. Davis and Olson make this assumption an explicit part of their model for a feasibility study by adding the dimension of motivational feasibility (15:575). The complete Davis and Olson model for a feasibility study includes the following areas of feasibility: technical, economic, motivational, schedule and operational (15:575). This thesis will use the Davis and Olson model for feasibility studies as its paradigm in investigating the feasibility of an EIS for USAF hospital administrators.

Using the predefined conceptual structure for feasibility studies suggested by Davis and Olson provided this researcher with the theoretical basis for choosing

relevant investigative questions regarding this topic. All aspects of the feasibility of an EIS for hospital administrators will be considered, with the exception of schedule feasibility. Schedule feasibility will not be considered since the implementation of an EIS in Air Force medical facilities is neither required nor under any deadline and, therefore, is irrelevant to this study.

The Davis and Olson structure is attractive because it explicitly or implicitly addresses six of the seven factors identified in Table 2 above. Davis and Olson use the same terminology as Ligon to identify economic, motivational, and operational feasibility and include these feasibility areas in their conceptual paradigm for feasibility. Furthermore, Davis and Olson's term of motivational feasibility captures most of the key aspects which Ligon attributes to the categories of management involvement, statement of objectives, and a study of the present system. Indeed, for a system to be motivationally feasible, Davis and Olson expressly identify the need for management involvement and articulation of system requirements (15:575). Implicitly, involvement of top management in such a project would assume some level of dissatisfaction with the current system. The only one of Ligon's list of factor's addressed in feasibility studies not covered by this thesis is a consideration of alternatives. This is omitted because any fair consideration of the feasibility of an alternative to the proposed EIS would involve a study of each alternative

at the same level of depth as the current study. Time does not permit the researcher to conduct multiple investigations.

Technical feasibility addresses the question of whether the application under consideration can be supported with available technology. It also must address whether the organization is at a level of sophistication which will enable it to use the proposed application (20:218).

Economic feasibility seeks to address cost/benefit issues. Costs and benefits should include both tangible and intangible benefits (4:259). Given the scope of this study, however, economic feasibility cannot be fully addressed. The reasons for this limitation will be discussed in a subsequent subsection of this chapter.

Motivational feasibility assesses whether the organization has the motivation to change current operations to accommodate the new system. It is largely dependent on a key player in the organization showing enthusiasm and support for the proposed system (15:575).

Operational feasibility is a "subjective assessment of the political and managerial environment in which the system will be implemented" (15:575). The greater the requirement for change in current operations, the less the chance of successful system implementation (15:575). In the context of implementing a new system into an organization, a Rand Corporation experiment identified the existence of a competent staff of available technical experts who could

provide "hands-on assistance" to users of the new system as a critical aspect of whether a new system turns out to be feasible (34:72). Donaldson concur with the belief that direct support of a newly installed system is crucial for its operational feasibility, recommending that a new system be carefully "nursed" by a team of information systems professionals in order to overcome any initial difficulties encountered by the users which could poison their confidence in the system unless quickly and capably addressed (18:210). Finally, research performed by Lucas and others indicates quite clearly that the support provided by vendors after implementation of a new system was strongly correlated ($p < .05$) with several aspects of user satisfaction (31:546-547). Strong local support to users in the period immediately following the installation of a new system seems to be an essential element of the operational feasibility of that new system.

Information System Feasibility Studies. The literature reviewed on the topic of EIS does not address a methodology for feasibility studies for organizations considering an EIS. This is not unexpected, given that most of the literature on EIS has been written by its enthusiastic advocates and not by organizations considering its purchase. However, several studies were found which indicate that a positive assessment of technical and motivational feasibility is critical for the successful implementation of new management information systems in the Department of

Defense. Three of these feasibility studies are discussed below.

Hawley and Dawdy considered both acceptability to potential users and technical feasibility issues in their study of the feasibility of a new training evaluation system for the U.S. Army. In particular, they emphasized the critical importance of motivational feasibility. In the absence of a perceived need of the system by users, they point out that acceptance of the proposed system would be a difficult task. A survey of those people who would be using the system formed a critical part of this study (23:5-1, 5-2).

A feasibility study considering the acquisition of a low cost computer-aided instruction by the Air Force Human Resources Laboratory at Brooks Air Force Base also focused on motivational and technical issues in their research plan. Potential users of this training aid were surveyed to determine both their interest in such a system and those areas in which the proposed system could be used most effectively (30:8, 10-11).

Ramp Corporation prepared a feasibility study for the U.S. Army Missile Command considering the use of micro-computer expert systems for contract administrators in 1987. This study established as its primary task the verification of user interest and their specific requirements. Here again, a survey was used to extract this information (6:4-5).

Each of the studies cited in this subsection used a survey instrument to establish user interest in the information system of interest. Technical issues also were considered by each of the studies discussed. Technological feasibility makes a new system possible, but motivational feasibility issues determine the success of a new system being considered. Even though no data were found in which systems created as a result of these surveys were evaluated as successful, the selection of the survey approach as a methodology to determine system feasibility prior to system development seems to be an accepted approach. User surveys are performed to help ensure that a system is built which meets the needs of eventual system users and one which has the support of these users. DeSanctis and Courtney make the following comment: "MIS failures often occur at the implementation stage, after the system has been labeled technically sound" (17:732). A system's success depends on a desire for the system by the intended users, an immediate problem to address, and an established MIS group which has the confidence of the users (17:732). The presence or absence of these elements, identified by Davis and Olson as motivational and operational feasibility, must be studied in addition to technical aspects of feasibility if a thorough evaluation of EIS feasibility for Air Force hospital administrators is to be made.

Feasibility Issues for a USAF Hospital Administrator EIS. Motivational feasibility must be determined by

examining the extent to which the key player in the proposed EIS, the hospital administrator, is dissatisfied with the current method of information gathering and the degree of support he has for an EIS. The degree to which administrators are dissatisfied with current reporting methods and whether they see any benefits to information provided via an EIS is essential in evaluating this aspect of feasibility.

Economic feasibility of the proposed system cannot be evaluated fully. An EIS system would compete with other initiatives for project money. It would not be a decision to buy at a local level. Since it cannot be determined what projects would compete with an EIS, a final determination of EIS economic feasibility cannot be made. However, factors such as the extent of common hardware and the perceived value of an EIS by administrators will have an impact on this aspect of feasibility and will be investigated.

Operational feasibility will depend on the amount of change needed to support an EIS and the availability of a technically competent local medical systems staff to coach the administrator on effective use of the system. A critical issue here is not only the presence of a local information systems staff, but the level of confidence that the user has in this staff (15:575).

Technical feasibility issues surrounding EIS implementation in Air Force Hospitals comprise a large part of the study. Several issues must be considered. First,

does the hardware exist in USAF medical facilities to accommodate an EIS? EIS systems, as they now exist, require an infrastructure which includes a mainframe or minicomputer which stores all organizational data centrally (52:54-55). This central storage issue is key, because without such a configuration, an EIS cannot "drill down" for more details and, as a result, no longer can be categorized as an EIS.

A final aspect of technical feasibility requires the existence of a stable set of critical success factors in common use. Civilian hospitals have identified key management indicators for themselves. However, many of these indicators, such as profitability indices, market potential assessments and product pricing, simply are not relevant in the military health care administrator's environment. A stable set of alternative key indicators must be identified to determine the feasibility of an EIS in order to establish the common core of data that Rockart and Treacy say is imperative in a successful EIS (45:83).

Many prominent researchers on the subject concur with the Rockart and Treacy view. According to Pearce, an EIS with unstable, changing models is not practical (43:26-33). Shoebridge emphasizes this point by stating that an effective EIS must be able to provide the executive with information on trends. He asserts that current performance must be measured against both historical performance of the organization and against the current performance of organizations in the same industry (50:150). Trend

measurement over time and across organizations is difficult, if not impossible, without stability in the measurement criteria (45:83-84). If organizational criteria for self-evaluation are volatile, comparisons of current performance against past performance become a matter of subjective opinion, and the potential of the EIS to measure trends objectively on quantitatively based criteria is lost. Similarly, if common measures of performance across an industry, in this case, CONUS-based Air Force hospitals, do not exist, objective comparative measurements of performance between facilities or against an industry standard cannot be made very easily. The result here again is comparison through subjective evaluation, a task for which an EIS is not an effective tool. Determining a stable set of management indicators for an industry is, therefore, a matter of critical importance in assessing EIS feasibility for a given industry. As a result, it would seem prudent to examine again those indicators identified by Parker in 1987 and assess their stability, a recommendation made by Parker herself in her concluding remarks (42:78).

Parker's 1987 study considered 129 potential management indicators and determined 28 key performance indicators used by hospital administrators at the time. These indicators are shown in Table 3 below.

Parker's research was the first to investigate management indicators used by Air Force Hospital administrators (42:78). As a cross-sectional survey, it

captured the attitudes of Air Force hospital administrators at one point in time. Although she had no reason to doubt the validity of the management indicators used by hospital administrators at that time, she recommended that a follow-up study be made to ascertain whether or not the indicators which she found are stable and of continuing importance to Air Force hospital administrators (42:78). This thesis will undertake the recommended follow-up study in order to answer investigative question 3, which examines the presence or absence of a stable set of indicators, a critical element in an EIS.

Table 3.

Key Performance Indicators Used by USAF Hospital Administrators by Major Administrative Subarea (42:52)

Personnel/Administration	Logistics
Medical readiness training	Personnel Reliability
SORTS reporting	Overdue/critical backorders
Hospital incident reports	Customer support complaints
Mobility actions	Facility projects status
Hospital injuries	Security violations
Funding shortfalls and actions	Safety hazard
Evaluation reports	WRM Program percentages
Suspensing actions	Hospital injuries
Patient Administration	**Resource Management**
Mobility actions	Manpower priceouts
Bed occupancy data	Increased manpower requests
Patient deaths	Productivity of providers
VIP patients	Internal inspection
Hospital incident reports	Overdue internalinspections
Patient complaints	Other agency inspections
Appointment waiting times	Funding shortfalls and actions
Backlog of outpatient record filing	

Conclusion

Executive information systems promise many benefits to busy hospital administrators in an environment of ever-increasing complexity and responsibility. Although not a panacea, an EIS can help the administrator identify areas where his action is needed. Prior to system development, however, the feasibility of an EIS must be examined. The aspects of feasibility addressed by Davis and Olson are used as the conceptual foundation of this research. Investigative questions were developed based on this conceptual foundation in order to cover each aspect of feasibility regarding an EIS for USAF hospital administrators, with the sole exception of schedule feasibility, which was assessed to be irrelevant in the current study. The following chapter will address specifically the methodology used which captured the data needed to assess these areas of feasibility.

III. Methodology

Introduction

This chapter describes the principal methodology to be used to answer the investigative questions posed in the first chapter. Included in this chapter is a justification of the selection of the survey method, a description of the populations under study, the methods used in data collection, and the statistical tests which were used to analyze the data. The researcher followed a premeditated step by step plan for action which is described in this chapter and recounted in chronological order.

Phases

The research was accomplished in two distinct phases. The first phase involved a view of the literature and interviews of experts on the topic of executive information systems and their support requirements. This initial phase of the research was necessary in order to answer the first investigative question: "What elements are necessary to support an executive information system?" Key findings of this phase have been reported in the previous chapter, and are summarized in the following paragraphs.

Five major aspects of feasibility were identified from a review of the literature. These were: economic, schedule, technical, motivational and operational. Of

these, only the latter three are directly relevant to the current study.

Economic feasibility, the evaluation of whether a project can be paid for in an Air Force project of this type, is largely dependent on external (i.e., Congressional) funding. As a result, economic feasibility cannot be fully addressed in a study which collects data from facilities into which an EIS may someday be installed. This caveat notwithstanding, some limited aspects of economic feasibility can and will be assessed. The assessable aspects of economic feasibility are byproducts of the research into the technical feasibility issue. Specifically, if computer hardware is common across facilities and if the infrastructure to support an EIS exists, then the less costly an EIS would be to develop. This study will be able to judge economic feasibility in terms of degree, but not in terms of rendering a determination of feasible or not feasible from an economic standpoint.

In contrast to the economic feasibility issue, this study will be able to say absolutely nothing concerning schedule feasibility. Schedule feasibility, the feasibility aspect which determines whether a project can be made operational by a certain deadline, is not relevant in this study since no system is being purchased at the present time.

The remaining three aspects of feasibility, technical, operational and motivational, are of critical importance in assessing the potential of an executive information system (EIS) for Air Force hospital administrators. Moreover, these aspects of feasibility can only be assessed by questioning key staff at the facilities into which an EIS may someday be installed. The following paragraphs provide operational definitions for these three aspects of feasibility which will be of direct concern in this research effort.

An EIS will be judged to be technically feasible if data can be accessed at a single input source and maintained by multiple departments, in this case all medical administrative offices, through a microcomputer or other terminal. This can be accomplished either through a centralized database or a distributed database. A local area network must also be in place and used to connect these key offices. Investigative question #5 covers this aspect of technical feasibility. A second component of technical feasibility requires that a set of stable and critical management indicators can be identified. Without a steady conceptual foundation, an EIS cannot be built. Investigative question 3 focuses its interest on this aspect of technical feasibility. Finally, if a standard medical EIS is to be built for all inpatient USAF medical facilities, the computer hardware across facilities must be similar; the purpose of investigative question 7 is to

determine the extent to which hardware has been standardized across Air Force medical facilities.

Motivational feasibility is based on the belief that a system can only be successful if the users have a desire for it. Investigative question 2 seeks to determine the extent to which administrators favor the EIS concept in general while investigative questions 6 endeavors to establish the degree to which administrators would desire elements of a decision support system to augment the capabilities of an EIS.

Finally, for a system to be successful, the local management information systems staff must be capable of supporting the users in developing a level of comfort with the new system. This local capability of supporting use of a new system is a key aspect of operational feasibility and is addressed in this study in investigative question 4. The three aspects of feasibility under direct study, technical, motivational and operational, are all determined at the base level and are the focus of this research effort.

The literature review was the primary methodology used for the initial phase. The review was conducted by using a combination of printed reference materials and on-line reference searches with DIALOG and DTIC. Factors critical to the feasibility of an EIS in Air Force hospitals were culled from this review and officials at the Air Force Surgeon General's Office were contacted to determine the practicality of the research effort. They indicated that if

base level technical and motivational support for an EIS at Air Force hospitals could be established, such a system might be considered for eventual acquisition (40).

The second phase of the research was conducted using the written survey instruments. The remainder of this chapter is devoted to justifying this selection as a methodology, describing the content of the surveys and follow-up procedures, and outlining the proposed methods for analyzing the data.

The Relationship of Investigative Questions to Feasibility Issues

The investigative questions left unanswered by the literature review are listed below:

Question 2. To what extent do USAF hospital administrators desire an executive information system?

a. What is the level of satisfaction among USAF hospital administrators with their current methods of obtaining critical management information?

b. To what extent do administrators believe that their effectiveness and efficiency would be improved by an EIS?

Question 3. To what extent can a stable set of critical management indicators for USAF hospital administrators be identified?

Question 4. To what extent are the medical systems staff personnel at USAF hospitals capable of providing local

technical support to administrators in the operation of an EIS?

Question 5. To what degree has the integration of management information data in USAF hospitals been achieved?

Question 6. To what extent do administrators desire the type of executive information system which also supports the decision-support system elements of database manipulation and exploration of hypothetical scenarios?

Question 7. To what extent is the computer hardware in use by Air Force medical facilities similar?

Question 8. To what extent is the level of technical and motivational support for an EIS associated with the following variables?

a. Facility size.

b. Experience level of the administrator.

c. Administrator confidence in the local medical systems staff.

d. Level of satisfaction with current methods of obtaining information.

As shown in Table 4, the above investigative questions address one or more of the aspects of feasibility discussed in the previous chapter. Some investigative questions cover more than one aspect of feasibility. As mentioned earlier, the extent of common hardware (investigative question 7) and the level of integration of organizational data (investigative question 5) are measurements of technical feasibility which, as a by-product, indicate a relative, but

not absolute, degree of economic feasibility. The existence of these technical features would make the marginal cost of EIS development cheaper and, therefore, more economically feasible than if these features were not in place. Investigative question 8 has a natural intersection between operational and motivational feasibility since it seeks to test the degree to which several independent variables are correlated with dependent variables of technical and motivational feasibility.

All of the questions identified in Table 4 can be answered best through direct questioning of the key players in the organization. Hospital administrators are best suited to responding to the questions of motivational feasibility, questions 2 and 6, since they are reporting their own personal

Table 4

Investigative Question Relationships to Feasibility

Feasibility Aspect	Investigative Question Number
Technical	3,5,7,8
Motivational	2,6,8
Operational	4,8
Economic	5,7

opinions toward the proposed system. Questions 5 and 7, more technical in nature, are more the bailiwick of the

hospital's medical systems officer, who is in an excellent position to give accurate responses to these questions. Question 5 will also seek to capture what percentage of the administrator's key management indicators are already being tallied by automated systems and stored in a centralized database. Question 4 addresses operational feasibility and will be more difficult to extract. In this case, the plan is to elicit responses from both the administrator and the chief information officer of the hospital. Operational feasibility depends in part on the confidence of the user in the trainer/assistant and the trainer/assistant in himself. Therefore, determining the ex ante confidence of these groups in supporting the operation of the proposed system would partially capture this aspect of feasibility. A more definitive evaluation of operational feasibility would not be possible without an actual prototype and site testing to determine if ex ante confidence levels mirrored actual demonstrated capability in supporting the system.

Question 3 requires retesting the hospital administrator key management indicators found by Parker in 1987 with the current group of administrators. The stability of these key indicators will be examined by asking current administrators to determine the value of the management indicators identified by Parker, using her original scale and rating categories. The null hypothesis will be that the value and the relative ranking of the critical information item is unchanged. Using a confidence

level of alpha = .05 will be used in a t-test to compare the 1987 mean rating with the 1990 rating; a Wilcoxon signed rank test will make the same comparison for the rank orderings of indicators. Failure to reject the null hypothesis will provide evidence of the relative stability of the indicators.

Finally, question 8 addressed suspected correlations between selected factors and the level of motivational and technical support levels for the proposed EIS. Correlations between the variables of interest were accomplished using data collected from the questionnaires.

Justification of the Survey Approach

Self-administered mail surveys were selected to answer investigative questions 2 through 8 due to the geographical distance between the researcher and most of the survey population; and because of demonstrated good results from this method in a 1987 study (38:21). A lengthy survey of hospital administrators conducted by Parker resulted in a 58 per cent response rate, thanks in part to persistent follow-up by that researcher (38:21). This researcher expected a still better response rate, since the anticipated time needed to fill out this questionnaire will be considerably less than Parker's questionnaire, which was estimated to take 45 minutes. In contrast, the administrator's questionnaire used for this study was timed to take an average of seventeen minutes during pretesting; the chief

information officer's took ten. Given this expectation of an acceptable response, the additional cost of time and money to administer the questionnaires in person to the widely dispersed populations could not be justified for the marginal gains of external validity which an improved response rate would provide.

Populations

The populations of interest are Air Force hospital administrators and medical systems officers in CONUS. AFR 168-4 identifies 66 CONUS Air Force hospitals or various sizes; the locations of these facilities is available at Appendix A. All of these facilities have an administrator and a medical systems officer (MSO), positions always filled because of their critical importance to the operation of a medical facility (7). In the event of an unexpected vacancy of the administrator, the facility's associate administrator takes on this position until another officer is assigned into the vacated billet (7). If the MSO is absent, another Medical Service Corps officer would be tasked with taking over that function as an additional duty (7). Given the small size of the populations of interest, there is no reason why a complete census of the populations should not be sought. A minimum of 30 responses for each group is required to invoke the assumption of the normal distribution of data permitted by the Central Limit Theorem. Furthermore, attaining a lower response rate would begin to

raise questions over the representativeness of the respondents of the entire population. Assuming a reasonable response rate, conclusions reached should apply to all CONUS-based Air Force hospitals. However, the unique role of these populations makes it impossible to generalize any conclusions of the feasibility of an EIS intended for administrators of non-Air Force owned hospitals or even for USAF operated freestanding outpatient medical clinics.

The Survey Instruments

Two self-administered questionnaires, one for hospital administrators and the other for medical systems officers, were used to collect data for this research project. The questionnaires were developed by this researcher and can are available at Appendices C and D. The majority of the questions were written based on insights gained from the literature and interviews with the experts cited in the previous chapter. Both questionnaires included questions on the respondent's demographic and facility characteristics. Some of these were used as blocking variables in the analysis of variance done to answer the subparts in question 8 and the remainder were used as control variables. The second part of both questionnaires involves a series of questions which, when summed together, provide a composite rating for given dependent variables, which are the kernel elements of investigative questions #2 through #7 and their subparts. Questions posed to

respondents became increasingly probing as the questionnaires proceeded. This method is strongly advised by Churchill (10:231-232). Such an approach draws the interest of the respondent slowly and is purported to encourage the completion of a survey. By beginning with easily answered, factual questions, the respondent feels encouraged to press ahead with the task. Gradually, more probing questions encourage the respondent to reflect on his responses, giving greater theoretical validity to questions that may be difficult to answer (10:232). The questionnaires also seek to avoid misconceptions or diversity of understanding by avoiding generalizations or assuming foreknowledge of technical terminology. For example, instead of asking whether the administrator considers an EIS to be a good tool, the administrator was asked a series of questions asking for his evaluation of characteristics of the system. Pretesting the questionnaires on several individuals with previous experience as medical systems officers or administrators was accomplished to ensure that the researcher's objectives in questionnaire design as described in this subsection were achieved.

Pretesting

The draft questionnaires were critically evaluated and pretested prior to their mailing to the survey populations. Pretesting was accomplished in several phases. The thesis

advisor first reviewed the questionnaires for completeness and appropriateness. He then recommended review by three faculty members experienced in questionnaire development from the Air Force Institute of Technology's Department of Communication and Organizational Sciences. The recommendations of these experts were considered and, for the most part, accepted, resulting in the revision of the questionnaire. The final step of survey pretesting was accomplished by having eight Medical Service Corps (MSC) officers based at Wright Patterson AFB, with prior experience as administrators or medical systems officers, complete the surveys. Four MSC officers in each category were identified and volunteered to participate in pretesting. The administrator's survey took an average of 17 minutes for the pretest group; the medical systems officer's survey averaged 10 minutes. These groups made several recommendations, which led to the further modification of the questionnaires. The surveys were then passed through official channels to the Air Force Military Personnel Center for final approval. This approval was granted on 7 March 90, with the only required changes being the deletion or modification of three questions from which individual respondents could be identified.

Data Collection Plan

The surveys were mailed to CONUS hospital administrators and medical systems officers on 16 March

1990. Addresses were obtained from the Air Force Surgeon General's Office. The respondents' office symbols, SGA (Administrator) and SGI (Medical Systems Officer), respectively, were included to ensure that the questionnaire was properly routed within the facility. Self-addressed envelopes were included to facilitate the return of the questionnaires. In the interest of generating as high a response rate as possible, follow-up phone calls were made to both hospital administrators and medical systems officers in early April 1990 in an effort to boost the response rate.

Follow-Up Procedures. The minimum response rate of 30, was achieved for both the administrator and the medical systems officer populations by 30 March 1990, a scant two weeks after the mailing and prior to any follow-up whatsoever. Despite the encouraging response, the researcher stuck to his original plan and made follow-up phone calls to both populations' members using telephone numbers provided by the Air Force Surgeon General's Office. Each phone call took an average of approximately 15 minutes, during which time the researcher usually spoke to both the medical systems officer and the administrator's secretary. A systems officer was counted as "followed-up" only if the researcher spoke with the systems officer himself or someone who identified themselves as a member of the systems office and promised to relay a message. An administrator was counted as "followed-up" if the researcher spoke with either the administrator himself or his secretary. In addition,

targeted respondents were counted as "followed-up" without phone calls if, as was the case in about 20 per cent of the returned envelopes, a postmark appeared which was legible and from which the facility's identity was not in doubt.

Since the surveys were not due until April 13th, the calls to the target respondents were made under the guise of a courtesy to make sure that the targeted individual had received the survey. However, the real purpose of the follow-up was to encourage target population members to respond who might not respond if they thought their input was of no interest. As it turned out, the researcher's worry that the surveys would be discarded unless personal follow-ups were made proved to be unwarranted. Follow-up calls were made on 3, 4 and 5 April, 1990. All respondents, save those few who could be identified from the postmark, had to be contacted because the anonymity of responses meant the researcher could not selectively follow-up only those who had not yet responded. Following these calls, 50 of the 67 medical systems officers and 53 of the 67 administrators, a percentage of 75 and 79, respectively, had been followed up, as defined in the previous paragraph.

Plans to contact the remaining survey population members on the following day were cancelled when over thirty responses were found in the researcher's mailbox on the afternoon of 5 April. At that point, with responses from 45 systems officers (67%) and 47 administrators (70%), the marginal expected benefit of contacting those few remaining

people who had neither responded nor received a follow-up call was deemed too small in relation to the seven to eight hours of telephone conversations that would be required to complete a 100 per cent follow up effort. Only three of the systems officers of the fifty and one of the fifty-three administrators in the "followed-up" group indicated that they had not seen the survey. These individuals were sent a copy of the proper survey addressed to their attention. Most others contacted indicated that they had already returned their surveys. Assuming that the proportion of nonrespondents was distributed relatively equally between the group having received a "follow-up" contact and the remainder who did not, the researcher expected to contact no more than seven of the systems officers and four of the administrators who had not responded by 5 April 1990. Having far exceeded Parker's response rate of 58 per cent more than a week prior to the response deadline, the researcher chose to invest his time and efforts into activities which promised a better marginal rate of reward. Among these alternative endeavors was structuring and debugging the programs which would run the statistical tests to be used to analyze the survey responses and which are discussed in the sections which follow.

Prior to discussing the specific statistical tests used, it is necessary to address the more fundamental issues of survey precision, validity, and reliability.

Validity and Precision

This research and its associated surveys make no claim to have application beyond the realm of the two populations of interest, USAF hospital administrators and USAF hospital medical systems officers. Given the limited scope of the research, external validity beyond that necessary to ascertain the representativeness of the respondents within the population, is not a concern of this study. However, based on the known response rate and the 95 per cent confidence interval we desire, we can measure the precision of the ratings given by the survey instruments. The equation given by Churchill for sample size, where n is the size of the sample, where z is the z score desired for a given confidence interval (with z = 1.96 used for 95 per cent confidence), H is the absolute precision of the responses, and s is determined using the range/6 as the estimate of the standard deviation, is shown below (10:386).

$$n = z^2 * (s)^2 * 1/H^2 \quad (1)$$

The number of respondents, is known for both survey populations, for administrators n=55, for MSOs, n=52. Since our focal concern is on the 5- and 7-point (1-7) Likert scale measuring MSO and administrator perceptions, the range of possible response is 6 and the estimated standard deviation is, therefore, 1 (6/6) for the 7 point scale and .66 (4/6) for the 5-point scale. Using equation (1) and

solving for H, the precision of the survey item questions is reported as follows:

MSO survey precision = .2718

Administrator survey precision (7 point scale items) = .2643

Administrator survey precision (5 point scale items) = .1771

The above levels of precision were judged to be adequate for this study. This level of precision means that a mean score of 3.00 on the five point scale is not significantly different from a mean of 3.1771. In practical terms, since the level of precision of the instruments is between .2 and .3, any comparison of means between individual survey items beyond a single decimal place would be inappropriate. Nevertheless, perception ratings are expressed to two decimal places in Chapter IV for the practical purpose of breaking the numerous ties which would result from a single decimal presentation, particularly in the section where the administrator's assessment of the value of 127 items is discussed. The reader is cautioned against drawing any conclusions comparing means of single items where differences do not exceed the precision levels identified above.

In contrast to external validity, internal validity of the survey instruments was an important factor. Davis

stated that internal validity could be attained using three approaches: criterion related validity, content validity or construct validity (14). Since there is no criterion of "known" perceptions available against which the responses extracted by the survey instrument can be compared, criterion related validity is not possible.

Content validity is determined by the judgement of others, usually experts, who assess the degree to which an instrument adequately and accurately covers the domains of interest (10:292). Content validity is not determined statistically (14) and was established through pretest and evaluation by locally available Medical Service Corps officers as described earlier in this chapter.

Construct validity is, according to Churchill, "the most difficult type of validity to establish" (10:293). Reliability is a necessary condition for establishing construct validity. Constructs communicate abstract concepts which are not directly measurable (10:292-293). This research does not seek to identify or verify abstract concepts underlying measures of feasibility. Instead, as identified in Chapter I, it assumes that the feasibility constructs developed by Davis and Olson are valid. Validation of the Davis and Olson feasibility constructs would shift the emphasis of this research from its present focus on the practical matter of assessing the potential of a particular information system to one of theoretical discussion involving definition and concept building. This

latter type of research is certainly important, but is beyond the scope of this particular research effort. As a result, construct validity is not addressed herein.

Reliability

Reliability addresses whether a survey instrument yields consistent and stable results. Several methods for assessing reliability exist (10:295,100). These include test/retest, alternative forms, split half, and internal consistency (14; 26:218). The internal consistency approach to reliability was selected because it can be used in assessing a single instrument used at a single point in time. Multiple questions were used to assess critical feasibility factors and Cronbach's coefficient alpha was used to determine the survey's reliability by analyzing the internal consistency of responses given by a single respondent. It is considered to be the most rigorous of the available reliability measures (35:85-86). Disagreement exists among experts regarding what level of coefficient alpha is necessary to ensure reasonable reliability of an instrument or of a given composite indicator. Nunnally suggests that modest levels of reliability, which he describes as those with an alpha of .7 or higher, are sufficient for the early stages of research (39:245). Davis stated that a Cronbach alpha score of .6 or better would still represent a credible indicator of measurement reliability (14). This researcher chose to take a

conservative approach and selected the higher level of .7 in the Cronbach alpha statistic as the threshold level for reliability of composite variables in this research.

Statistical Tests

Upon receipt of the completed questionnaires, data were loaded into several data files by the writer. The input was verified for accuracy by the researcher's spouse and rechecked by the researcher if a discrepancy was identified. Several analysis programs designed by the researcher were written in SAS for the purpose of analyzing the accumulated data. The programs were tested extensively beforehand using portions of the data to ensure that the programs were error-free and measuring the relationships and frequencies of the data correctly. SAS software was selected because of its flexibility, availability, ability to perform anticipated analyses, and the researcher's familiarity with the programming language. The SAS User's Guides were the primary references for programming assistance (47; 48).

Data reliability was checked using the Cronbach efficient alpha statistic. The questionnaires were built with multiple questions used to build answers to investigative questions two through six. Investigative question 7, which asks what computer hardware is in use at the facility, is an exception to this general rule, and was answered with a single question. The Cronbach alpha reliability measure determined whether or not respondents

understood questions in the same manner as intended by the researcher intended them by using multiple questions to build composite response indicators. Composite indicators failing this reliability screen were decomposed into their constituent parts and then analyzed. Composite indicators passing the reliability screen were evaluated into a composite rating by blending in the ratings for each of the components equally. A seven point Likert scale was used to quantify the responses to all dependent variables, except those answering investigative question 3, which used the same five-point Likert scale as the Parker study which it sought to validate. The scale values were considered to be interval. The dependent variables were based on investigative questions two through six and were scored based on composite ratings resulting from averaging responses to questions in each grouping. Independent variables included the characteristics of the respondents and their respective facilities, as well as the response to investigative question 7. Table 5 summarizes the variables used in the survey and the questions pertaining to them.

Frequencies, means and standard deviations of the variables were calculated. A confidence level of alpha = .05 was used for all statistical tests as the hurdle for assessing the statistical significance of results. Paired t-tests and the Wilcoxon signed rank test were used to

Table 5. Variables Assessed in Survey

Variable	Administrator's Survey Items	MSO Survey Items
Satisfaction with current method of information gathering	7,8,10,164	N/A
Belief that an EIS would improve efficiency and effectiveness	151-153,165-168	17,18
Stability of key management indicators	18,19,24-150,162	16
Confidence in local systems staff	16,17,21-23	19-22
Level of data integration	N/A	11-15
Type of hardware	N/A	9,10
Desire for DSS type hypothetical modeling	154-161,163	N/A
Rank	1	1
Bed size of facility	5,6	7,8
Size of systems staff	N/A	4,5
Experience in position	4a	6a
Experience as Administrator/MSO	4b	6b,6c
Comfort level with automated systems	12-15,169-170	N/A

evaluate the stability of management indicator importance over the interval of Parker's 1987 survey and the current survey. The relationships hypothesized in investigative question 8 were analyzed using Spearman's rank correlation coefficient, Spearman's rho, to determine the strength of correlations.

The results of these statistical analyses and the details of which tests were used to answer which investigative questions are covered in chapter IV.

Summary

The research was divided into two distinct phases. The first phase, a literature review, provided insight into the problem and helped identify key areas to investigate in order to determine feasibility. The results of this phase of the study were reported in the previous chapter. The second phase involved the development, administration and analysis of a mail survey. This chapter focused its discussion on the second phase of the research effort. A mail survey was selected as the most efficient method of gathering the data needed to answer those investigative questions requiring responses from USAF hospital administrators and medical systems officers, the populations under study. The small size of the populations made a total census approach feasible and enhanced the external validity of the study. The survey instruments were developed with the help of literature on the topic, the advice of the university faculty and pre-testing with medical service corps officers stationed at Wright-Patterson AFB, Ohio. Revisions were made to enhance the internal validity of both instruments.

Multiple items for investigative questions were asked to check the reliability of survey responses. Survey

instrument precision was evaluated based on the number of surveys returned and was deemed adequate for the purposes of this research. Cronbach's coefficient alpha was selected as the reliability measure for determining the reliability of composite variables built with multiple components. A conservative cutoff level of .7 for this measure was selected as the reliability hurdle. If composite variables were found to be reliable, response values to the component survey questions were blended in equally to obtain the composite variable mean score. All quantitative data collected from the two surveys were considered to be at least interval.

Surveys were mailed on 16 March 1990. Extensive follow-up was done in order to achieve a high response rate. The response to the surveys was unexpectedly high even without the follow-ups, but follow-ups were still made in accordance with the researcher's original plan.

A variety of statistical tests were chosen as the method to answer the investigative questions. Specific tests used in the analysis included descriptive statistics, t-tests, the Wilcoxon signed rank tests, reliability tests, and correlations between individual variables. Recommendations, findings and conclusions based on the results of these analyses are drawn in Chapter V. The following chapter discusses the specific findings of the research as a result of the analyses described in this section.

IV. Analysis of Survey Responses

Introduction

This chapter analyzes the responses to the surveys administered to the two populations of interest, medical systems officers and administrators of CONUS-based Air Force inpatient medical treatment facilities. First, the demographic characteristics of those responding to the survey will be described. Next, the reliability of the composite indicators built from multiple questions will be assessed and discussed. Finally, analysis of the responses will be discussed using the framework of the investigative questions as the structure for organizing this material. As a reminder to the reader, the investigative questions remaining unanswered, with parentheses indicating the feasibility issues they address, are listed below:

Question 2. To what extent do USAF hospital administrators desire an executive information system? (Motivational)

a. What is the level of satisfaction among hospital administrators with their current methods of obtaining critical management information?

b. To what extent do administrators believe that their effectiveness and efficiency would be improved by an EIS?

Question 3. To what extent can a stable set of critical management indicators for USAF hospital administrators be identified? (Technical)

Question 4. To what extent are the medical systems staff personnel at USAF hospitals capable of providing local technical support to administrators in the operation of an EIS? (Operational)

Question 5. To what degree has the integration of management information data in USAF hospitals been achieved? (Technical/Economic)

Question 6. To what extent do administrators desire the type of EIS which also supports DSS elements of database manipulation and exploration of hypothetical scenarios? (Motivational)

Question 7. To what extent is the computer hardware in use by Air Force Medical facilities similar? (Technical/Economic)

Question 8. To what extent is the level of technical and motivational support for an EIS associated with the following variables? (Technical/Motivational/Operational)

a. Facility size

b. Experience level of the administrator.

c. Administrator confidence in local medical systems staff.

d. Level of satisfaction with current methods of obtaining information.

Notes on Data Presentation

Prior to addressing these questions some preliminary discussion on data presentation, respondent demographics, and survey reliability is appropriate. Throughout this chapter percentages are given which may not sum to 100 per cent. This is due to rounding. In addition, some respondents failed to answer every question. Therefore, the number responding is shown in square brackets in every table heading. Percentages are based on the total number responding to the question being presented unless otherwise specified.

Administrator Survey- Respondent Representativeness Assessment

Fifty-five of the sixty-six administrators in the survey population responded to the survey, resulting in a response rate of 83 per cent. This figure included three responses which arrived after the stated survey response suspense date of 13 April 1990. These tardy responses were included for the sake of completeness. The last of the late responses was received on 2 May 1990. One questionnaire was deemed unusable due to the paucity of responses contained on it; the respondent chose not to answer 138 of the 170 total items. After eliminating this single response, the adjusted response rate was 82 per cent for usable responses. All other surveys were usable and were included in the analyses. The surveys which were returned and usable were roughly

proportionate to their representation in the population for size of hospital. Specifically, the response rates for the three subgroups were: Hospital, 80 per cent (41/51); Regional Hospital, 89 per cent (8/9); and Medical Center, 83 per cent (5/6). A Chi-Square test to determine whether the distribution of facilities represented differed from the number of responses expected by facility was done in order to ensure an unskewed representation across facility types. The total usable response rate of 82 per cent was multiplied times the total number of facilities in each category to obtain the expected frequency. Observed frequencies were enumerated by the actual count of returned questionnaires which were usable. Despite the fact that the expected cell size was only 4.92 for the medical center cell, less than the expected value of five per cell recommended for the Chi-Square procedure, the cell value was close enough that it was included. The Chi-Square value from this equation was .1014. The observed significance of the test was p = .951. This value for Chi-square results in a failure to reject the null hypothesis that the responses were not biased according to facility type using an alpha level of .05. As a result, we can state that the sample of returned questionnaires is representative of the total population.

Administrator Respondent Demographics

The frequency and percentage breakouts of the key demographic variables follow.

Rank. The typical respondent to the administrator's questionnaire held the rank of Lieutenant Colonel. Nearly all responding administrators were field grade officers. Given the fact that, with few exceptions, the position of hospital administrator is the highest operational position which can be held by a Medical Service Corps Officer, the relatively high rank structure for this position should not be considered to be unusual. In fact, according to Major Debra Cavanaugh, Deputy Chief for Medical Service Corps utilization, senior Majors and lieutenant colonels are the typical choices for all but the largest of Air Force inpatient medical facilities (8). Table 6 shows the distribution of rank among the responding administrators.

Table 6. Rank of Administrator Respondents [n=54]

Rank	No. of Responses	Percentage
Captain	4	7.4
Major	17	31.5
Lt Colonel	20	37.0
Colonel	13	24.1

Education. All but one of the respondents had a master's degree as their highest degree. This reflects a trend in the Medical Service Corps (MSC) to try to access new MSC officers from among those who have already gained the professional credential of a Master's Degree, usually in Business or Health Services Administration. According to Major Debra Cavanaugh, MSC Utilization Deputy Chief at the

Air Force Military Personnel Center, 51 per cent of new MSCs enter with a Master's degree (8). Moreover, MSCs compete not only for promotion but also for administrator positions by meeting a selection board. These annual administrator's boards require candidates to have a Master's degree (8). As a result, one would expect that most Air Force hospital administrators would have this credential. Table 7 shows the lopsided distribution of Master's degrees reflected in the survey population.

Table 7. Highest Degree Held By Administrator Respondents [n=54]

Degree	No. of Responses	Percentage
Less than Bachelor's	0	0
Bachelor's	1	2
Master's	53	98
Ph.D.	0	0

Facility Size/Type. Most respondents represent hospitals, the least complex of the three types of USAF inpatient medical facilities. This is a result which was expected, given that the majority of Air Force inpatient facilities are of this type. Table 8 depicts this distribution. Similarly, display of the inpatient bed size shown in Table 9 reflects this pattern of predominantly small hospitals, typical of Air Force inpatient medical facilities.

Table 8. Facility Type of Administrator Respondents [n=54]

Type	No. of Responses	Percentage
Hospital	41	76
Reg Hospital	8	15
Med Center	5	9

Table 9.

Facility Inpatient Bed Size of Administrator Respondents [n=54]

Size	No. of Responses	Percentage
1- 20	19	35
21-40	18	33
41-70	7	13
71-100	3	6
101+	7	13

Experience in Position. Half of the respondents indicated that they had no prior experience as a hospital administrator of another facility. On the other extreme, some reported ten or more years of experience as a hospital administrator. Table 10 reflects the distribution of prior administrative experience. The survey question asked for the input in months. Table 10 displays these data by rounding the administrator's response up to the nearest year integer in order to highlight the fact that most hospital administrators have had absolutely no prior experience as a hospital administrator at another USAF hospital. The job tenure of administrators in their present position ranged from those very new to the position to those which had been in place for several years. Table 11 reflects the respondent's tenure in their current positions.

Table 10. Previous Hospital Administrator Experience [n=52]

Years Prior Experience	Number	Percentage
0	26	50
1-2	6	12
3-4	13	25
5 or more	7	13

Table 11. Tenure in Current Position [n=53]

Months in Position	Number	Percentage
0-12	18	34
13-24	18	34
25-36	11	21
>36	6	11

Administrator Demographic Summary. The demographics of the administrator respondents reflect no surprises. The population of administrators from the various facility types in the population is well represented by those who responded to the survey, as demonstrated by the Chi-square test. The typical administrator responding to the survey was a lieutenant colonel with a master's degree from a small inpatient facility of 40 inpatient beds or less. The typical respondent had no prior experience as a hospital administrator and had served in his current position for two years or less. These demographics of the administrator population did not reveal any unusual or unexpected characteristics.

Systems Officer Survey- Respondent Representativeness Assessment

The second of the two survey populations of this study were Medical Systems Officers (MSOs). The response rate of this population was 79 per cent, with 52 of 66 responding. All surveys returned were usable. All surveys returned to the researcher were included in the study, even those returned later than the established deadline of 13 April 1990. This was done in order to get as complete a picture of the survey population as possible. As was the case with the administrators, the MSO respondents were in proportion to the total MSO population in terms of facility type. Specifically, 76 per cent (39/51) of the hospital MSOs responded, 89 per cent (8/9) of the regional hospital MSOs, and 66 per cent (4/6) of the medical center MSOs. One respondent did not identify the type of facility. A Chi-Square test, used to determine whether the distribution of facilities responding differed from the number of responses expected by facility, was done in order to ensure an unskewed representation across facility types. The total response rate of 79 per cent was multiplied times the total number of facilities in each category to obtain the expected frequency. Observed frequencies were enumerated by the actual count of returned questionnaires.

Despite the fact that the expected cell size is less than five for the medical center cell, the cell value was close enough that it was included. The Chi-Square for this

equation was .2820. The observed significance of the test was p =.8680. This results in a failure to reject the null hypothesis that the responses were not biased according to facility type using an alpha level of .05. As a result, we can state that the sample of responses received from MSOs seems to be representative of the population as a whole with regard to facility type.

Medical Systems Officer Repondent Demographics

The frequency breakouts of key MSO demographics are given in the tables included in this section which appear below.

Rank. As expected, the MSOs were much more junior in rank than the hospital administrators. This researcher was surprised by the high number of civilians holding the position of facility MSO, as he had never encountered one himself despite six years of service in the Medical Service Corps. However, the utilization of civilians as the Medical Systems Officer is not proscribed by the governing regulation, AFR 168-4, Administration of Medical Activities, and would not be considered unusual by others. The regulation only recommends that the commander appoint a systems officer who has expertise both in broad areas of hospital management in general and information resources management in particular (16:14-3). The civilian respondents ranged in civil service grade from GS-5 to GS-11. Table 12 shows the distribution of grades among the respondents.

Table 12. Rank of MSOs [n=49]

	No. of Responses	Percentage
2Lt	5	10
1Lt	9	18
Capt	27	52
Major	1	2
Civ	9	18

Education Level. It was interesting to note that several of the MSOs did not have Master's degrees. Only a small minority of 13% of them had majored in a computer science related topic in a Master's or Bachelor's program; the majority had degrees in general management or hospital administration. Curiously, three of the respondents, all civilians, had less than a Bachelor's degree; however, as Table 13 reflects, the majority possessed master's degrees.

Table 13. Highest degree Held by MSO [n=52]

	No. of Respondents	Percentage
Less than Bachelor's	4	8
Bachelor's	15	29
Master's	33	63
Ph.D.	0	0

Percentage of Time Devoted to Medical Systems Duties. It was interesting to see the percentage of time spent by titular MSOs on their duties as MSO. The percentage of time spent ranged from 5% to 100%. Traditionally, MSO responsibilities have been an additional duty at all but the

largest medical treatment facilities. However, the skewing of frequencies toward the lower end of the percentage range was particularly noteworthy. The results shown in Table 14 reflect this part time orientation on the part of MSOs.

Table 14. Percent of Time Devoted to Systems Duties [n=51]

	No. of Responses	Percentage
0-25	25	49
26-50	9	18
51-75	2	4
76-100	15	29

Staff Size. The size of the MSOs staff was reported to be quite small, in general. It was surprising to note how many systems officers, some of whom were able to devote little time to systems programs themselves, also had little staff to support them in their responsibility of managing the facility's information systems. These management duties are outlined in AFR 168-4, Chapter 14, and are extensive, covering one and a half full pages of single spaced print. The duties and responsibilities assigned include the following: 1) Providing training, 2) writing and maintaining implementation and security plans, 3) assisting users with analysis and presentation of all information desired, 4) identifying and acquiring information resources required and, 5) establishing and enforcing automation standards for hardware and software use (16:14-3, 14-4). When these responsibilities are added to the local requests

for support, the tasks levied on medical systems officers and their staffs become quite extensive. The staffing of medical systems offices appears to be quite small in comparison to their list of responsibilities.

The size of staff reported, excluding the MSO himself, who spent at least 75% of their time on information systems tasks was reported as shown in Table 15:

Table 15. Systems Staff Size (excluding the MSO) [n=51]

	No. of Responses	Percentage
0	8	16
1	26	51
2-4	10	20
5 or more	7	14

Job Experience. The range of tenure in the systems position yielded no unusual results. Traditionally, Medical Service Corps officers are rotated into two or more roles at a facility during a standard 2-4 year tour of duty. As a result, the modal short tenure depicted in Table 16 is an expected consequence.

Table 16. Tenure in Current MSO Position (in months) [n=52]

Months	No. of Responses	Percentage
0-11	30	58
12-23	14	27
24-35	3	6
36+	5	10

MSC Experience. As expected, those MSOs who were MSC officers were relatively new to the corps, which is depicted in Table 17 below.

Table 17.

Years of Experience as a Medical Service Corps Officer [n=40]

	No. of Responses	Percentage
0-1	5	13
2-3	12	30
4-6	12	30
7+	11	28

Hospital Type. All types of hospitals were represented by the respondents in proportions which more or less reflected the total mix of facility types and bed size. Tables 18 and 19 show this mix.

MSO Demographic Summary. A high percentage of hospital Medical Systems officers responded to the survey. The responding group represented the total population as measured by facility

Table 18. MSO Hospital Types Reported [n=51]

	No. of Responses	Percentage
Hosp	39	76
Rgn Hosp	8	16
Med Cen	4	8

Table 19. MSO Bed Size Reported [n=52]

	No. of Responses	Percentage
1- 20	21	40
21-40	14	27
41-70	10	19
71-100	2	4
100+	5	10

type in proportions roughly equal to the population total, as supported by the Chi-square test. The typical MSO was a Captain or a Lieutenant, had been in his position less than a year and did not have formal academic training in a computer oriented discipline. Most spent less than half of their time on their MSO duties, presumably because they were tasked with one or more other roles in the hospital. The majority of the respondents reported having a staff, defined as individuals who spent more than 75% of their time on systems tasks, of one or less. This figure and the amount of time devoted to systems duties seemed rather low when one considered the responsibilities of the medical systems officers as defined by Air Force regulation alone.

Reliability Analysis

The Cronbach's alpha analysis of reliability was done using an interactive matrix language (IML) procedural program which enabled the researcher to perform the reliability analyses supported by the Statistical Package

for the Social Sciences (SPSSX) program in the SAS environment. Items with reverse scaling were included to ensure that sufficient attention was being given to the survey responses. Each quantitatively assessed variable is shown in Table 20 below with the reliability level when using all premeditated components.

Initial Reliability Analysis. Deletion of some questions was considered where reliability could be improved without sacrificing the breadth of the composite variable, especially if the reliability was less than .7, as measured by Cronbach's alpha. The SAS output performs a sensitivity analysis predicting a revised Cronbach alpha if the item under consideration is deleted. This analysis permitted the researcher to scrutinize that question which would boost the reliability rating most without time consuming trial and error testing. The sensitivity table showed that no improvements to the relatively high Cronbach alpha values were achievable through component elimination for the composite variables B1, D1, and G.

At the other extreme, composite variables A and B2 could not be improved to an acceptable level of reliability. Variable B2, built with only two questions, could not be improved. Apparently the questions ask very different things from the individual

Table 20. Initial Reliability Check

Variable	Descriptions	Items	Cronbach alpha
A	Administrator satisfaction with current information gathering methods	A7,A8,A10, A164	.1684
B1	Administrator's belief that an EIS would improve efficiency and effectiveness	A20,A151, A153,A165, A166,A167, A168	.8018
B2	Systems officer's belief that an EIS would improve efficiency and effectiveness of the administrator	I17,I18	.2009
D1	Administrator's confidence in local systems staff	A16,A17, A21,A22, A23	.8668
D2	Systems officer's confidence in self and staff	I19,I20, I21	.4852
G	Administrator's desire for DSS type hypothetical modeling	A154,A155, A156,A157, A158,A159, A160,A161, A163	.8784
M	Administrator's comfort level with automated systems	A12,A13, A14,A15, A169,A170	.6188

systems officer's perspective. Table 21 displays the results of the individual elements in variable B2.

Question I17 asks the MSO's level of agreement with the following statement: "I think that an on-line Executive

Information System (EIS) containing the information items shown in question 16 would be valuable to my administrator."

Table 21. Component Ratings for Variable B2

[Using 1 (Strongly Disagree) to 7 (Strongly Agree) Scale]

Variable	Description	Mean
B2-1	Systems officer's belief that EIS is valuable	6.05
B2-2	Systems officer's belief that administrator will use EIS	5.78

In contrast, question I18 asks: "I think my administrator would use an on-line EIS containing the information elements listed in question 16 to supplement his information gathering methods." The mean response to the former question is 6.05, a relatively strong indication of agreement. Although the mean response to latter question, I18, is similar at 5.80, the reliability check uncovered a high degree of variability between the responses to these questions given by an individual respondent. This variability would seem to indicate one of two things:

1) The respondents did not understand one or both of the questions, or

2) The value of an EIS and expectations of its use are divergent issues. That is to say, the MSOs feel that even a

valuable system may not necessarily be used by the administrator.

This researcher tends to support the latter hypothesis, although the evidence to support this opinion is certainly not conclusive. The administrator's comfort level with computers, captured by composite variable M, only shows a mild level of confidence in computers in general (5.41 on a seven point scale with four as neutral and seven as the maximum positive rating). By their own assessment, it seems fair to say that administrators are not wildly enthusiastic computer aficionados. Moreover, the administrator survey results revealed that administrators believe, by and large, that computer systems will not be able to substitute for their personal contacts with their staff for extracting information. If medical systems officers perceived these opinions as held by their administrators, it may have led them to conclude that their administrator may not use an EIS even if it was a valuable tool. This association, however, is purely conjectural.

Variable A, administrator satisfaction with current information gathering methods, also proved to be a poor composite. Table 22 shows the results for the individual items of the failed composite variable.

Although administrators expressed unhappiness with current information methods, the sources of unhappiness did not seem to exist in those areas where an EIS could be expected to relieve their unhappiness. Most disagreed with

the statement that information gathering meetings were a waste of time. If meetings are the only means of gathering critical information, then this activity would not be a waste of time because automated information systems do not provide administrators with needed information currently. Moreover, administrators object, though less strongly, to the idea that meetings are inefficient means of gathering information. Conclusions are difficult to draw from

Table 22. Component Ratings for Variable A

[Using 1 (Strongly Disagree) to 7 (Strongly Agree) Scale]

Variable	Description	Mean
A-1	Administrators happy with current info gathering methods	3.69
A-2	Information gathering meetings with subordinates are a waste of time	2.54
A-3	Meetings are an inefficient method of gathering and disseminating information	3.67
A-4	Administrator's belief that it is essential that critical management indicator info be provided in writing	3.85

these data. Three possible explanations include:

1) An EIS alone will not make administrators happier, and/or

2) Administrators find importance in face-to-face contacts and an EIS will not eliminate meetings and may have no significant effect on these, and/or

3) Perhaps responses were an artifact of measurement, tainted with the respondent's conscious or subconscious concern over not getting any improvements to the current system if he stated that problems in the current system do not exist.

Here as in the previous paragraph, the possible explanations for the breakdown of composite variable A in reliability analysis are purely conjectural. Literature reviewed in Chapter II which related the preference, expressed by some executives, to gather information verbally through direct personal contact supports the second explanation offered. However, further research would be required to determine more precisely the factors underlying these responses.

In contrast to variables A and B2, intervention was possible, and accomplished, in the cases of composite variable D2 and M. The rehabilitation of composite variable D2 involved dropping the question to systems officers asking whether or not they had the right training to perform their duties. The composite indicator D2 tried to capture whether or not systems officers felt confident in their ability to understand complex information systems. Systems staff's time and experience, the core content of the remaining questions in the composite, were left as the measures to determine this factor. On average, systems officers disagreed slightly with the idea that they did not have the proper experience, giving responses averaging to 3.0 for

question I20. They were more neutral about the availability of their time and suitability of their training for supporting complex information systems, giving scores of 4.5 and 4.1, respectively, to questions I19 and I20. Each of these questions addressed different issues related to the systems officer's ability to support complex systems. The analysis of responses through reliability checks made it clear that training did not belong in a composite variable seeking to quantify self-assessment of this ability.

The rehabilitation of composite variable M, testing the administrator's level of comfort with automated systems in general, was somewhat more difficult, involving the removal of two components from the original set of six. Question A169 asked the administrator to state his level of agreement with the following statement: "In the past, management information systems have cost more than they were worth." It is possible that even an individual who is very comfortable with information systems might have been disappointed by the performance of systems encountered in the past, so dropping this question seemed reasonable. Question A13 asked the administrator's degree of agreement with the following statement: "Computers have the potential to help me manage my responsibilities better." In retrospect, a question worded like this is difficult to disagree with, as confirmed by the average response of 5.99. Since only the most recalcitrant opponents of computers would fail to agree with this statement, there was little

discriminatory value in this question. As a result, the researcher felt that this question also could be removed without weakening the breadth of coverage of composite variable M to any significant degree.

In contrast, the questions remaining in the composite variable seemed to address the issue of an administrator's comfort with automated systems more directly. Clearly, this was the case with question A12, which requested a response for the statement: "I am uncomfortable with using a computer myself." Questions A14 and A15 tried to determine if the administrator was likely to use a computer himself. Question A14 proposed: "A computer on a hospital administrator's desk has more value as a symbol than as an actual tool to for the administrator to use." Question A15 asked the administrator to respond to the following statement: "Using a keyboard is a task for clerks and secretaries, not for executives." Finally, question A170 asked the administrator to speculate on the following: "I believe that the costs of a future management information systems would outweigh its benefits." The idea behind this question was that the administrator who was more comfortable with information systems would be more positive about the potential of information systems to provide support. This type of question stands in contrast to question A169, which asked the administrator to judge the value of information systems which he had experienced. These remaining four questions build a good composite variable and, collectively,

adequately address the issue of administrator comfort with information systems. Based on this analysis, the removal of the two component questions causing the composite variable to be unreliable seemed reasonable.

Summary of Reliability Analysis. An initial reliability check was accomplished using a SAS IML procedure. The results indicated that only three of the seven composite variables proved reliable using the premeditated set of components for the variables. An analysis of the output led to the deletion of two components from one variable and one component from another variable. As a result of these actions, five of the seven composite variables exceeded the reliability hurdle of a .7 or greater Cronbach alpha.

Final Reliability Results. The final reliability results are shown in the next two tables. Table 23 reflects the reliability of variables after the adjustments discussed above were made. It also shows the composite variable mean score for those variables which passed the reliability screening. Table 24 is provided as a reference to the reader to help him recall the meaning of the letter symbols for the surviving composite variables.

Table 23. Original Measures after Adjustments

Variable	Action	Revised Cronbach alpha	Mean
A	No action	.1684	N/A
B1	No action	.8018	6.09
B2	No action possible	.2009	N/A
D1	No action	.8668	4.19
D2	Drop I21	.7102	3.75
G	No action	.8784	5.75
M	Drop A169, A13	.7444	5.41

Table 24. Composite Variable Descriptions

Variable	Description
B1	Administrator's belief that an EIS would improve efficiency and effectiveness
D1	Administrator's confidence in systems staff
D2	System's officer confidence in systems staff
G	Administrator's desire for DSS aspects included in EIS
M	Administrator's comfort level with computers

Investigative Question 2 Analysis

Investigative Question 2 asked: To what extent do USAF hospital administrators desire an EIS? This question was then broken down into two interrelated subquestions, namely:

a. What is the current level of satisfaction of current methods of information gathering?

b. To what extent do administrators believe that their effectiveness and efficiency would be improved by an EIS?

Unfortunately, the composite variable "A", designed to answer the first subquestion of this investigative question broke down under scrutiny. However the direct question on the topic, variable A-1, indicated a mean satisfaction of 3.69, on the dissatisfied side of neutral. While the other questions did not form a valid composite variable, two of the three others were nearly neutral as well. The third, variable A-2, was moderately suggestive of the usefulness of meetings. There is no evidence to conclude that administrators are dissatisfied with their current information gathering methods. Nevertheless, administrators strongly believe that EIS would help them.

There was no difficulty in answering the second subquestion of this investigative question. The composite variable B1 had relatively good reliability; the composite variable score 6.09 means rather strong agreement on the part of surveyed hospital administrators with the statement that an EIS would enhance effectiveness and efficiency. These results would indicate that a moderately strong level of motivation exists to improve the current system of information gathering techniques for administrators and that an EIS is perceived to be a step toward that improvement. These results would support the idea that an EIS is motivationally feasible since the principle users of the

system are neither satisfied nor dissatisfied with current methods and are very receptive to improving them.

Although it is clear that administrators favor the concept of an EIS for their use, there are aspects of their current information gathering methods which they value. Findings from the literature discussed in Chapter II identified the high value executives placed on direct verbal communication when gathering needed information. In general, the hospital administrators surveyed seemed to agree that direct verbal interaction added value to the data received from subordinates. Table 25 highlights aggregate responses to the items on the administrator's questionnaire which were germane to this issue. The mean relates to a seven-point Likert scale wherein one indicated strong disagreement and seven indicated strong agreement with the question.

The above responses constitute a result consistent with the findings of MacLeod and Jones which was presented in Chapter II. USAF hospital administrators value direct personal interaction with their subordinates in the information gathering process. However, it is not clear from these findings whether the data provided by an EIS would be of less value to administrators than data received directly from a subordinate. Moreover, even if direct personal interaction provided better quality information, the time cost of accessing this information would certainly

Table 25. Importance of Direct Personal Interaction in Information Transfer

Item No.	Question	Mean
8	Information gathering meetings with my subordinates are a waste of time.	2.58
9	Explanations surrounding facts and results are at best superfluous and sometimes obscure the truth.	3.17
10	Meetings are an inefficient method of gathering and disseminating information.	3.69
11	The nonverbal signals which my subordinates give me while answering my questions adds meaning to their responses.	5.42

be higher than accessing information on the same topic through an EIS. The trade-off between EIS's efficiency and the direct personal interaction method's claim to enhanced information quality is an issue which will be addressed in Chapter V.

Question 3 Findings: Critical Management Indicator Stability

Investigative Question 3 asked: To what extent can a stable set of critical management indicators for USAF hospital administrators be identified? This question was answered by comparing means and ranks of management indicators between Parker's 1987 results and this researcher's 1990 results. Standard deviations were not available for the mean ranking data for the Parker scores,

possible. Therefore, the data were examined in the aggregate using a paired t-test and a Wilcoxon signed rank test for all indicators. In addition, since Parker's research focused on only CONUS hospitals and did not include regional hospitals and medical centers as does the present study, the comparisons discussed below only used the 1990 survey subpopulation of hospitals initially, so comparisons would be made across equivalent facility types. Both surveys used the same questions, identically worded, with the exception of two questions dropped in the current survey which appeared to be redundant. Therefore, 127 items were used to compare the mean and ranked responses in the two surveys. If an EIS for hospital administrators is to be technically feasible, the key management indicators must have some degree of stability. Without this stability, changes to the EIS would be too frequent to make the EIS technically or operationally feasible. Table 26 displays the results of comparisons between various population groupings for variables in the aggregate.

1987 Hospital vs 1990 Hospital Mean Comparison. Scores given by administrators of hospitals, as distinct from medical centers and regional hospitals, dropped an average of .04 rating points overall in 1990 vis-a-vis the 1987 ratings of management indicator value. The expectation of this researcher was that there would be no significant

Table 26. Overall Comparative Data

	Respondents	Mean	St Dev	RANGE Minimum	RANGE Maximum
1987	31	3.53	.562	2.00	4.61
1990(Hosp only)	41	3.49	.473	2.40	4.41
1990(Med Cen/ Rgn Hosp)	13	3.39	.465	2.31	4.50
1990 (All)	54	3.46	.463	2.37	4.39

difference between the means of the 1987 and 1990 surveys. An examination of the range of individual indicator averages and mean and standard deviation for all variables was presented in Table 26. These measures reflect a tighter distribution of individual item ratings in 1990 relative to 1987 for hospitals.

The expectation of no change in indicator valuation was supported by statistical analysis. A paired difference t-test resulted in a t-score of -1.47, an observed significance (p-level) of .1446. Using the alpha level of .05 established earlier in this study, this p-level results in failing to reject the implicit null hypothesis that the mean ratings of indicator value have not changed in the interval under examination. Figure 1 depicts the movements in means graphically. Visual inspection of this figure confirms the statistical evidence that there has been little movement in perceived management indicator valuation.

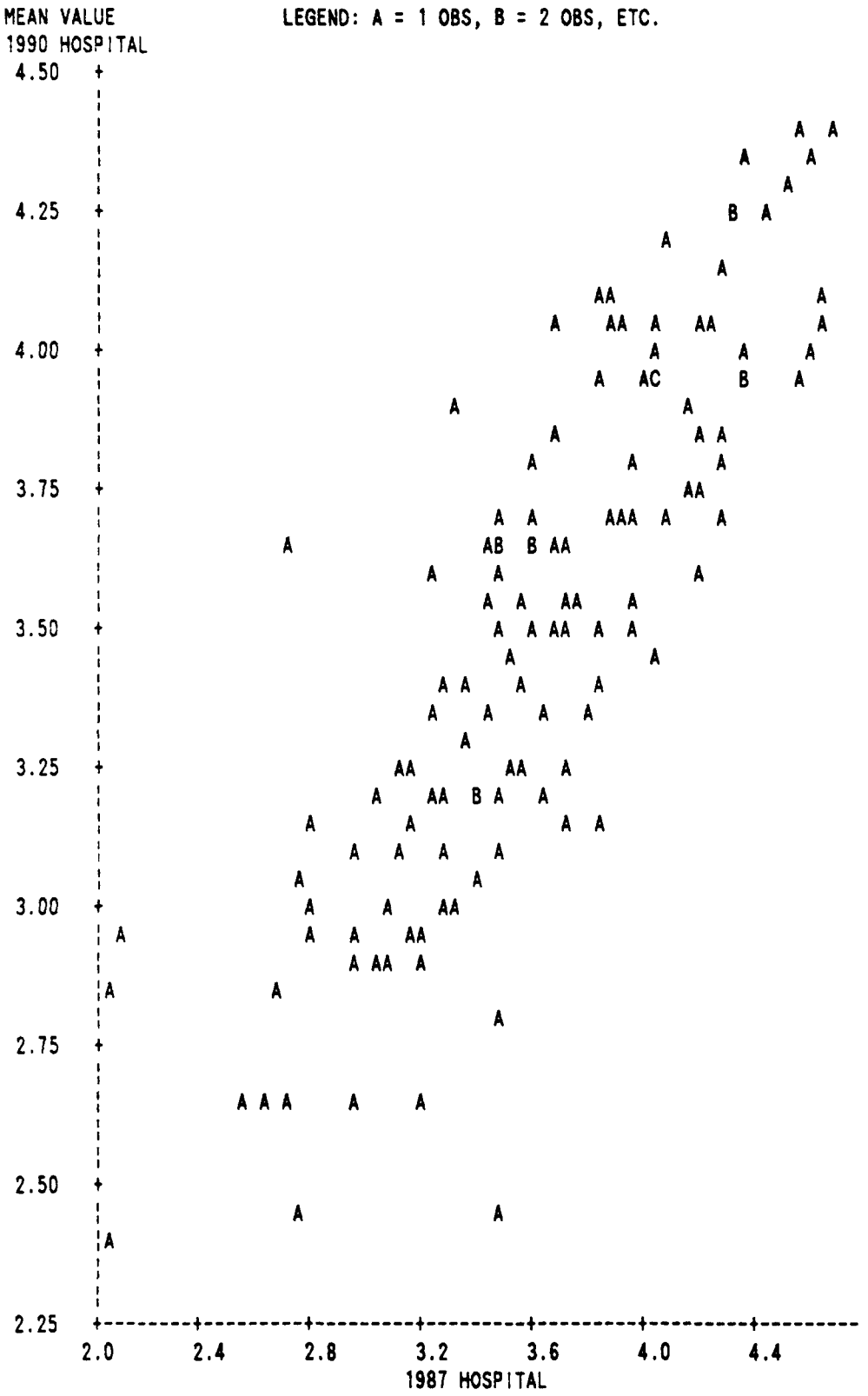

Figure 1. Comparison of Mean Indicator Valuations

1990 Hospital vs. Medical Center/Regional Hospital Mean Comparison. Having established the stability for USAF Hospitals over time in the previous subsection, the next step in this part of the analysis is to determine whether the 1990 responses from administrators of larger facilities differs from those made by administrators of the smaller facilities. Since Parker's study did not include these larger facilities, a direct comparison with 1987 values is not possible for this group. However, comparing the responses of administrators from larger and smaller facilities is important because of its implications on feasibility. If no significant difference is found between the population subgroups then it follows that a single system would be appropriate for facilities of all sizes. If this is not found to be the case, then the implied necessity of developing different systems for facilities of different sizes would negatively impact the economic feasibility of a EIS.

Administrators of medical centers and regional hospitals gave an average mean rating for all 127 indicators which was .1 below that of their hospital administrator counterparts. The same t-test as described earlier with 1987 hospital ratings compared against 1990 hospital ratings yields a t-score of 5.15 and a p-value of .0001. It seems that administrators of larger facilities show a slightly greater tendency toward circumspection when it comes to rating the value of management indicators, perhaps because

in a larger facility they must be more discriminatory in the indicators they consider lest they be flooded with excessive information. The practical significance of this difference between 1990 hospitals and the larger facilities polled in 1990 is minimized, however, upon closer investigation of the relative rank changes in the indicator ratings.

Rank Order Comparisons. Relative ranks of indicators and their stability are more important than the stability of means when examining the feasibility of constructing an EIS. Means provide an absolute assessment of the importance of an item from the respondent's perspective, but relative ranks show the pecking order of indicators on a scale of importance. Even in the unlikely case that an EIS could be built which contained all the information an administrator would ever desire, the administrator himself would certainly focus his attention on some top grouping of key indicators from which he could base a judgement of overall performance and general problem areas. The determination of the optimal number of management indicators for a USAF hospital administrator's EIS is a design issue which goes beyond the scope of this research. Whatever the total number of indicators to be included in an EIS, their relative stability is important to ensure that the top portion included is not subject to so much volatility as to make the system implementation impractical. The researcher used SAS's PROC UNIVARIATE procedure to determine the significance of the rank differences between 1987 and 1990

significance of the rank differences between 1987 and 1990 hospitals. The Wilcoxon-Signed Rank Score was -142.5 and the Probability > S was .7232, leading the researcher to fail to reject the null hypothesis of no changes in overall ranking of the management indicators on a relative scale. Figure 2 depicts this relative stability graphically.

While the differences in indicator value means between larger and smaller facilities in the 1990 data pool were found to be significant, the differences in rank order of the indicators was not. Although there were small individual differences, administrators of both groups placed the indicators in a similar relative order, based on their aggregated responses. The Wilcoxon signed rank test comparing the rank orderings given by administrators of larger versus smaller facilities in 1990 yielded the result of -5.5, a probability > S of .9891, demonstrating nearly identical rank orderings of indicators by the administrators of both groups. This result indicates that although administrators of larger facilities may assess the importance of all indicators, on the whole, to be lower than their counterparts in smaller facilities, there is little difference in how these two groups assess the relative merits of the set of 127 management indicators presented.

Stability Summary. In summary, both the value means and relative ranks of management indicator information proved to be stable when the 1987 ratings of indicators given by hospital administrators were compared with the

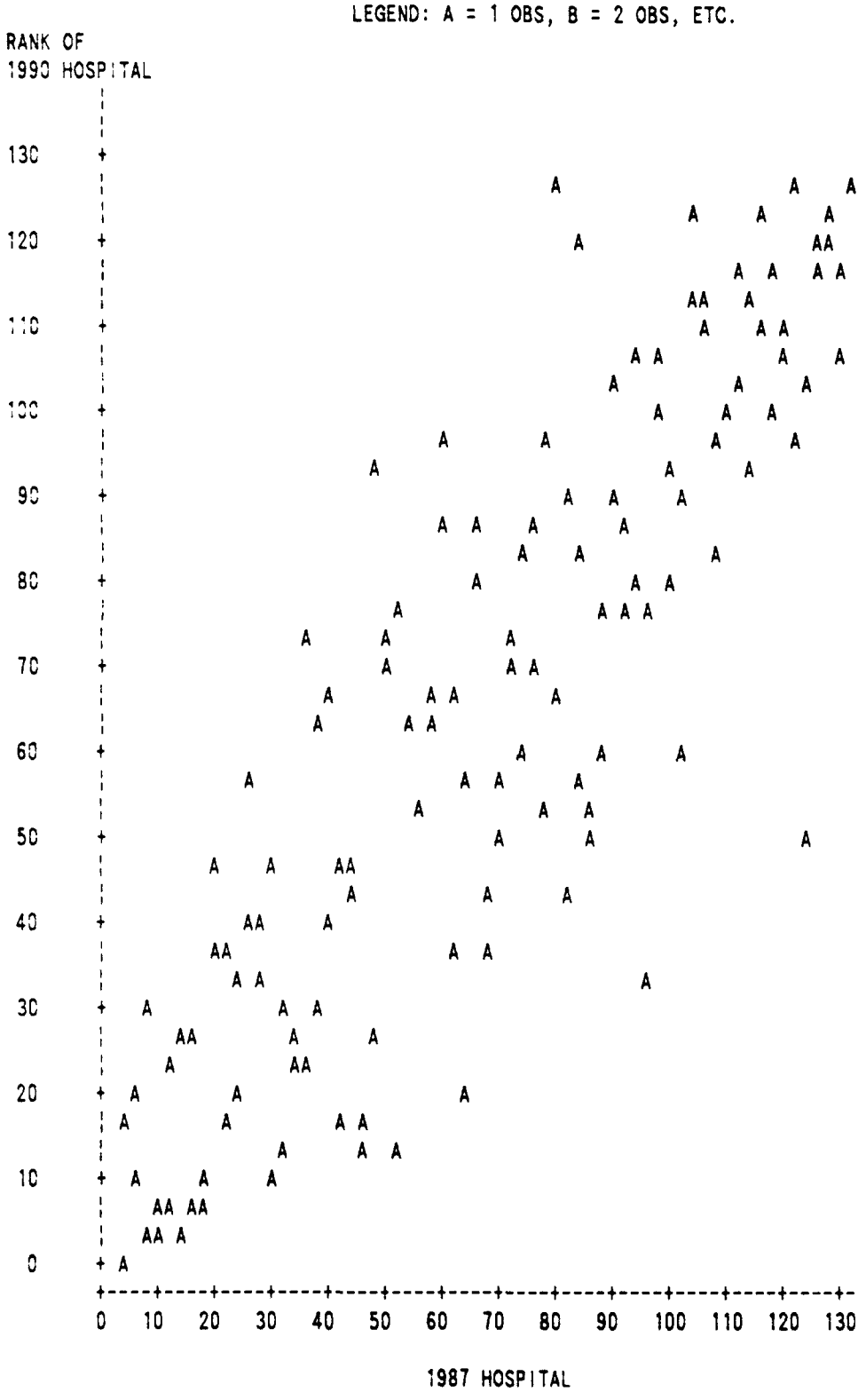

Figure 2. Rank Comparisons of Indicators, 1987 and 1990

ratings given by this group in 1990. Furthermore, the relative ranks of the management indicators did not prove to be different between smaller and larger facilities polled in 1990, even though a difference in means between these groups was detected. Given the lack of difference in relative ranking of importance between the two population subgroups, the differences in absolute ratings of indicator valuation is significant only from a statistical, rather than a practical perspective. The statistical difference in means between these groups simply says that hospital administrators have an inflated sense of what is important relative to administrators of larger facilities. An academic analogue is possible with grades from schools with differing levels of grade inflation. The comparison of the performance of two students from different schools is most fairly made based on relative rank within one's class rather than on grade point average, since one school may be more niggardly in giving high grades to students than another. In this case, the important benchmark for comparison is the relative ranking of the student. Similarly, in the case of management indicator valuation, it is the relative rank of an indicator which is of true importance.

The results of the previous subsection supports the contention that indicator valuation, at least in a relative sense, is stable across both time and across facility size. The stability of the relative ranks of indicators is more important than mean ratings for system design. Stability

across all sizes of facility supports the position which states that a single administrative EIS could be built for all inpatient facilities. This is an aspect of technical feasibility that bodes well for future economic feasibility, since the costs involved in building a single EIS will be less than the costs involved to build multiple EISs which would handle the differing needs of the various facility types.

Outlier Investigation. The distribution of all 1987 and 1990 means and mean changes were normal. The range of rank changes, although showing a normal distribution pattern overall, displayed some isolated anomalies which bear further scrutiny. Examining those indicators which show some volatility may provide insight into understanding the nature of swings in relative rankings of importance. This understanding may provide valuable clues on proper EIS design and is worth investigating.

Table 27 depicts the range of rank movements in the indicators studied. An increase in ranking shown in this table indicates an increase in relative importance. The direct comparison group of hospitals only is shown. Among the outlier group increasing in importance, two indicators, nonavailability status and CHAMPUS claims, increased in relative importance 61 and 71 positions, respectively.

CHAMPUS claims shot up from 122nd to 50th place and Nonavailability status jumped from 93rd place in 1987 to 32th in 1990. This researcher hypothesizes that the

Table 27. Range of Difference in Ranks 1987-1990

(Hosp only) [n=127 questions]

Amount of Change	Number of Measures Changing	Percentage
Up 30+	9	7
Up 20-29	10	8
Up 10-19	19	15
Up 1-9	29	23
0	3	2
Down 1-9	19	15
Down 10-19	20	18
Down 20-29	12	9
Down 30+	6	5

shifting of responsibility for CHAMPUS outlays from the CHAMPUS office to that of the Medical Facility resulted in greater emphasis upon these data by the facility administrator. Under the previous policy, a facility could issue a nonavailability statement and leave the funding of patient care to the CHAMPUS office. Under the new policy initiative, called catchment area management, the facility remains responsible and must pay for those patients to which it issues nonavailability statements out of its own budget. It is now very much in the self-interest of the facility administrator to manage these two areas better since the new program holds him accountable for CHAMPUS expenditures generated by nonavailability statements from his facility.

Tables 28 through 30 show the changes in indicator ranks in detail, by quartile. Rankings are shown for 1987 Hospital versus 1990 Hospital only in order to ensure direct comparability of populations. Selection of quartiles to

make these comparisons is completely arbitrary. The purpose of this section is not to prove relative stability of rankings already shown in the previous subsection. Instead, the researcher's purpose is to identify possible reasons behind shifts in relative rankings and to give the reader a better feel for this portion of the research, which represents a longitudinal study of the perceptions of management indicator importance among USAF hospital administrators.

Segmenting the data into quartiles and considering changes in indicators in the context of these groupings was convenient for several reasons. First, it is the standard method used by SAS to break out portions of data. Second, using quartiles results in a top quartile of indicators, a group of 32, which encompasses rather closely the top 28 indicators Parker described as highly valued. Parker's selection of most valued indicators was based on establishing an arbitrary cutoff point of a 4.00 valuation on her 5-point Likert scale for information value. Although this researcher disagrees with Parker's use of an arbitrary cutoff to designate "most valued" indicators from others, using a similar grouping of indicators will help future researchers who may continue this longitudinal study of relative importance of management indicators. Rank orderings to distinguish variable groupings were used because of the importance of relative rather than absolute value ratings, as explained earlier in this section.

The movements in relative ranks for management indicators which were in the top quartile in 1987 are examined in detail in the tables below. These are scrutinized closely because they comprise the most likely candidates for inclusion in an EIS due to their high ranking in importance by administrators in the past.

Table 28. 1987 Top Quartile Group Movement Summary

1990 Rank	No. of Responses	Percentage
Top Quartile	24	75
Next Quartile	8	25
Next Quartile	0	0
Last Quartile	0	0

Table 29 highlights those indicators which dropped into the second quartile in 1990 after a 1987 first quartile appearance. The average drop in rank among these indicators was 19.375. Noteworthy is the fact that all of the indicators moving to the second quartile were in the bottom half of the 1987 first quartile group.

Table 29. 1987 Top Quartile Indicators Moving to Second Quartile

Item	1987	1990 [Hosp]
PRP Reporting	17	46
Patient Deaths	18	36
Logistics Customer Complaints	19	38
Bed Occupancy Rates	22	34
VIP Patients	23	57
Evaluations (OES/EPR)	25	41
WRM Percentages	26	33
Outpatient Record Filing Backlog	27	47

A closer look at the individual indicators contained in the top quartile is of value because it reveals the details of subtle changes in administrator valuation rankings of the most highly regarded indicators. Table 30 reveals some developing trends of interest. First of all, the readiness

Table 30. 1987 Top Quartile Detail Listing

Item	1987	1990 [Hosp]	Relative Change
Manpower Requests	28	9	+19
Expense Equipment	30	13	+17
Appointment Waiting Lists	15	5	+10
Product Recalls	32	22	+10
Manpower Priceouts	12	4	+8
Facility Projects	14	8	+6
Suspensing	16	10	+6
Investment Equipment	31	25	+6
Provider Productivity	7	2	+5
Other Agency Inspections (HSMI/SAV)	8	6	+2
Internal Inspection Discrepancies	21	23	+2
Inpatient Filing Backlog	29	27	+2
Fund Shortfalls	5	3	+2
Safety Hazards	20	19	+1
Hosp injuries	1	1	0
SORTS Reporting	3	11	-8
Patient Complaints	10	18	-8
WRM Percentages	26	34	-12
Bed Occupancy Rates	22	35	-13
SGL Customer (Staff) Complaints	19	43	-14
Hospital Incidents	2	16	-14
Evaluation Reports	25	39	-14
Hospital Staff Who are Patients	24	40	-16
Patient Deaths	18	36	-18
Overdue Internal Inspections	13	32	-19
Outpatient Record Filing Backlog	27	46	-19
Security Violations	11	31	-20
Mobility Actions	6	30	-24
PRP Reporting	17	42	-25
VIP Patients	23	59	-36

related issues of SORTS Reporting, Mobility Actions, WRM Percentages, and security violations are all moving downward in relative importance. In contrast, highly regarded resource related indicators, such as manpower priceouts, equipment acquisition status, and manpower requests, are gradually moving upward in relative importance. Since an EIS is likely to use either all of the indicators in the top quartile or a subset of them, closer scrutiny of these most highly regarded indicators is warranted and made readily available in Table 30.

Table 31 summarizes movements in the Second Quartile of the 1987 management indicators. Table 32 highlights those indicators which migrated to the top quartile in 1990.

Table 31. 1987 Second Quartile Group

1990 Rank	No. of Responses	Percentage
Top 25%	7	22
Next 25%	14	44
Next 25%	11	34
Last 25%	0	0

Table 32.

1987 Second Quartile Indicators Migrating to Top Quartile in 1990

Item	1987	1990
Future Budget	34	23
Narrative Summaries (Patient treatment)	35	31
Out of stock conditions	40	17
Overspending	44	12
CE workorders	46	27
Workload Data	49	15
Other Payments	62	14

As noted previously in the explanation of Table 30, a distinct upward movement of resource based management indicators is apparent in Table 32; most of the indicators shown in that table have some relationship to resource acquisition or utilization.

Tables 33 and 34 show the changes in the 1987 third quartile group.

Table 33. Third Quartile 1987 Ranks

1990 Rank	No. of Responses	Percentage
Top 25%	1	3
Next 25%	8	25
Next 25%	15	53
Last 25%	8	19

Table 34. Volatile Upwardly Mobile Indicators in 1987 Third Quartile

Item	1987	1990
Nonavailability Status *	93	24
Overdue Records	90	50

* Only indicator moving from third quartile to first quartile.

Tables 35 through 37 show the changes in the 1987 Last Quartile of management indicators.

Table 35. 1987 Last Quartile Indicator Movements

1990 Rank	No. of Responses	Percentage
Top 25%	0	0
Next 25%	2	6
Next 25%	6	19
Last 25%	23	74

Table 36. 1987 Last Quartile Indicators Moving to Second Quartile

Item	1987	1990
CHAMPUS Claims	122	50
Overdue Records	99	59

Table 37. Volatile Upwardly Mobile Indicators from 1987 Last Quartile

Item	1987	1990
Third Party Liability Claims	108	82
Patient Payments	119	97
CHAMPUS Claims	122	50

The above discussion focused on exceptional cases where the valuation of a given indicator was unusually volatile. By an large, the indicators proved to be rather stable, especially in terms of relative importance. Appendix B is available to the reader who would like to see the ratings of each of the 127 indicators studied.

Overall Observed Level of Indicator Stability. An analysis of Tables 28, 31, 33 an 35 shows that nearly sixty per cent of the 127 indicators used to compare 1987 rankings to those of 1990 remained in the same quartile. Moreover, as shown in Appendix B, much of the movement between quartiles occurred at the margins of the quartiles. This relatively high level of quartile cohesiveness is another indicator of the relative stability of indicator rankings.

Administrator Opinion of Indicator Stability. Direct questions regarding the administrators opinions on the stability of critical indicators corroborated the mild

support for the conclusion of relative stability of management indicators made through the quantitative data analysis described in previous subsections. Question 18 on the administrator's survey, "I could use the same set of management indicators I use here at any other USAF inpatient medical facility with minor modifications," received a response mean of 5.52 (midway between slightly agree and agree on the 7 point Likert scale used for that portion of the questionnaire). Question 19 of the administrator's survey, "Key management indicators I use to judge my facility's performance are relatively stable," scored out with a similar overall mean of 5.5 on the same scale. The belief on the part of administrators that management indicators for USAF hospitals are rather universal and relatively stable supported the evidence provided by administrator responses with regard to indicator valuation.

Summary Comments On Investigative Question 3. The relative rankings of USAF hospital administrator management indicators are statistically stable. For the most part, movements in the perceived level of importance of a given indicator are gradual. However, there are cases where there has been precipitous change in the perceived relative and absolute level of importance for particular indicators. Most of these are traceable to shifts in Surgeon General policy emphasis in 1987 and 1990. Readiness issues typically dropped in importance. In contrast, all resource oriented issues moved up strongly as a group, most likely

due to funding limitations which began in the late eighties and are projected into the future. Management indicators of quality assurance also showed gains in relative importance, although these were less dramatic than those associated with resource management. The lesson to be drawn from this portion of the research seems to be that management indicators remain relatively stable but are affected by changes in the task environment and shifts in policy, priorities or emphasis.

Investigative Question 4 Analysis

Investigative question 4 asked: "To what extent are medical systems staff personnel at USAF hospitals capable of providing local technical support to administrators in the operation of an EIS." This question is answered using three types of data. First, the perceptions of administrators and systems officers of the capability of the systems staff will be considered. Second, cogent and representative quotations from open comments will be presented. Finally, staff size will be evaluated. In this way, the researcher hopes to capture a holistic picture regarding the predicted capability of the systems staff to operationally support an EIS for USAF hospital administrators.

Neither administrators nor systems officers feel very confident in the medical systems staff's ability to provide technical guidance in support of the daily operations of an EIS. The reliability of the composite variable for both

groups is strong. Administrators and systems officers both have neutral feelings with regard to the ability of the assigned medical systems staff to take on the challenge of supporting a new and complex management information system. On a seven point scale with one as the lowest level of confidence, seven as the highest confidence level and four as neutral, administrators gave a composite average score of 4.19 while the systems officers gave a rating slightly below neutral at 3.76. A large sample t-test was performed to determine whether these differences in population means differed statistically from zero. No statistical difference between population means was found. The resulting test statistic was z=.473. This corresponds to a p-level of approximately .6392, which leads to a clear failure to reject the null hypothesis of no difference between the means given by the two population groups. Summarizing, both MSOs and administrators are in agreement and are neutral on the question of the ability of the locally assigned systems staff to understand and support complex management information systems.

Strongly worded comments on the MSO surveys give further insight into the reasons behind this lack of self-confidence. MSOs emphasized time and again their belief that they were understaffed and the staff they did have did not have the appropriate training. Examples of this are below, with the specific questionnaire number identified in parentheses.

(4) "Commanders and administrators cannot easily get or commit resources to systems offices."

(11) "I have been in the position as CIO (author's note: CIO stands for Chief Information Officer, and is a synonym for Medical Systems Officer) for one year. I feel insufficient resources (1 authorization) are allocated to the current role. Computers are playing in the MTF (author's note: MTF stands for medical treatment facility). Current demands of staff and multitude variations of several systems require 3 times the current allocation."

(17) "A major weakness now is that we have no funded authorizations to manage our computer. Our MAJCOM says that I earn four people to cover systems, but I only have one full-time person and she is taken "out of hole..." our systems people are tied up just keeping the equipment running and serviced."

(20) I consider myself lucky now with the fact that I now have a civilian systems manager. Prior to hiring, we had to convince lab to give up one of their civilian positions so we could convert to a systems slot. The civilian replaced a Senior Airman 906 (Medical Administrative Specialist). Bottom line, the AF needs to consider making a civilian slot for systems mgr. for every USAF hosp (sic). A 906 is not trained in this environment and you cannot expect the MSC Resource Management Officer to run it properly with his budget and manpower concerns. It is a full time job for

someone that is qualified. Rotating a 906 creates incredible anarchy. (sic)"

(28) If we are to entertain further advancement of medical systems in the facility, then someone at the top will need to decide to employ the right personnel to get the job done."

Assuming that an EIS is not unlike other complex management information systems in the level of support it requires from information systems professionals, it appears that an EIS would require additional manpower resources in order to be operationally supportable. As identified in the literature review, a competent local systems staff is indispensable when it comes to transitioning from a manual system to an automated systems. Without the help of these professional technical midwives, the viability of a newly implemented system, however user-friendly its design, is susceptible to rejection by its user. The additional staff resources necessary to support an EIS implementation would need the proper background and experience to make them useful in the task of supporting the operations of a complex automated system, particularly in the first stages of implementation.

The distribution of the percentage of time spent on systems officer duties and the facility type validated the common sense notion that larger facilities would tend to have full-time systems officers who, in turn, would spend

the bulk of their time on systems related duties. This idea was supported by the data, as shown in Tables 38 below:

The Chi Square test for independence was performed on a two by two version of Table 38, with column ranges divided

Table 38. Percentage of Duty Time Spent on Systems Duties [n=48]

	0-25	26-50	51-75	76-100
Hospital	23	9	2	6
Rgn Hosp/ Med Center	2	0	0	6

between zero to 50 per cent and 51 to 100 per cent. Even in its collapsed form, the expected cell value for the Rgn Hosp/Med Cen officer spending 50 per cent or less time at systems duties was 4.17 and less than the expected value count of five per cell required for Chi-square. Nevertheless, since this single cell value was so close to five, a Chi-Square test was still performed, resulting in a Chi-square value of 9.761 and a p-value of .002, clearly indicating that facility type plays a major role in the percentage of time a system officer devotes to systems duties. Even if Chi-Square was deemed invalid, a visual inspection of the table would still point toward a nonrandom distribution of the entries into cells, thus leading to the same conclusion that time spent on systems duties is indeed related to the facility type. Therefore, if no additional resources are provided, an EIS would seem to be more feasible from an

operational perspective at a larger facility. Further evidence suggesting that smaller facilities might not be able to shoulder the burden of supporting an EIS without the provision of additional manpower resources is shown in Table 39 below. Smaller facilities simply do not seem to have the resources on hand necessary to support the operations of a complex information system.

Table 39. Systems Staff Size (75%+ working SGI) by Facility Type

	0-1	2-3	4-5	6+
Hosp	33	7	0	0
Rgn Hosp/ Med Cen	2	3	2	1

Investigative Question 5 Analysis

Investigative Question 5 asked: To what degree has the integration of management information data in USAF hospitals been achieved? Integration of management information systems to date appears to be very limited, as indicated by Tables 40 through 43 below.

Table 40. LAN Existence in Hospital [n=52]

	No. of Responses	Percentage
LAN not present	42	81
LAN present	10	19

Table 41. E-mail Capability [n=52]

	No. of Responses	Percentage
E-mail not present	45	87
E-mail present	7	13

Table 42. Electronic File Transfer Between Sections [n=52]

	No. of Responses	Percentage
No Capability	47	90
Capability	5	10

Table 43. Centralized Database Available [n=52]

	No. of Responses	Percentage
No centralized database	26	50
Centralized database	26	50

Table 43 is somewhat deceptive. Those respondents who indicated the existence of a centralized database indicated that only about half of the 1987 top quartile indicators were captured in the database. Moreover, the indicators said to be captured generally reflected those captured by three separate and insular minicomputer systems. In fact, some respondents paradoxically indicated the availability of multiple centralized databases in the unstructured comments section of the survey. It is possible that some construed this question to ask whether or not any databases were stored on a platform larger than a microcomputer and believed that the centrally and universally procured, self-contained AQCESS, MEPRS or MEDLOG systems met the criterion

as they interpreted it. AQCESS supports Patient Administration; MEPRS supports Resource Management; MEDLOG supports Medical Logistics. However, the databases maintained by these are systems are not presently connected to other systems. Furthermore, the hardware was not designed to process transactions and information not related to their intended use, and such use is against the express guidance of the program managers (45; 51). These systems would not be defined to be a centralized database by the author. The fact that much of the data necessary to support an EIS is being captured at many facilities is certainly advantageous. However, since the capabilities for expansion of applications using the available hardware are limited, the opportunity for inexpensive piggybacking of an EIS onto currently installed systems does not appear possible. Capturing the necessary data is not the only required foundational element for an EIS. In order to make use of the data, the facility must have the capability to transfer data from the point of collection to the executive's terminal quickly and easily. This data transfer requirement implies the need for a local area network connecting key data collection nodes within the hospital with the administrator's device.

The existence of a local area network (LAN) in a facility is a matter of practical necessity for EIS support. Although it is theoretically possible that an EIS could be supported without a LAN, and, instead, use a staff member to

manually upload updated data required by the EIS using floppy disks, such an approach is operationally impractical and should not be considered as a long-term solution for EIS implementation. After a LAN is established in a facility, some of the simplest and most basic capabilities to be implemented are electronic mail and electronic file transfer. The fact that neither LANs, nor the rudimentary capabilities supported by a LAN exist in most USAF hospitals now is a serious obstacle not only to EIS implementation, but an impairment in the efficient operations of a myriad of functions supported by automated systems.

Analysis of Investigative Question 6

Investigative Question 6 sought to answer the following question: To what extent do administrators desire an EIS which also supports DSS elements of database manipulation and exploration of hypothetical scenarios?

The reliability of the composite variable testing for the importance of including DSS aspects in an EIS for hospital administrators, composite variable G, resulted in the highest Cronbach alpha score for this study, .8784. The composite variable was very broad and inclusive in its coverage of DSS capabilities. In fact, nine separate questions were used to generate the composite mean score for this variable. Table 44 shows the aspects of DSSs addressed by the component questions included in composite variable G.

The mean score for the composite variable for inclusion of DSS components, as itemized in the above table, was a quite favorable 5.75 rating on a seven point scale. This approval rating was just slightly lower than the score for the support of an EIS in general. Based on this positive reaction, it seems that an EIS should contain some DSS components to meet the needs of USAF hospital administrators.

Table 44. DSS Aspects Covered by Composite Variable G

Survey Item No.	Mean	Focal Issue of Question
154	6.29	Access to historical data for trend assessment
155	5.65	Inclusion of evaluation criteria in the system
156	5.85	Inclusion of baseline data to assist in comparisons with similar sized facilities
157	5.65	Inclusion of reference point information to assist in comparisons with other hospitals in the MAJCOM
158	5.29	Inclusion of normative baseline criteria for comparison against a standard
159	5.73	System identification of deviations from expected or desired performance requiring the administrator's intervention
160	6.21	Support of manipulation of input variables in support of sensitivity analysis or "what if" scenario examination
161	5.69	Inclusion of relevant decision models
163	5.33	Presentation of alternative courses of action

Analysis of Investigative Question 7

Investigative Question 7 asked to what extent the computer hardware used by Air Force Medical facilities was similar.

All Air Force Hospitals have the following systems which capture some of the most highly regarded management indicators: AQCESS for Patient Administration, MEPRS for Medical Resource Management, and MEDLOG for Medical Logistics (49; 55). These systems are comprehensive stand alone minicomputer systems which include both the software and the hardware necessary to run the desired operations.

AQCESS includes the following management information data:

Hospital incident reports
Hospital injuries
Bed occupancy
Patient deaths
VIP patient status
Hospital status

MEDLOG includes the following key management indicators:

Overdue/critical backorders
WRM program percentages

MEPRS includes only one of the highly rated figures:

Cost accounting data

All CONUS inpatient medical facilities have these systems. However, the use of these systems for purposes other than the system for which they were built is strictly forbidden by the agencies which made the central procurement

of these hardware systems and continue to manage them (49; 55). The result of this guidance is a triad of rather powerful systems which do not interface with each other or other management information systems in the facility, when available. In addition to these systems, some respondents reported the existence of other insular Tri-service systems initiatives, such as the Tri-Pharmacy and Tri-Lab systems. Few other systems beyond these centrally procured, insular systems were reported except for the Phoenix system, reported by three facilities, which is a comprehensive industrial hygiene/environmental health system initiative of the Air Force Logistics Command.

Investigative Question 7 Analysis Summary. Apart from the three aforementioned universal systems, scarcity and diversity, rather than abundance and uniformity seems to be the rule regarding large size computer hardware in Air Force hospitals. Indeed, most facilities reported no automated resources other than microcomputers beyond the AQCESS, MEPRS and MEDLOG systems. The problems associated with insular and disparate systems has been recognized by Department of Defense medical systems personnel. Several agencies, including the Air Force Office of Medical Support, are working at developing and implementing the Comprehensive Health Care System (CHCS) which will build a universal and comprehensive hardware platform to support a medical facility's data processing needs (21). CHCS is a promise of a future hardware environment which, optimistically, will be

established during the latter half of this decade (21). CHCS is not a solution currently available. The hardware situation in USAF medical facilities with its present insular configuration represents a technical obstacle for EIS implementation. Under the current fiscal climate, the likelihood of obtaining sufficient financial resources to overcome this problem seems quite small (21). Therefore, under current circumstances, it does not appear to be economically feasible to enhance the information systems infrastructure to an extent where an EIS addressing the entire spectrum of an administrator's information needs would be technically feasible (21).

Analysis of Investigative Question 8

Investigative Question 8 asked: To what extent is the level of technical and motivational feasibility correlated with various factors including rank, hospital size, experience, and level of satisfaction with current information gathering methods?

Correlations between an administrator's measured motivation for an EIS and various demographic factors were measured in the hope that more obvious and easily retrievable information could be used as surrogates to assess a given administrator's motivation to have an EIS. If, for example, administrators from larger facilities were consistently more favorably disposed toward EIS than administrators from smaller facilities, a strong case for

placement of EIS in larger facilities could be made, all other factors being equal. Motivational feasibility would not have to be determined through administration of a survey to individuals but, instead, could be assessed on the basis of the more easily identified factor of facility size. Unfortunately, the data did not show any convenient, statistically significant correlations which could act as surrogate indicators for assessing motivational feasibility. Table 45 depicts the Spearman correlation coefficients for the various factors of interest. Spearman's rho was used in lieu of Pearson's product moment coefficient because the assumption of a normal distribution for some of the variables, such as facility type, could not be made. In such cases, Spearman's rank correlation coefficient is the appropriate correlation measure (200:980). Rather than examine correlations between normally distributed variables with Pearson's r and the remainder with Spearman's measure, the researcher chose to present all correlation findings using Spearman's r for the sake of uniformity. No correlations of any great strength were found. However, two correlations of statistical significance were noted. First, the level of comfort that an administrator has in computer systems in general is strongly correlated with the administrator's motivation to have an EIS. This means that the more comfortable the administrator was with automation systems in general, the more likely it was that he would be favorably disposed toward acquisition of an EIS to support

his information needs. Although Spearman's r was only .423, the probability of this correlation occurring by chance was only .0017. A second correlation which was unlikely to occur by chance, with an observed significance level of .0436, was that between satisfaction and motivation/desire to have an EIS. The Spearman coefficient was -.28105. This correlation indicates that the less satisfied the administrators were with their current information gathering methods, the more eager they were to have an EIS.

A second area of interest in investigative question eight was to what extent the factors of technical feasibility are associated with a variety of variables. It was not possible to determine the relationships between technical feasibility and the administrator reported experience, confidence in his systems staff, or satisfaction with current methods, as originally intended, because the changes in the administrator's survey dictated by the Military Personnel Center (MPC). MPC's requested deletion of items in the survey identifying the responding facility made it impossible to link the administrator's perceptions to the technical aspects of his facility, which were captured in the systems officer's survey. The only variable that could be assessed for its correlation with the presence of technical feasibility was that of facility size. Unfortunately, this correlation did not show a well defined differentiation of technical support capability between facilities of various types. Almost all hospitals reported

a machine on hand which was larger than a microcomputer. However, both of the facilities which did not have this capacity were the smallest of the USAF hospitals,

Table 45. Spearman Correlation of Motivation Level with Other Factors.

FACTOR	SPEARMAN'S R	P-LEVEL
Rank	-.00332	.9814
Hospital Type	-.03284	.8191
Number of Inpatient Beds	-.0101	.9417
Experience in Current Position	-.1812	.2080
Experience as a Hospital Administrator	-.1382	.3383
Experience as an MSC Officer	-.0719	.6234
Administrator Confidence in Systems Staff	-.00345	.9806
Administrator Satisfaction with Current Info Gathering Methods	-.28105	.0436
Administrator Comfort with Automation	.4237	.0017

those in the 1-20 bed capacity. Tables 46 and 47 display the availability of a centralized database with relation to

bed size and facility type, respectively. This examination revealed the somewhat more distinguishing, but not unexpected, responses. Essentially, the larger the facility, the more likely it is to have hardware and software of greater complexity.

Table 46. Availability of Centralized Database by Bed Size [n=52]

	Hospital Bed Size				
Centralized Database	1-20	21-40	41-60	61-100	101+
No	13	9	3	0	2
Yes	8	5	7	2	3

Table 47. Availability of Centralized Database by Hospital Type [n=51]

Centralized Database	Hosp	Rgn Hosp	Med Cen
No	23	2	2
Yes	16	6	2

The expected distribution of centralized databases existing mostly in larger facilities is supported, but exceptions do exist. As a rule, however, the larger the facility, the more likely it is that it has the hardware and database in place which would make the addition of an EIS more technically feasible. These results do not indicate that EIS would be feasible in the larger types of facilities and not the smallest, although there is a tendency for the larger facilities to have the infrastructure necessary to support an EIS.

The results of the analysis of this final investigative question are disappointing from a practical point of view. Unfortunately, there is no clear cut differentiation between large and small facilities from the perspective of technical feasibility. Equally unfortunate is the fact that those characteristics which distinguish between levels of motivational feasibility for EIS are not readily usable since they are unique to an individuals perceptions and not easily identified. As a result, any prototype testing or limited implementation scheme for EIS would be best advised to proceed after asking the administrator a series of questions relevant to assessing his level of motivation for EIS and determining if the required technical infrastructure was available at the potential installation site. An easier way of selecting initial installation sites does not seem to be available.

Comparative Perceptions of Survey Populations

Some questions were posed to both the administrators and the medical systems officers for purposes of comparison. Table 48 shows these parallel questions in the surveys. The (I) following a question number stands for inverse. These questions were the same as in the other questionnaire except that they were stated in negative form. The means shown in the table for these adjusted questions were transposed to reflect the equivalent score of the question had it been asked in a non-negated form. The wording in the two

questions is identical except in those cases where the administrator is referenced. The different wording of the question in the administrator's survey is shown in parentheses for those instances where it differs from that contained in the systems officer's survey. T-tests were performed to determine whether a statistically significant difference between the population means existed. All levels of significance led to a failure to reject the null hypothesis that the perception means are equal using alpha at .05.

Table 48. Comparative Ratings in Parallel Questions.

Question No.		Mean		p-level	Question
SGI	SGA	SGI	SGA		
17	151	6.05	6.31	.246	I think that an on-line EIS containing the information items shown in question 16 (Section IVA) would be valuable to my administrator (to me).
18	152	5.78	5.93	.5418	I think my administrator (I) would use an on-line EIS containing the information elements listed in question 16 (Section IVA) to supplement his (my) information gathering methods.
22	169	3.90	4.38	.1586	In the past, management information systems have cost more than they were worth.
23(I)	170	3.53	3.53	1.0	I (do not) believe that the costs of a future management information system would outweigh its benefits.

Summarizing these findings, it seems that both administrators and medical systems officers are supportive of the EIS concept. Both populations believe that the administrator would use an EIS, if installed with the capabilities identified in the survey. Neither population showed great enthusiasm for systems already in place; they were neutral in their opinion on whether past information systems were worth more than their cost. They displayed somewhat more hope that future MISs would contribute benefits in excess of their costs. The mean perceptions of the populations on these issues did not show any statistical differences. What these data do seem to indicate is an uncertainty of the value of systems in general, both past and future, but a comparatively higher perception of the value of an EIS. This outcome is yet another piece of evidence pointing toward a high level of motivational feasibility for an EIS.

Summary of Analysis

This chapter analyzed the responses to the questionnaires of the two population groups under study, USAF hospital administrators and medical systems officers of CONUS inpatient medical facilities. The response rate for both populations exceeded 75 per cent. The profile of the respondents in terms of facility type did not differ significantly from that of the population as a whole for both groups. The typical administrator was a Lieutenant

Colonel at a small hospital in his first time in the position of hospital administrator. The typical medical systems officer was a Captain from a small hospital with between two and six years in the Medical Service Corps and with less than one year of tenure in the position of medical systems officer.

The reliability of several composite variables was assessed using Cronbach's coefficient alpha. Five of the seven reliability measures proved to be reliable and were used in later analyses. Two of the seven reliability factors were not reliable and were not used. In these cases, the components of the composite variables were each examined individually in order to analyze the data toward the end of determining answers to the investigative questions. The analysis proceeded by analyzing the data with the aim of answering the investigative questions left unanswered by the literature review. Administrators were found to be somewhat dissatisfied with their current information gathering methods and very much in favor of the EIS concept as an aid to their efficiency and effectiveness. Moreover, there was strong support voiced for the inclusion of DSS features in the EIS design. Based on these responses, an EIS was determined to be motivationally feasible.

Management indicators used by hospital administrators were found to be stable over time. There was no statistically significant difference in the relative and

absolute rating for value given to a set of 127 management indicators by hospital administrators in 1990 vis-a-vis ratings given by hospital administrators in 1987. However, some dramatic shifts in indicator values were noted; these were attributed to shifts in policy or environmental conditions. The relative stability of management indicators supported an aspect of technical feasibility for an EIS. However, the shifts of a significant minority of variables made it clear that any new EIS system should be designed with flexibility if it is to be a practical tool of lasting effectiveness.

Neither hospital administrators nor MSOs felt very confident of the ability of the assigned systems staff's ability to comprehend and support the use of a complex information system. This evaluation seemed reasonable based on the responses given by systems officers in other portions of their survey. The typical systems officer spent 25 per cent or less of his time on systems duties, had no formal training in medical systems and had a staff of one or none to perform the extensive responsibilities levied on them presently by Air Force regulation. In open comments they clearly expressed the viewpoint that they felt that their resources were insufficient to carry out their assigned missions at the level of quality which they desired. Assuming that an EIS is not dissimilar to other complex information systems in its need for the initial stages of implementation to be guided and supported by information

systems professionals, it seems clear that an EIS would not be operationally feasible unless additional manpower resources with proper background and training were assigned along with the EIS.

Air Force medical facilities currently lack the data and technical infrastructure necessary to support an EIS. Less than half of the management indicator items which administrators consistently rated highly were being captured in a database. The systems capturing the data were isolated, stand-alone, single function systems. Most facilities did not have a local area network. Furthermore, apart from three centrally purchased stand alone systems, much diversity existed among installed systems in USAF inpatient medical facilities. All of these factors lead to a conclusion that an EIS would not be technically feasible given the current state of USAF medical information systems. Overcoming this technical obstacle would involve a financial commitment which may not be economically feasible in the foreseeable future (20). The degree of administrator interest in an EIS was not correlated with any of the following factors: rank, facility type, bed size of facility, experience, or confidence in the local medical systems staff. Statistically significant correlations were found between motivation for an EIS and general comfort level with automated systems and level of satisfaction with current information gathering methods. The more comfortable the administrator was with automated systems, the higher the

level of his support for an EIS. The less satisfied the administrator was with current information gathering methods, the higher his level of motivation for an EIS. Both of these statistically significant correlations with motivation for an EIS are based on individual perceptions rather than institutional characteristics. As a result, the findings are not particularly valuable in determining an implementation strategy since individuals in the Air Force rotate on a rather frequent basis.

This chapter described the analysis performed on the responses to survey instruments sent to USAF hospital administrators and medical systems officers. Chapter V will continue the discussion of the findings alluded to in this chapter by addressing the implications of the answers to the investigative questions on the feasibility issues under study. In addition, recommendations for future research and action based on these findings and an overall conclusion will be offered.

V. Findings, Recommendations, and Conclusion

Introduction

This thesis has considered the question of whether an executive information system (EIS) for USAF hospital administrators is feasible and desirable. Chapter I introduced general issues surrounding the current health care environment and pointed out the critical importance to health services administrators of timely and properly scoped information. An EIS approach was identified as a method which would seem to meet the information needs of USAF hospital administrators. Eight investigative questions were developed to enable the researcher to determine the extent to which an EIS for USAF hospital administrators is feasible and desirable at the present time.

A literature review was performed in order to better understand EISs, how they fit into an organization, and what factors are critical to their successful introduction into an organization. This research, with highlights reported in Chapter II, showed that an EIS is a management information system which seeks to provide the executive with critical information easily. An EIS also has the capability to disaggregate composite and summary data and to view data details. An EIS sometimes incorporates elements of decision support systems as well. It was determined that motivational, technical, economic and operational aspects of

feasibility must all be met for such a system to be considered feasible. The results of the analysis of these aspects of feasibility will be discussed in detail in a later section of this chapter.

Two survey instruments, one for medical systems officer and another for administrators, were developed in order to assess the feasibility of an EIS for USAF hospital administrators. These surveys are available at Tabs C and D for the administrator and medical systems officer surveys, respectively. The surveys were sent to the 66 CONUS locations, identified in Appendix A, which have an inpatient medical facility. A response rate of approximately 80% was achieved for both surveys. An extensive analysis of the survey responses was performed and the salient highlights of this analysis were reported in Chapter IV.

This chapter addresses the four aspects of EIS feasibility studied in this research, makes recommendations for action and further research, provides an overall conclusion regarding the desirability and feasibility of an EIS for USAF hospital administrators and presents the implications of the research. The findings section of the chapter does not undertake any new data analysis tasks. Instead, it summarizes and reorganizes the analysis reported in the previous chapter and discusses it using the aspects of feasibility as the structure for the discussion. In this way, the researcher hopes that the reader will be able to refocus his thoughts on the ultimate research objective,

namely, the question of the desirability and feasibility of an EIS.

Feasibility Findings

The surveys sought to determine the feasibility of an EIS based on four aspects of feasibility: technical, economic, motivational, and operational. An analysis of the survey results shows clearly that a comprehensive EIS for USAF hospital administrators is not feasible under current conditions because feasibility levels for certain aspects, most notably technical and operational, are less than optimal. However, none of the problematic conditions which currently impede the feasibility of an EIS are insurmountable. The following subsections review each aspect of feasibility studied and the outcome of the analysis of the data related to the given feasibility aspect.

Technical Feasibility. Technical feasibility involved an assessment of several underlying factors which were addressed in the investigative questions. First, for an EIS to be technically feasible, a certain minimum level of information system infrastructure is necessary. This infrastructure includes a local area network and a mainframe, or a series of interconnected pieces of hardware, to serve as a reservoir of the centralized database from which the EIS must draw. The analysis of investigative questions five and seven were helpful in determining the

status for this aspect of technical feasibility. A local area network did not exist in the bulk of the facilities studied and a centralized data storage facility was reported to be present in only half of the facilities. Based on the findings in the literature review and the analysis of survey responses to applicable investigative questions, the absence of these two key EIS supporting elements means that an EIS cannot be considered technically feasible at the present time.

A second aspect of technical feasibility revolves around the ability to identify a relatively stable set of critical success factors in common use by USAF hospital administrators. This relatively stable set of indicators is necessary to avoid frequent modifications which would make maintenance of a relevant EIS impossible. The results from the previous chapter which discussed the analysis of investigative question #3 were helpful in assessing this aspect of technical feasibility. The set of performance indicators used by Parker in 1987 was evaluated again in 1990 by USAF hospital administrators of CONUS facilities. Sixty per cent of all indicators remained in the same quartile in 1990 as they were found in 1987. Perhaps even more significantly, 75 per cent of the indicators in the top quartile in 1987 remained in the top quartile in 1990. No statistically significant shift in rank ordering was noted for the overall set of indicators. Therefore, it seems

clear that this aspect of technical feasibility is not a problem.

The results of the technical feasibility assessment are encouraging. The fact that a stable set of management indicators can be identified means that an EIS will be technically feasible as soon as the necessary infrastructure of hardware is installed into USAF medical facilities. Relatively stable indicators are a fundamental component necessary for the feasibility of an EIS. While LANs and centralized data repositories to accommodate an EIS may be built someday, it is not acceptable or possible to force executives to change the indicators they use to make decisions about an organization just so they can use an EIS. Faced with a choice between using an EIS which provides them with information they do not desire or a manual system that provides them with information they do desire, executives will almost certainly use the latter system to support their needs and let the automated system lie idle and unused. The fact that an EIS for USAF hospital administrators is technically infeasible at present only because of the absence of an automated infrastructure means that the technical obstacle is a temporary one which can be cleared as soon as the will and the resources exist to clear it.

Economic feasibility. As was mentioned in Chapter II, only a limited assessment of economic feasibility can be conducted under the scope of the current research. Assuming the standard means of system acquisition in USAF hospitals

continues to be followed, an EIS purchase decision will not be made at a facility level. Facilities are not funded at levels which permit them to develop, install, and maintain complex information systems with local resources (20). Instead, the Air Force's approach of buying standard systems for all facilities, as has been done with AQCESS (Patient Administration), MEDLOG (Medical Logistics), and MEPRS (Medical Resource Management) will most likely be used to fund the development and installation of an EIS into individual facilities.

The approach of standardized, centrally managed system acquisition will be used to obtain the next major system in planning, the Composite Healthcare System (CHCS) (21). The approach of implementing standardized systems throughout USAF facilities serves to enhance the economical feasibility of an administrative EIS in the long term. Standardized systems mean that a single EIS can be built which can be operated at all USAF inpatient medical facilities. The direction toward standardized systems, coupled with the strong belief that an EIS will increase the efficiency and effectiveness of hospital administrators, encourages the position that investment in an EIS will not require a large amount of resources in proportion to the benefits which it will provide once most of the planned CHCS functions are installed. Until these CHCS functions and LAN connectivity are installed, however, an EIS will be relatively infeasible economically.

A factor which may come to work against an EIS's economic feasibility in the future is the extent to which administrators favor direct personal contact as a method for obtaining information. As pointed out in Chapter IV, administrator's believe that direct personal contact with subordinates in the information gathering process adds value to the information given. This result would suggest that administrators might view an EIS as a supplement to their information gathering methods instead of a substitute. If this is the case, then the potential benefits of an EIS would be reduced and such a reduction may tip the scales of a cost/benefit analysis of an EIS against EIS implementation from an economic feasibility perspective.

Motivational Feasibility. A system would be feasible from a motivational viewpoint if the target user group is not happy with current methods or if they see that the proposed system will enhance their performance. The analysis of investigative question two was useful in assessing the overall motivational feasibility of an EIS for USAF hospital administrators. An EIS does not seem to have a problem in the area of motivational feasibility. Even though administrators are neither happy nor unhappy with their current methods of information gathering, they are, almost without exception, enthusiastically supportive of the potential of an EIS to help them perform their duties. Moreover, as demonstrated from the analysis of investigative question six, they would like their EIS to incorporate

decision support system (DSS) elements which will help them to use the information provided by the system more effectively. Administrators reflected their high confidence in the ability of an EIS to improve their effectiveness and efficiency by giving it the highest positive rating on the survey, a 6.09 on a seven point scale. Based on this and other related results, little salesmanship would seem to be necessary to convince Air Force hospital administrators to try an executive information system built for their use. The extremely favorable indicators for motivational feasibility set it in sharp contrast to the final feasibility aspect considered, operational feasibility.

Operational Feasibility. Operational feasibility for an EIS was measured by evaluating the administrator's, and the medical systems officer's own, confidence in the ability of the local systems staff to support the operations of a complex new piece of automation, an EIS. The responses related to investigative question number four were helpful in assessing this aspect of feasibility. Both target population groups assessed the competence of the systems staff to provide the operational support necessary to guide the effective use of a complex information system like an EIS to be mediocre, at best.

The composite measure used to assess the systems staff's level of confidence, variable D, was approximately four on a seven point scale with one representing the opinion that the staff was incompetent and a seven

indicating competence. The user's belief that the systems staff is competent is critical in determining the confidence of the using group with regard to the systems staff's ability to provide them with the support they need in using a complex, new system, particularly the first stages of implementation. If users do not have a high level of confidence in the systems staff, operational feasibility is unlikely. Administrators lack confidence in the ability of their systems staff to provide support for complex information systems and their systems officers do not disagree with this assessment.

Several factors account for this absence of confidence in the systems staff by both administrators and systems officers. The primary factor seems to be the low level of staffing for the systems function at a local level. Many systems officers currently feel overwhelmed by their assigned systems responsibilities. Adding the responsibility of operationally supporting a new system appears to be anathema to them unless additional manpower resources are allocated.

Secondary reasons for this low level of confidence include the frequency of rotation into and out of systems roles for the systems officers and staffs, and the absence of the training, education or experience necessary to comprehend complex systems. The result of these problems is a local systems staff which is unprepared and unable to perform at a level which will support the operation of an

EIS by the hospital administrator. Therefore, an EIS is not operationally feasible under these circumstances.

These operational obstacles can be overcome, but only if resources are expended to train and educate a cadre of systems professionals and maintain their ability by keeping them involved in systems for longer periods of time. In addition to ensuring that staff members have suitable backgrounds, staff sizes and algorithms for allocating systems office staffing should be re-evaluated. Such action will ensure levels of staffing which are capable of fulfilling assigned tasks as well as providing support to end users of automation in the hospital. The result of these systems staff improvement actions will benefit end users by enabling them to make maximum productive use of purchased systems.

There is no substitute for well-trained local systems staff members who have the time and ability to lend supportive expertise to expand and improve the use of organizational computing resources. The absence of such a resource in USAF medical facilities has negative operational implications not only for the EIS, but for all automated systems, both in place and projected. Unfortunately, in a resource environment where cuts rather than enhancements are the mode, this deficit in systems staff numbers, ability and capability will be difficult to overcome. Therefore, operational feasibility obstacles will be the critical

barrier for the Air Force medical service to overcome if it desires an EIS for its administrators.

Summary of Feasibility Findings. The results of the feasibility assessment were mixed. Some of the factors evaluated showed an EIS to be feasible under the current conditions, while others identified obstacles to EIS feasibility.

Survey analysis revealed several obstacles which must be cleared prior to the installation of an EIS. Foremost among these obstacles was the size and background of locally assigned medical systems staffs. A majority of medical systems officers (MSOs) reported that, excluding themselves, they had a staff of one or less to attend to their assigned duties as systems officers. Moreover, almost a majority of medical systems officer responding (25/52) to this question, reported devoting less than 25 per cent of their time to systems duties. Several MSOs vented their frustration with this situation in open comments. They also complained that both they and their staffs lacked the proper background to function confidently in their systems roles. Administrators were neutral overall regarding their confidence in their systems staffs to handle complex management information systems. These problems represent a significant barrier to the operational feasibility of an EIS or any other complex management information system.

Aspects of technical feasibility were identified as another barrier to an EIS, particularly, the absence of LANs

in most of the surveyed facilities. LANs represent a basic foundational element for the EIS. A LAN enables the EIS terminal to tap into resources stored at other locations within the organization and is absolutely essential to EIS operations. The widespread absence of LANs in USAF medical facilities makes an EIS technically infeasible at the present time. Furthermore, the need to have a LAN in order to support an EIS lessens the economic feasibility of an EIS, since LAN installation cost would have to be added to the marginal cost of the EIS alone if an EIS were installed under the current circumstances. Despite these obstacles, there are several things that bode well for a future EIS installation.

The economic feasibility of an EIS yielded inconclusive results. Certainly, until CHCS is implemented and LANs are installed, the marginal cost of implementing an EIS would be prohibitively high. Assuming the implementation of CHCS and LAN installation, the economic feasibility of an EIS remains unclear. A proper assessment of this feasibility aspect would involve the determination of the extent to which an EIS replaced or improved current information gathering methods. A field experiment is necessary to answer this question. The outcome of such research would be the quantification of the potential benefits of an EIS and make the cost/benefit analysis of economic feasibility possible.

Foremost among the factors favorable to EIS implementation is the interest administrators have in its

capabilities. Administrators are neutral in their overall rating of their current information gathering methods, but strongly positive with regard to their belief that an EIS will be of benefit to them. An EIS is feasible from the motivational perspective. Based on this result, the evidence would seem to indicate that an EIS for hospital administrators is desirable. A second important feasibility factor which favors EIS implementation is the relative stability of management indicators used by hospital administrators. The current survey revealed no significant changes overall in the rank ordering of 127 management indicators from 1987 to 1990. This means a system, once built, will only require a moderate number of periodic adjustments in order to maintain its utility to administrators. This result means that an EIS is technical feasible in this regard. The fact that administrators are motivated for an EIS and that the management indicators they use are relatively stable are findings of critical importance. These two feasibility aspects are most important because they represent aspects of feasibility which are not likely to change. Had either of these aspects of feasibility proven to be infeasible, then there would be little chance of ever implementing an EIS. Fortunately, this was not found to be the case.

The feasibility analysis accomplished two important things. First, it identified specific obstacles to the feasibility of an EIS. More importantly, however, it showed

that there were no obstacles to feasibility which could not be overcome. The following section will include recommendations which address the obstacles to feasibility and which, if followed, should result in their removal.

Recommendations

Two types of recommendations appear necessary. The first involves recommendations for action by the Air Force Medical Service. The second group of recommendations involve areas for future research which this effort would like to have examined had time been available.

Recommendations for Action. Two types of recommendation for action are offered. First, four foundational actions are identified which serve to clear the current obstacles to the feasibility of an EIS. Second, recommendations broader in scope are offered which seek to capitalize on lessons learned from this study.

Four things must happen if sophisticated medical systems are to be used to the maximum extent of their potential in USAF medical facilities. The following paragraphs highlight each recommended action and the reasons behind them.

First, interconnectivity between systems must be achieved. Local area networks must be installed in all facilities and data captured by one section in the facility should be available to other legitimate users of the data without the need of re-entering the data. While the

contributions of MEPRS, MEDLOG, and AQCESS and other data capturing systems are important, their isolation precludes movement to a higher level of medical management. If the data captured by these systems is linked by a LAN, these data can be shared by all in the facility with a need to know. Thus, instead of supporting a single functional area, all affected staff could benefit. For example, access to MEDLOG data could allow a pharmacist to know when to expect the arrival of a needed and out-of-stock medication. This knowledge could be passed on to a patient or prescribing physician and the aggravation involved with contacting medical supply for the information and then relaying the information could be avoided. Similar benefits of improved data access occur for executive staff members, who are ultimately responsible for a large number of programs. By providing access to data stored by a single section to users in other sections of the hospital, a LAN multiplies the utility of the data capturing systems at relatively little cost. These benefits of a LAN accrue to the facility regardless of whether or not an EIS is installed. Action should be taken to connect all major data capturing systems in a medical facility.

A second recommendation which will be beneficial to medical facilities regardless of any ultimate decision regarding an EIS is that a standard configuration of CHCS be installed into medical facilities as quickly as possible. At present, AQCESS, MEDLOG and MEPRS capture only about half

of the management indicators that hospital administrators have consistently rated to be the most valuable. CHCS promises to capture the bulk of the 127 management indicators identified in this study. The installation of this comprehensive data collection system will provide the proposed EIS with the comprehensive, centralized data base which it requires to be fully functional.

Third, the training and educational opportunities for medical systems officers and their staffs must be seriously evaluated. It is apparent from the research that current methods inspire little self-confidence in abilities and little confidence from end users. As systems get more and more sophisticated, it becomes increasingly unreasonable to assume that a position in a systems office can be held by any medical service corps officer or medical administrative specialist as a part of the job rotation approach used by many hospital administrators. The complexity of medical systems encourages the development of a specialized cadre of personnel who will be used, if not exclusively, then predominantly, in a systems role. One approach to this might be to fill positions in the systems office with greater proportions of civilians. A second approach would be to use the Air Force Specialty Code (AFSC) prefix designation for systems training, the "C" more extensively at the base level and to ensure that award of the "C" prefix only be made after an individual underwent extensive and rigorous training.

The fourth, and final foundational recommendation for action is for the establishment of a multidisciplinary task force to study the reasons underlying the staffing levels of systems offices in Air Force hospitals. This task force should determine whether it is the staff sizing algorithm, local allocation decisions, or other reasons that are the cause of the excessive leanness in the staffs of medical systems offices. The task force should then make recommendations to the Air Force Surgeon General on appropriate staff size and what must be changed to provide adequately staffed systems offices at USAF inpatient medical facilities. Hopefully, such a task force would be successful in making recommendations which would result in medical systems offices being sized to a level where they could be more effective in operationally supporting installed information systems.

Concurrent with the foundation building actions described above, the monitoring of executive information systems for medical administration should continue. Recently, the Comprehensive Healthcare Management (CHCM) demonstration project was announced by the Defense Medical Systems Support Center. CHCM is an umbrella program which is testing a number of initiatives for the improvement of military healthcare management (20). Pilot studies and prototype testing of EISs should be included under the CHCM umbrella and results should be carefully evaluated and scrutinized by the Air Force Medical Service. If these

recommendations for action are followed, the EIS will be able to overcome the current technical, economic, and operational barriers to feasibility and will become a feasible option for improving the management of Air Force inpatient medical facilities.

The final recommendation for action is that the recommendations suggested in this thesis be incorporated into a strategic plan for systems development by the systems branch at the Air Force Office of Medical Support. It is important that the results of this and other research efforts related to the topic of systems improvement be communicated to this focal agency for consideration and action. Incorporating key results of academic research into a strategic plan ensures that valuable data and information are not lost and are considered by those responsible for initiating the actions which will bring future improvements to the capabilities of Air Force medical systems.

Recommendations for Research. The research revealed several opportunities for additional research in the area of EIS applications for the Air Force medical service. Particularly salient to the EIS issue in Air Force facilities would be an evaluation of what indicators are used by medical facility commanders, chief nurses, chiefs of hospital services and chiefs of aeromedical services. To what extent could these systems be merged into a single comprehensive EIS to be used by all members of the medical facility executive committee? The answer to this research

question might serve as the basis of an alternative approach in building a comprehensive EIS for all members of the medical facility's executive management team. The feasibility of a more comprehensive EIS would require additional evaluation, however. Specifically, although the indicators used by administrators appears to be stable, the extent to which this is the case for the indicators used by other member of medical executive management has not been studied.

A second question for research regards the optimal number of indicators used or desired by executives in an EIS. Is there a size beyond which the marginal benefit of providing an additional indicator is outweighed by the marginal cost of adding that additional capability, or is more always better? Operational testing and evaluation of a working EIS prototype would be critical in determining the answer to this question. Moreover, this question will have to be answered at some point prior to the installation of an EIS in order to ensure the delivery of a system that supports an administrator and does not compound his frustrations by burdening him with information overload or information shortfalls.

Another critical unanswered question concerns the selection of management indicators. This study has confirmed the relative stability of the set of indicators identified by Parker. However, this study did not determine whether or not alternate, and perhaps superior, indicators

are being used in the field by hospital administrators. Extensive field studies or interviews would be necessary to ferret out this valuable information.

Finally, the USAF hospital administrator EIS was only tested on the basis of its concept. The next logical step in growing and testing the support for an EIS would be a proof of the validity of the EIS concept through the field testing of a prototype EIS. Such a test should be accomplished to determine whether or not the enthusiasm for this or any other EIS can be sustained when the concept is made tangible; and, it would provide a more compelling basis for pressing forward with the implementation of an EIS into USAF medical facilities.

In addition to confirming the motivational feasibility of an EIS, a prototype EIS would make possible a field test to determine the extent to which the EIS supplants existing information gathering methods of administrators. As indicated in the comments in this chapter concerning economic feasibility, the case for an EIS is weakened from an economic standpoint if it is merely used as a supplementary information gathering device. An EIS must be able to demonstrate improvements in decision-making quality, efficiency, or effectiveness to give it benefits to offset economic costs associated with its installation and operation. Failure of an EIS to replace or improve current information gathering methods would indicate that the EIS was not a system which would result in long-term savings.

Under current budgetary circumstances, a system that delivers a redundant service without reducing costs is unlikely to receive a share of ever scarcer budget dollars. Therefore, an experiment to determine the extent to which an EIS can reduce costs is a vital research task; it is a task which is possible only through the development of a working EIS prototype.

Conclusion

The objective of this research was to determine whether an EIS for USAF hospital administrators was feasible and desirable. The research clearly indicates that administrators and medical systems officers alike believe that an EIS is a desirable tool. Unfortunately, this desire cannot be gratified at present due to some obstacles in feasibility for an EIS. As detailed earlier, these obstacles are found in both the technical and operational realms.

First, the technical infrastructure necessary to support an EIS effectively is absent. As long as this is the case, the economic feasibility of EIS will remain in doubt as well, due to the added marginal costs which are associated with the implementation of an EIS. The second obstacle to EIS installation is a local medical systems staff which, generally, lacks the size, expertise and confidence to shoulder the burden of supporting the operations of a complex management information system. The

literature has shown that newly installed systems need, among other things, the assistance of a qualified systems staff which is competent and able to answer questions on system utilization which occur in the initial stages of systems implementation. If users are not assisted during the critical initial stages of implementation, the system is likely to fall into disuse. The technical and operational obstacles described are not insurmountable, but action is required for these obstacles to an EIS to be eliminated.

An EIS for USAF hospital administrators is a tool desired by USAF hospital administrators and is feasible from a motivational perspective. The attractiveness of the EIS concept to hospital administrators and the critical role they play in effective medical facility operations makes the continued monitoring and consideration of EISs in healthcare applications a worthwhile endeavor. Development and testing of prototype EISs would help to maintain the interest of administrators in this tool. If a working prototype EIS was built and still enjoyed a strong level of support from USAF hospital administrators, the case to use whatever resources were necessary to overcome the current feasibility obstacles to an EIS could be made more emphatically. However, in the opinion of this researcher, a prototype system built as a "proof of concept" is not necessary to begin serious efforts in clearing the obstacles to an EIS for hospital administrators. Overcoming the obstacles to an EIS's feasibility is an important objective for the Air Force

medical service because the obstacles to an EIS will probably be obstacles to extracting the maximum potential from any sophisticated management information system. Overcoming the technical and operational obstacles to an EIS will unlock the potential both of systems installed and of those planned for installation into USAF medical treatment facilities in the future. Therefore, even if an EIS never is installed in Air Force medical treatment facilities, the foundational recommendations for action should still be considered, since the obstacles which these actions seek to eliminate represent a hinderance to a wide range of information systems operations.

Appendix A: Locations of USAF Inpatient Medical Facilities in CONUS

1. Hospitals

Altus OK
Barksdale LA
Beale CA
Bergstrom TX
Blythville AR
Cannon NM
Castle CA
Chanute IL
Columbus MS
Davis-Monthan AZ
Dover DE
Dyess TX
Edwards CA
Ellsworth SD
England LA
F.E. Warren WY
Fairchild WA
George CA
Grand Forks ND
Griffiss NY
Grissom IN
Hill UT
Holloman NM
Homestead FL
K.I. Sawyer MI
Kirtland NM
Laughlin TX
Little Rock AR
Loring ME
Luke AZ
Malmstrom MT
Mather CA
McConnell KS
Moody GA
Mountain Home ID
Myrtle Beach SC
Nellis NV
Patrick FL
Pease NH
Plattsburgh NY
Reese TX
Robins GA
Seymour Johnson NC
Shaw SC
Tinker OK
Tyndall FL
USAF Academy CO
Vandenburg CA
Whiteman MO
Williams AZ
Wurtsmith MI

2. Regional Hospitals

Carswell AFB TX
Eglin AFB FL
Langley AFB VA
MacDill AFB FL
March AFB CA
Maxwell AFB AL
Minot AFB ND
Offutt AFB NE
Sheppard AFB TX

3. Medical Centers

Andrews AFB MD
Keesler AFB MS
Lackland AFB TX
Scott AFB IL
Travis AFB CA
Wright-Patterson AFB OH

Appendix B: Comparative Value Ratings of Management Indicators, 1987 vs. 1990

DISPLAY #1: LISTING BY 1990 SURVEY ITEM NUMBER

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [ALL FACILITIES]	1990 SURVEY ITEM NUMBER
P/A STAFFING	3.87	3.44	24
HOSP TURNOVER	3.80	3.58	25
SPONSOR PROGRAM	3.13	2.61	26
209X DISCREPANCY	3.00	2.89	27
OJT TRAINING	3.63	3.12	28
PHYSICAL FITNESS	3.10	2.85	29
DISCIP ACTIONS	3.77	3.14	30
EVALUATIONS	4.07	3.68	31
MIL DECORATIONS	3.47	3.20	32
MILITARY LEAVES	3.27	3.29	33
DEP CARE PROGRAM	3.07	2.83	34
COMMANDERS CALL	3.40	2.50	35
OVERDUE PHOTOS	2.87	2.57	36
TDY REQUESTS	3.50	3.61	37
MED LIBRARY	3.10	2.89	38
TELEPHONE ABUSE	2.62	2.61	39
PUBS AND FORMS	3.40	3.15	40
TELECOMM	3.33	3.20	41
SUSPENSING	4.21	4.06	42
SECURITY PRGM	3.64	3.39	43
CIVILIAN AWARDS	3.41	3.07	44
EEO ACTIONS	3.24	2.94	45
CIV GRIEVANCES	3.38	2.80	46
CIV POSITIONS	3.35	3.33	47
MED READINESS	4.52	4.00	48
MOBILITY ACTIONS	4.48	3.94	49
SORTS REPORTING	4.55	3.98	50
SECTION STAFFING sgr	3.72	3.28	51
DISPOSITIONS	3.59	3.46	52
BED OCCUPANCY	4.10	3.83	53
PATIENT DEATHS	4.18	3.65	54
INHOUSE BIRTHS	3.44	3.33	55
VSI/SI/III	3.96	3.35	56
VIP PATIENTS	4.10	3.52	57
INPT FILE BACKLOG	3.97	3.85	58
NARR SUMMARIES	3.93	3.85	59
PATIENT LEAVES	2.48	2.56	60
HOSP STAFF PATIENTS	4.10	3.67	61
ER ADMISSIONS	3.38	3.57	62
READMISSIONS	3.52	3.74	63
CONTAG DISEASE	3.35	3.44	64

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [ALL FACILITIES]	1990 SURVEY ITEM NUMBER
AEROMED EVACS	3.18	3.07	65
PTS TRANSFERRRED	3.07	3.13	66
CIVILIAN PATIENTS	2.66	3.04	67
OUT FILE BACKLOG	4.00	3.70	68
APPT WAITING LIST	4.24	4.32	69
OVERDUE RECORDS	3.14	3.61	70
EMERGENCY PATIENTS	3.54	3.26	71
TRANS BACKLOG	3.52	3.74	72
INCOMPL RECORDS	3.39	3.70	73
RECORDS TRANSF	2.00	2.92	74
RECORDS COMMITTEE	3.31	3.19	75
MED INFO REQUESTS	2.59	2.81	76
PATIENT COMPLAINTS	4.29	3.92	77
MED BOARD ACTIONS	3.21	3.34	78
NONAVAIL STATUS	3.24	3.88	79
CHAMPUS CLAIMS	2.64	3.65	80
TUMOR REGISTRY	2.86	3.06	81
3RD PARTY LIAB	3.03	3.25	82
LOD DETERMINATION	2.97	2.92	83
HOSP INCIDENTS	4.57	4.00	84
PRP REPORTING	4.21	3.61	85
SECTION STAFFING SGL	3.69	0.00	0
MDSF FILL RATE	3.48	3.50	86
MDSF INVENTORY	3.45	3.33	87
INVEN TURNOVER	3.14	3.35	88
CRIT BACKORDERS	4.17	4.04	89
OUT OF STOCK	3.83	3.98	90
RECEIPTS VS SALES	3.17	3.31	91
EMERG REQUESTS	3.86	3.72	92
HIGH DOLLAR ITEMS	3.41	3.69	93
LOCAL PURCHASE	3.41	3.50	94
PETTY CASH	2.05	2.94	95
EXPENSE EQUIPMENT	3.97	4.04	96
INVEST EQUIP	3.97	3.96	97
EQUIP REPAIRS	3.59	3.83	98
SPARE PARTS	2.72	3.04	99
SALES BY AREA	3.07	3.28	100
PRODUCT RECALLS	3.97	3.83	101
SHIP DISCREP	2.72	2.98	102
NONMED SUPPORT	2.57	2.64	103
BASE DP SUPPOPRT	3.74	3.32	104
LINEN SUPPLY	2.86	2.91	105
CUST COMPLAINTS	4.18	3 74	106
FACILITY PROJECTS	4.25	4.13	107
HSKPG CONTRACT	3.50	3.57	108
CONTRACT DISCREP	3.39	3.55	109
CONTRACT AWARDS	3.48	3.51	110
SECURITY VIOL	4.29	3.91	111

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [ALL FACILITIES]	1990 SURVEY ITEM NUMBER
SAFETY HAZARDS	4.36	4.17	112
HOSP INJURIES	4.61	4.33	113
CE WORKORDERS	3.75	3.94	114
FIRE DRILLS	3.74	3.41	115
VEHICLE DISCREP	3.54	3.24	116
VEHICLE REPLACE	3.18	3.06	117
WRM PERCENTAGES	4.07	3.81	118
WRM FUNDS	3.68	3.50	119
FOOD SERVICE	3.21	3.00	120
MEALS SERVED	3.04	3.09	121
FOOD COSTS	3.00	2.93	122
SECTION STAFFING SGM	3.68	0.00	0
FUND SHORTFALLS	4.50	4.26	123
COST VARIATIONS	3.79	4.00	124
OVERSPENDING	3.79	4.05	125
FUTURE BUDGET	3.96	3.96	126
MEPR REPORTS	3.33	3.11	127
COST AUDITS	3.50	3.39	128
COST CONTAINMENT	3.82	3.69	129
PATIENT PAYMENTS	2.71	3.11	130
DELINQUENT ACCTS	2.89	2.94	131
MSA DISCREPANCIES	3.89	3.46	132
ADMISSIONS OTHER	3.59	3.57	133
OTHER PAYMENTS	3.59	4.00	134
SEARCH FEES	2.00	2.37	135
MANPOWER PRICEOUTS	4.26	4.30	136
MANPOWER REQUESTS	4.00	4.15	137
WORKLOAD DATA	3.74	4.13	138
WORKLOAD AUDITS	3.37	3.65	139
PROVIDER PRODUCTIVIT	4.46	4.39	140
UPMR DISCREP	2.96	3.24	141
INT INSP DISCREP	4.11	4.04	142
OVERDUE INT INSP	4.26	3.87	143
OTHER AGENCY INSP	4.44	4.13	144
SUGGESTION PRGM	2.67	2.46	145
UNIT GOALS	3.89	3.70	146
SPECIAL STUDIES	3.63	3.15	147
MED SYS PROJECTS	3.65	3.57	148
AUTOMATION RQSTS	3.27	3.26	149
DP DIFFICULTIES	3.65	3.56	150

DISPLAY #2: LISTING BY 1987 RANKING

COMPARATIVE VALUE RATINGS OF MANAGEMENT INDICATORS, 1987 VS. 1990

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [HOSP ONLY]	1990 SURVEY ITEM NUMBER
HOSP INJURIES	4.61	4.41	113
HOSP INCIDENTS	4.57	4.03	84
SORTS REPORTING	4.55	4.10	50
MED READINESS	4.52	4.00	48
FUND SHORTFALLS	4.50	4.35	123
MOBILITY ACTIONS	4.48	3.93	49
PROVIDER PRODUCTIVIT	4.46	4.38	140
OTHER AGENCY INSP	4.44	4.28	144
SAFETY HAZARDS	4.36	4.24	112
PATIENT COMPLAINTS	4.29	4.00	77
SECURITY VIOL	4.29	3.95	111
MANPOWER PRICEOUTS	4.26	4.33	136
OVERDUE INT INSP	4.26	3.95	143
FACILITY PROJECTS	4.25	4.23	107
APPT WAITING LIST	4.24	4.26	69
SUSPENSING	4.21	4.13	42
PRP REPORTING	4.21	3.69	85
PATIENT DEATHS	4.18	3.83	54
CUST COMPLAINTS	4.18	3.78	106
CRIT BACKORDERS	4.17	4.03	89
INT INSP DISCREP	4.11	4.03	142
BED OCCUPANCY	4.10	3.85	53
VIP PATIENTS	4.10	3.60	57
HOSP STAFF PATIENTS	4.10	3.77	61
EVALUATIONS	4.07	3.73	31
WRM PERCENTAGES	4.07	3.88	118
OUT FILE BACKLOG	4.00	3.68	68
MANPOWER REQUESTS	4.00	4.20	137
INPT FILE BACKLOG	3.97	3.93	58
EXPENSE EQUIPMENT	3.97	4.05	96
INVEST EQUIP	3.97	3.95	97
PRODUCT RECALLS	3.97	3.95	101
VSI/SI/III	3.96	3.43	56
FUTURE BUDGET	3.96	3.98	126
NARR SUMMARIES	3.93	3.93	59
MSA DISCREPANCIES	3.89	3.53	132
UNIT GOALS	3.89	3.78	146
P/A STAFFING	3.87	3.51	24
EMERG REQUESTS	3.86	3.70	92
OUT OF STOCK	3.83	4.03	90
COST CONTAINMENT	3.82	3.68	129
HOSP TURNOVER	3.80	3.71	25
COST VARIATIONS	3.79	4.03	124
OVERSPENDING	3.79	4.10	125

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [HOSP ONLY]	1990 SURVEY ITEM NUMBER
DISCIP ACTIONS	3.77	3.17	30
CE WORKORDERS	3.75	3.95	114
BASE DP SUPPOPRT	3.74	3.40	104
FIRE DRILLS	3.74	3.48	115
WORKLOAD DATA	3.74	4.10	138
SECTION STAFFING sgr	3.72	3.35	51
SECTION STAFFING SGL	3.69	0.00	0
WRM FUNDS	3.68	3.53	119
SECTION STAFFING SGM	3.68	0.00	0
MED SYS PROJECTS	3.65	3.65	148
DP DIFFICULTIES	3.65	3.53	150
SECURITY PRGM	3.64	3.48	43
OJT TRAINING	3.63	3.15	28
SPECIAL STUDIES	3.63	3.23	147
DISPOSITIONS	3.59	3.50	52
EQUIP REPAIRS	3.59	3.85	98
ADMISSIONS OTHER	3.59	3.63	133
OTHER PAYMENTS	3.59	4.03	134
EMERGENCY PATIENTS	3.54	3.21	71
VEHICLE DISCREP	3.54	3.33	116
READMISSIONS	3.52	3.79	63
TRANS BACKLOG	3.52	3.72	72
TDY REQUESTS	3.50	3.65	37
HSKPG CONTRACT	3.50	3.63	108
COST AUDITS	3.50	3.48	128
MDSF FILL RATE	3.48	3.41	86
CONTRACT AWARDS	3.48	3.55	110
MIL DECORATIONS	3.47	3.23	32
MDSF INVENTORY	3.45	3.23	87
INHOUSE BIRTHS	3.44	3.46	55
CIVILIAN AWARDS	3.41	3.10	44
HIGH DOLLAR ITEMS	3.41	3.64	93
LOCAL PURCHASE	3.41	3.51	94
COMMANDERS CALL	3.40	2.45	35
PUBS AND FORMS	3.40	3.20	40
INCOMPL RECORDS	3.39	3.72	73
CONTRACT DISCREP	3.39	3.60	109
CIV GRIEVANCES	3.38	2.80	46
ER ADMISSIONS	3.38	3.67	62
WORKLOAD AUDITS	3.37	3.65	139
CIV POSITIONS	3.35	3.35	47
CONTAG DISEASE	3.35	3.56	64
TELECOMM	3.33	3.20	41
MEPR REPORTS	3.33	3.05	127
RECORDS COMMITTEE	3.31	3.21	75
MILITARY LEAVES	3.27	3.38	33
AUTOMATION RQSTS	3.27	3.30	149
EEO ACTIONS	3.24	3.00	45

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [HOSP ONLY]	1990 SURVEY ITEM NUMBER
NONAVAIL STATUS	3.24	3.92	79
MED BOARD ACTIONS	3.21	3.38	78
FOOD SERVICE	3.21	2.98	120
AEROMED EVACS	3.18	3.08	65
VEHICLE REPLACE	3.18	3.18	117
RECEIPTS VS SALES	3.17	3.33	91
OVERDUE RECORDS	3.14	3.58	70
INVEN TURNOVER	3.14	3.21	88
SPONSOR PROGRAM	3.13	2.63	26
PHYSICAL FITNESS	3.10	2.91	29
MED LIBRARY	3.10	2.95	38
DEP CARE PROGRAM	3.07	2.93	34
PTS TRANSFERRRED	3.07	3.15	66
SALES BY AREA	3.07	3.24	100
MEALS SERVED	3.04	3.08	121
3RD PARTY LIAB	3.03	3.26	82
209X DISCREPANCY	3.00	3.00	27
FOOD COSTS	3.00	2.90	122
LOD DETERMINATION	2.97	2.90	83
UPMR DISCREP	2.96	3.18	141
DELINQUENT ACCTS	2.89	2.95	131
OVERDUE PHOTOS	2.87	2.63	36
TUMOR REGISTRY	2.86	3.08	81
LINEN SUPPLY	2.86	2.88	105
SPARE PARTS	2.72	2.97	99
SHIP DISCREP	2.72	2.98	102
PATIENT PAYMENTS	2.71	3.15	130
SUGGESTION PRGM	2.67	2.45	145
CIVILIAN PATIENTS	2.66	3.05	67
CHAMPUS CLAIMS	2.64	3.67	80
TELEPHONE ABUSE	2.62	2.65	39
MED INFO REQUESTS	2.59	2.85	76
NONMED SUPPORT	2.57	2.65	103
PATIENT LEAVES	2.48	2.63	60
PETTY CASH	2.05	2.97	95
RECORDS TRANSF	2.00	2.87	74
SEARCH FEES	2.00	2.40	135

DISPLAY #3: LISTING BY 1990 ALL FACILITY RANKING

COMPARATIVE VALUE RATINGS OF MANAGEMENT INDICATORS, 1987 VS. 1990

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [ALL FACILITIES]	1990 SURVEY ITEM NUMBER
PROVIDER PRODUCTIVIT	4.46	4.39	140
HOSP INJURIES	4.61	4.33	113
APPT WAITING LIST	4.24	4.32	69
MANPOWER PRICEOUTS	4.26	4.30	136
FUND SHORTFALLS	4.50	4.26	123
SAFETY HAZARDS	4.36	4.17	112
MANPOWER REQUESTS	4.00	4.15	137
FACILITY PROJECTS	4.25	4.13	107
WORKLOAD DATA	3.74	4.13	138
OTHER AGENCY INSP	4.44	4.13	144
SUSPENSING	4.21	4.06	42
OVERSPENDING	3.79	4.05	125
CRIT BACKORDERS	4.17	4.04	89
EXPENSE EQUIPMENT	3.97	4.04	96
INT INSP DISCREP	4.11	4.04	142
MED READINESS	4.52	4.00	48
HOSP INCIDENTS	4.57	4.00	84
COST VARIATIONS	3.79	4.00	124
OTHER PAYMENTS	3.59	4.00	134
SORTS REPORTING	4.55	3.98	50
OUT OF STOCK	3.83	3.98	90
INVEST EQUIP	3.97	3.96	97
FUTURE BUDGET	3.96	3.96	126
MOBILITY ACTIONS	4.48	3.94	49
CE WORKORDERS	3.75	3.94	114
PATIENT COMPLAINTS	4.29	3.92	77
SECURITY VIOL	4.29	3.91	111
NONAVAIL STATUS	3.24	3.88	79
OVERDUE INT INSP	4.26	3.87	143
INPT FILE BACKLOG	3.97	3.85	58
NARR SUMMARIES	3.93	3.85	59
BED OCCUPANCY	4.10	3.83	53
EQUIP REPAIRS	3.59	3.83	98
PRODUCT RECALLS	3.97	3.83	101
WRM PERCENTAGES	4.07	3.81	118
READMISSIONS	3.52	3.74	63
TRANS BACKLOG	3.52	3.74	72
CUST COMPLAINTS	4.18	3.74	106
EMERG REQUESTS	3.86	3.72	92
OUT FILE BACKLOG	4.00	3.70	68
INCOMPL RECORDS	3.39	3.70	73
UNIT GOALS	3.89	3.70	146

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [ALL FACILITIES]	1990 SURVEY ITEM NUMBER
HIGH DOLLAR ITEMS	3.41	3.69	93
COST CONTAINMENT	3.82	3.69	129
EVALUATIONS	4.07	3.68	31
HOSP STAFF PATIENTS	4.10	3.67	61
PATIENT DEATHS	4.18	3.65	54
CHAMPUS CLAIMS	2.64	3.65	80
WORKLOAD AUDITS	3.37	3.65	139
TDY REQUESTS	3.50	3.61	37
OVERDUE RECORDS	3.14	3.61	70
PRP REPORTING	4.21	3.61	85
HOSP TURNOVER	3.80	3.58	25
ER ADMISSIONS	3.38	3.57	62
HSKPG CONTRACT	3.50	3.57	108
ADMISSIONS OTHER	3.59	3.57	133
MED SYS PROJECTS	3.65	3.57	148
DP DIFFICULTIES	3.65	3.56	150
CONTRACT DISCREP	3.39	3.55	109
VIP PATIENTS	4.10	3.52	57
CONTRACT AWARDS	3.48	3.51	110
MDSF FILL RATE	3.48	3.50	86
LOCAL PURCHASE	3.41	3.50	94
WRM FUNDS	3.68	3.50	119
DISPOSITIONS	3.59	3.46	52
MSA DISCREPANCIES	3.89	3.46	132
P/A STAFFING	3.87	3.44	24
CONTAG DISEASE	3.35	3.44	64
FIRE DRILLS	3.74	3.41	115
SECURITY PRGM	3.64	3.39	43
COST AUDITS	3.50	3.39	128
VSI/SI/III	3.96	3.35	56
INVEN TURNOVER	3.14	3.35	88
MED BOARD ACTIONS	3.21	3.34	78
CIV POSITIONS	3.35	3.33	47
INHOUSE BIRTHS	3.44	3.33	55
MDSF INVENTORY	3.45	3.33	87
BASE DP SUPPOPRT	3.74	3.32	104
RECEIPTS VS SALES	3.17	3.31	91
MILITARY LEAVES	3.27	3.29	33
SECTION STAFFING sgr	3.72	3.28	51
SALES BY AREA	3.07	3.28	100
EMERGENCY PATIENTS	3.54	3.26	71
AUTOMATION RQSTS	3.27	3.26	149
3RD PARTY LIAB	3.03	3.25	82
VEHICLE DISCREP	3.54	3.24	116
UPMR DISCREP	2.96	3.24	141
MIL DECORATIONS	3.47	3.20	32
TELECOMM	3 33	3.20	41
RECORDS COMMITTEE	3.31	3.19	75

MANAGEMENT INDICATOR	1987 MEAN	MEAN 1990 [ALL FACILITIES]	1990 SURVEY ITEM NUMBER
PUBS AND FORMS	3.40	3.15	40
SPECIAL STUDIES	3.63	3.15	147
DISCIP ACTIONS	3.77	3.14	30
PTS TRANSFERRRED	3.07	3.13	66
OJT TRAINING	3.63	3.12	28
MEPR REPORTS	3.33	3.11	127
PATIENT PAYMENTS	2.71	3.11	130
MEALS SERVED	3.04	3.09	121
CIVILIAN AWARDS	3.41	3.07	44
AEROMED EVACS	3.18	3.07	65
TUMOR REGISTRY	2.86	3.06	81
VEHICLE REPLACE	3.18	3.06	117
CIVILIAN PATIENTS	2.66	3.04	67
SPARE PARTS	2.72	3.04	99
FOOD SERVICE	3.21	3.00	120
SHIP DISCREP	2.72	2.98	102
EEO ACTIONS	3.24	2.94	45
PETTY CASH	2.05	2.94	95
DELINQUENT ACCTS	2.89	2.94	131
FOOD COSTS	3.00	2.93	122
RECORDS TRANSF	2.00	2.92	74
LOD DETERMINATION	2.97	2.92	83
LINEN SUPPLY	2.86	2.91	105
209X DISCREPANCY	3.00	2.89	27
MED LIBRARY	3.10	2.89	38
PHYSICAL FITNESS	3.10	2.85	29
DEP CARE PROGRAM	3.07	2.83	34
MED INFO REQUESTS	2.59	2.81	76
CIV GRIEVANCES	3.38	2.80	46
NONMED SUPPORT	2.57	2.64	103
SPONSOR PROGRAM	3.13	2.61	26
TELEPHONE ABUSE	2.62	2.61	39
OVERDUE PHOTOS	2.87	2.57	36
PATIENT LEAVES	2.48	2.56	60
COMMANDERS CALL	3.40	2.50	35
SUGGESTION PRGM	2.67	2.46	145
SEARCH FEES	2.00	2.37	135
SECTION STAFFING SGL	3.69	0.00	0
SECTION STAFFING SGM	3.68	0.00	0

Appendix C: Hospital Administrator Questionnaire

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

Reply to
Attn of: LSG (Captain Constantian, Autovon 785-4437) 24 Mar 90

Subject: Questionnaire

To: Survey Respondent

1. Please take the time to complete the enclosed questionnaire and return it to Captain Constantian in the enclosed envelope by 13 April 1990.

2. This questionnaire measures your perceptions and attitudes toward a hypothetical information system intended for use by Air Force hospital administrators. The data gathered will become part of an AFIT research project and may influence the future design or development of information systems support for Air Force health care administrators. In particular, the results of the survey will be shared with the Medical Systems Support Branch, AFOMS/SGSI, and the Deputy Chief, Air Force Medical Service Corps.

3. Your individual responses will be combined with others and will not be attributable to you personally.

4. Your participation is completely voluntary, but Captain Constantian and I would certainly appreciate your help. For further information, please contact me at Autovon 785-2061 or Captain Constantian at Autovon 785-4437.

5. Thank you for your support!

LARRY W. EMMELHAINZ, Lt Col, USAF
Director of Research and Consulting
School of Systems and Logistics

2 Enclosures
1. Questionnaire
2. Return Envelope

USAF HOSPITAL ADMINISTRATOR EXECUTIVE INFORMATION SYSTEM FEASIBILITY STUDY (HOSPITAL ADMINISTRATOR)

I. **Instructions:** This questionnaire is designed to assess the feasibility of implementing an executive information system (EIS) designed to assist the Air Force hospital administrator to manage assigned responsibilities. In particular, your interest in and estimation of the value of such a system will be assessed.

Please complete the demographic and other information section and then use the seven point rating scale shown on the top of each page to answer the remaining questions. Space is provided at the end of the questionnaire for any additional comments.

It should take approximately 20 minutes to complete this questionnaire. Please ensure that you answer every question. Thank you for sharing your opinion in this effort.

II. **Demographic and Other Information:** (Circle or fill in the blank).

1. Rank
   a. Captain
   b. Major
   c. Lieutenant Colonel
   d. Colonel
   e. Other (explain) _____

2. Total Military Service (years/months) _____

3. Highest Education Level Completed
   a. Bachelor's
   b. Master's
   c. Ph.D.
   d. Other (explain) _____

4. Experience (specify years/months)

   a. In current position: _____
   b. As an administrator of another Air Force hospital (a Medical Treatment Facility with inpatient beds): _____
   c. As an Air Force Medical Service Corps officer _____

5. How is your hospital classified?

   a. Hospital
   b. Regional Hospital
   c. Medical Center

SURVEY APPROVAL: USAF SCN 90-14
EXPIRATION DATE: 1 MAY 90

6. Number of operating beds at your facility:

a. 1-20
b. 21-40
c. 41-70
d. 71-100
e. > 100

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED

1-------2-------3-------4-------5-------6-------7
Strongly Disagree Slightly Neutral Slightly Agree Strongly
Disagree Disagree OR Agree Agree
Can't
Decide

III. General Information

7. _____ I am happy with my current methods of gathering the information I need to support my decision-making.

8. _____ Information gathering meetings with my subordinates are a waste of time.

9. _____ Explanations surrounding facts and results are at best superfluous and sometimes obscure the truth.

10. _____ Meetings are an inefficient method of gathering and disseminating information.

11. _____ The nonverbal signals which my subordinates give me when answering my questions adds meaning to their responses.

12. _____ I am uncomfortable with using a computer myself.

13. _____ Computers have the potential to help me manage my responsibilities better.

14. _____ A computer on a hospital administrator's desk has more value as a symbol than as an actual tool for the administrator to use.

15. _____ Using a keyboard is a task for clerks and secretaries, not for executives.

16. _____ The systems staff assigned to my facility has the time to answer any questions I have about information systems.

17. _____ The systems staff assigned to my facility has the expertise to answer any questions I have about information systems.

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1-------2-------3-------4-------5-------6-------7
Strongly Disagree Slightly Neutral Slightly Agree Strongly
Disagree Disagree or Agree Agree
Can't
Decide

18. _____ I could use the same set of management indicators I use here at any other USAF inpatient medical facility with minor modifications.

19. _____ Key management indicators I use to judge my facility's performance are relatively stable.

20. _____ An automated information system could provide me with the management information I need to function effectively as a hospital administrator.

20.a. _____ An automated information system provides me with the management information I need to function effectively as a hospital administrator.

21. _____ My systems staff does not have the right training or experience to understand complicated information systems.

22. _____ My information systems staff does not have the time to help me learn how to use a new computer system.

23. _____ My systems staff does not have the talent to teach me about how to use a new computer system.

==========

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4----------5
None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

IVA. Management Indicator Valuation

Information Item	Rating
24. Section staffing in Personnel and Admin	_____

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW.
FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4----------5

None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

25. Hospital staff arrivals and departures _____

26. Sponsor program data _____

27. Personnel action discrepancies (AF Form 209X) _____

28. On-the-job training _____

29. Physical fitness program _____

30. Disciplinary actions _____

31. Evaluation reports (OERs and APRs) _____

32. Military decorations _____

33. Military leaves _____

34. Dependent care responsibility program _____

35. Commander's calls _____

36. Overdue official photos _____

37. TDY requests _____

38. Medical Library inventory _____

39. Telephone abuse reports _____

40. Publications and forms support _____

41. Telecommunications (message) support _____

42. Suspensing actions _____

43. Security program _____

44. Civilian awards _____

45. EEO actions _____

46. Civilian grievances _____

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4---------5

None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

47. Civilian position actions

48. Medical readiness training _____

49. Mobility actions _____

50. SORTS (UNITREP) reporting _____

51. Section staffing in Patient Administration _____

52. Inpatient dispositions _____

53. Bed occupancy data _____

54. Patient deaths _____

55. In-house births _____

56. Very Seriously, Seriously Ill & Incapacitating Illness patients _____

57. VIP patients _____

58. Backlog of inpatient filing and coding _____

59. Overdue narrative summaries _____

60. Patient leaves/passes _____

61. Hospital staff who are patients _____

62. Patients admitted after Emergency Room visit _____

63. Readmissions _____

64. Contagious disease patients _____

65. Aeromedical evacuations _____

66. Patients transferred (other than air evac) _____

67. Civilian (paying) patients _____

OR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4----------5
None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

68. Backlog of outpatient record filing _____

69. Appointment waiting lists _____

70. Overdue charged-out health records _____

71. Emergency patients _____

72. Backlog of medical transcription _____

73. Incomplete health records referred to providers _____

74. Health records transferred/retired _____

75. Health records committee proceedings _____

76. Requests for release of medical information _____

77. Patient complaints _____

78. Medical board actions _____

79. Nonavailability statements _____

80. CHAMPUS claims _____

81. Tumor registry actions _____

82. Third party liability notifications _____

83. Line of duty determinations _____

84. Hospital incident reports _____

85. Sensitive Duties Program _____

86. Medical-Dental Stock Fund (MDSF) fill rates _____

87. MDSF inventory adjustments _____

88. Inventory turnover _____

89. Overdue/critical backorders _____

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4----------5
None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

90. Out-of-stock conditions _____

91. Receipts vs. sales (MDSF) _____

92. Emergency requests _____

93. High dollar item requests _____

94. Local purchase requests _____

95. Petty cash fund actions _____

96. Expense equipment status _____

97. Investment equipment status _____

98. Backlog of equipment repair requests _____

99. Spare parts inventory _____

100. Sales by functional area _____

101. Product recalls, suspensions and alerts _____

102. Reports of discrepancies in shipment _____

103. Support to nonmedical organizations _____

104. Base data processing support difficulties _____

105. Linen supply inventory _____

106. Customer complaints about support _____

107. Facility projects status _____

108. Housekeeping contract discrepancies _____

109. Other service contract discrepancies _____

110. Service contract awards _____

111. Security violations _____

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4----------5
None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

112. Safety hazard reports _____

113. Hospital injuries (staff and patients) _____

114. Backlog of Civil Engineering work orders _____

115. Fire drills _____

116. Vehicle discrepancies _____

117. Vehicle replacement actions _____

118. War Readiness Materiel (WRM) program percentages _____

119. WRM funding and orders placed _____

120. Food service inventory adjustments _____

121. Meals served/rations earned _____

122. Medical food costs _____

123. Funding shortfalls and actions _____

124. Analysis of cost variations _____

125. Overspending by functional areas _____

126. Future budget preparations _____

127. Medical Expense and Performance Reports (MEPR) _____

128. Cost audits _____

129. Cost containment initiatives _____

130. Patient payments for services _____

131. Delinquent patient accounts transferred out _____

132. Medical Service Account discrepancies _____

133. Military admitted to other facilities _____

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1----------2----------3----------4----------5
None Limited Moderate High Very High

What do you consider the value of the information items listed below to be? Use the above scale to respond.

134. Payments for civilian treatment of military members _____

135. Fees collected for medical record searches _____

136. Manpower priceouts _____

137. Increased manpower requests _____

138. Workload data by cost center _____

139. Workload audits _____

140. Productivity of providers _____

141. Unit Personnel Management Roster discrepancies _____

142. Internal inspection discrepancies _____

143. Overdue internal inspections _____

144. Other agency inspections (e.g. HSMI & SAV) _____

145. Suggestion Program data _____

146. Unit goals and objectives _____

147. Status of special studies _____

148. Status of medical systems projects _____

149. Data automation requests _____

150. Data processing difficulties (e.g. downtime) _____

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neutral or Can't Decide	Slightly Agree	Agree	Strongly Agree

IVB. EIS Evaluation

Consider an automated information system which would provide those information items in Section IVA which you considered to be of high and very high value. Imagine a management information system which would give you this information in summarized fashion in a menu-driven format. This system would also have the capacity to investigate the detailed information of any summarized measure at your request (For example, overall facility provider productivity would be shown, but, at your option, you could review productivity by service or provider).

Using the above scale, please answer the following questions.

151. _____ This system would be of value to me in performing my duties.

152. _____ I would use such a system instead of current methods of obtaining that information.

153. _____ I would use an on line Executive Information System to supplement current methods of gathering information.

154. _____ This system should include historical data for assessing trends.

155. _____ This system should include evaluation criteria to help me decide what to do given my facility's performance.

156. _____ This system should include reference point data to help me compare my facility's performance to the performance of Air Force hospitals of similar size.

157. _____ The system should include reference point data to help me compare my facility's performance to the performance of other hospitals in the command.

158. _____ The system should include reference point data to help me compare my facility's performance against a centrally established criterion for a satisfactory performance level.

FOR THE FOLLOWING SECTION PLEASE USE THE RATING SCALE BELOW. FILL IN YOUR ANSWER IN THE SPACE PROVIDED.

```
      1-------2-------3-------4-------5-------6-------7
Strongly Disagree Slightly Neutral Slightly  Agree Strongly
Disagree          Disagree  or     Agree           Agree
                            Can't
                            Decide
```

159. _____ The system should highlight data where my intervention would be appropriate.

160. _____ The system should have the flexibility to allow me to manipulate inputs so I can evaluate the projected impact of decision alternatives which I am considering.

161. _____ The system must help me structure the information it provides into a decision model.

162. _____ The system must be tailored to my individual style of decision making to be useful.

163. _____ The system should present me with a list of viable decision alternatives if I request it.

IVC. EIS Summary Evaluation

164. _____ It is essential that all critical management indicator information provided to me be communicated in writing.

165. _____ An executive information system for hospital administrators is an idea worth pursuing.

166. _____ An executive information system for hospital administrators would be valuable to me.

167. _____ An executive information system developed as described with the high value indicators selected in Section IV C would improve my <u>effectiveness</u> as an administrator.

168. _____ An executive information system developed as described would improve my <u>efficiency</u> as an administrator.

169. _____ In the past, management information systems have cost more than they were worth.

170. _____ I believe that the costs of a future management information system would outweigh its benefits.

V. Additional Comments

Please write in any comments or additional information regarding this questionnaire or specific questions contained herein in the space below and on the back of this page.

THANK YOU FOR YOUR PARTICIPATION. USE THE SELF ADDRESSED ENVELOPE TO RETURN THIS QUESTIONNAIRE OR SEND TO THE FOLLOWING ADDRESS:

AFIT/LSG (Capt Constantian)
Wright-Patterson AFB, OH 45433-6583

Appendix D: Medical Systems Officer Questionnaire

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

Reply to
Attn of: LSG (Captain Constantian, Autovon 785-4437) 24 Mar 90

Subject: Questionnaire

To: Survey Respondent

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2. This questionnaire measures your perceptions and attitudes toward a hypothetical information system intended for use by Air Force hospital administrators. The data gathered will become part of an AFIT research project and may influence the future design or development of information systems support for Air Force health care administrators. In particular, the results of the survey will be shared with the Medical Systems Support Branch, AFOMS/SGSI, and the Deputy Chief, Air Force Medical Service Corps.

3. Your individual responses will be combined with others and will not be attributable to you personally.

4. Your participation is completely voluntary, but Captain Constantian and I would certainly appreciate your help. For further information, please contact me at Autovon 785-2061 or Captain Constantian at Autovon 785-4437.

5. Thank you for your support!

LARRY W. EMMELHAINZ, Lt Col, USAF
Director of Research and Consulting
School of Systems and Logistics

2 Enclosures
1. Questionnaire
2. Return Envelope

USAF HOSPITAL ADMINISTRATOR EXECUTIVE INFORMATION SYSTEM FEASIBILITY STUDY
(Medical Systems Officer)

I. **Instructions:** This questionnaire should be completed by the hospital's Medical Systems Officer or equivalent. Its purpose is to assess your facility's existing information systems for their suitability in supporting an executive information system (EIS) which would assist the USAF hospital administrators (SGA) in managing their assigned responsibilities. Questions concerning your opinion on several issues and on your background will also be asked.

Please respond to all the questions. Space is provided at the end of the questionnaire for any additional comments. It should take you approximately 10 minutes to complete the questionnaire. Please ensure that you answer every question. Thank you for sharing this information.

II. **Demographic and Other Information (circle or fill in blank)**

1. Rank

   a. Second Lieutenant
   b. First Lieutenant
   c. Captain
   d. Lt Col/Major
   e. Other (please state) _____

2. Highest Level of Education attained

   a. Bachelor's
   b. Master's
   c. Ph.D.
   d. Other (please specify) _____

3. Major area of study (fill in as applies):

   a. Bachelor's: _____

   b. Master's : _____

4. What percentage of your time is spent exercising your role as Medical Systems Officer? _____

5. Number of people assigned to your staff who perform information systems duties 75% of the time or more (other than you)? _____

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6. Experience (specify years/months)

a. In current position _____
b. As a facility level medical systems officer _____
c. Working with medical information systems management in a full-time capacity _____
d. As an Air Force Medical Service Corps officer? _____

7. How is your hospital classified?

a. Hospital
b. Regional Hospital
c. Medical Center

8. Number of operating beds in your facility?

a. 1-20
b. 21-40
c. 41-70
d. 71-100
e. >100

III. Information System Characteristics

9. Does your facility have a computer installed more powerful than a microcomputer (e.g. mainframe, minicomputer)?

a. No (go to question 12)

b. Yes

10. What make and model is it (are they)?

_____

_____

_____

_____

_____

_____

_____

11. Place a check next to the offices which have at least one microcomputer in them:

____ Administrator	____ Resource Mgmt
____ Medical Logistics	____ Medical Readiness
____ Medical Squadron	____ Personnel & Admin
____ Patient Admin	____ Medical Systems
____ Facilities Management	____ Nutritional Medicine
____ Quality Assurance	____ Credentialling
____ Medical Library	

12. Does a local area network exist at your facility?

a. No

b. Yes (if yes, answer the questions below)

12.a. Is electronic mail use widespread for inter-office communications?

(1) Yes (2) No

12.b. Do people in your facility transfer files between offices on a regular basis?

(1) Yes (2) No

13. Does your facility currently have an automated centralized database of any kind?

a. No (skip to question 18)

b. Yes (Answer questions 15 through 17)

14. What type of hardware supports this database?

a. Mainframe computer

b. Minicomputer

c. Microcomputer

d. Other (specify) _____

15. Check all of the following offices which have routine read OR write access to this centralized database:

____ Administrator	____ Medical Logistics
____ Facilities Mgmt	____ Medical Readiness
____ Medical Squadron	____ Personnel & Admin
____ Medical Systems	____ Patient Administration
____ Resource Management	____ Nutritional Medicine
____ Quality Assurance	____ Credentialling
____ Medical Library	

16. Check all of the information items contained on your facility's centralized database.

____ Levels of medical readiness training

____ SORTS C-ratings

____ Hospital incident report data

____ Hospital injury data

____ Funding shortfall projection data

____ Evaluation report status (OPRs, EPRs)

____ Suspense monitoring

____ Mobility Program status

____ Bed occupancy data

____ Patient death data

____ VIP Patient Status information

____ Hospital staff who are patients

____ Backlog of outpatient records for filing

____ Appointment waiting times (by clinic/service)

____ Patient questionnaire/complaint data

____ Sensitive Duties Program data

Item 16 is continued on the following page

16 (cont.) Place an X by all of the information items contained on your facility's centralized database.

____ Overdue/critical backorders

____ Customer complaints about supply/equipment support

____ Facility projects status

____ Security violations

____ Safety hazard reports

____ WRM program percentages

____ Manpower priceout information

____ Increased manpower request status

____ Provider productivity

____ Internal inspection discrepancies

____ Overdue internal inspections

____ HSMI/SAV/other agency inspection results

****

USE THE FOLLOWING SCALE TO ANSWER QUESTIONS 17 through 23
FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

```
      1-------2-------3-------4-------5-------6-------7
Strongly  Disagree Slightly Neutral Slightly Agree  Strongly
Disagree           Disagree   or     Agree           Agree
                              Can't
                              Decide
```

****

17. I think that an on-line Executive Information System (EIS) containing the information items shown in question 16 would be valuable to my administrator.

_____

18. I think my administrator would use an on-line EIS containing the information elements listed in question 16 to supplement his information gathering methods.

_____

19. My staff and I would have the time to respond to the administrator's questions on how to use a sophisticated management information system.

_____

****
USE THE FOLLOWING SCALE TO ANSWER QUESTIONS 17 through 23
FILL IN YOUR RESPONSE IN THE SPACE PROVIDED.

1-------2-------3-------4-------5-------6-------7

Strongly Disagree	Disagree	Slightly Disagree	Neutral or Can't Decide	Slightly Agree	Agree	Strongly Agree

****

20. My staff and I do not have the right experience to understand complicated information systems.

_____

21. My staff and I do not have the right training to understand complicated information systems.

_____

22. In the past, management information systems have cost more than they were worth.

_____

23. I do not believe that the costs of a future management information system would outweigh its benefits.

_____

IV. Current Methods

Please describe any initiatives at your facility which deliver information to your administrator on-line in the space below.

_____

_____

_____

_____

_____

V. Comments

Please place any comments or clarifications regarding this questionnaire or specific questions contained herein in the space below and on the back of this page.

THANK YOU FOR YOUR PARTICIPATION. USE THE SELF ADDRESSED ENVELOPE TO RETURN THIS QUESTIONNAIRE OR SEND TO THE FOLLOWING ADDRESS:

AFIT/LSG (Capt Constantian)
Wright-Patterson AFB, OH 45433-6583

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Vita

Captain Alan R. Constantian [redacted] He graduated from Jonathan Dayton Regional High School in Springfield, New Jersey, in 1977. In 1981, he graduated magna cum laude from Bates College in Lewiston, Maine with a Bachelor of Arts degree in Political Science. He received a Fulbright Scholarship to study the history of German church/state relations at the University of Goettingen in the Federal Republic of Germany in the 1981/1982 academic year. Upon his return to the United States, he attended the University of Chicago's Graduate School of Business, from which he graduated with a Master's of Business Administration in Hospital Administration and Marketing in 1984. In that same year he was commissioned in the Air Force Medical Service Corps. He has since been assigned to Sheppard AFB, Texas and San Vito AS, Italy, serving in various health care administrative roles. He entered the School of Systems and Logistics, Air Force Institute of Technology, in May 1989.

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13. ABSTRACT (Maximum 200 words)
This study investigated the feasibility of implementing an executive information system (EIS) for hospital administrators at USAF inpatient medical facilities. Successful system implementation requires such an EIS to be technically, economically, operationally, and motivationally feasible. Failure to meet any of these feasibility factors jeopardizes successful implementation. Surveys were administered to all CONUS-based USAF hospital administrators and medical systems officers to gather data on feasibility issues. An eighty per cent response rate was achieved. Motivational feasibility was evident from the high rating of the EIS concept given by administrators. However, the other aspects of feasibility proved to be less positive. Indicators of technical feasibility brought mixed results and the EIS did not appear feasible from an economic or operational perspective at present. The information systems infrastructure must be improved if an EIS is to become a feasible opition. Specifically, local area networks must be installed and systems staffs augmented in size and ability.

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