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The Determination of the Most Important Criteria to the Success of a Patient Care Hospital Information System

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THE DETERMINATION OF THE MOST IMPORTANT CRITERIA TO THE SUCCESS OF A PATIENT CARE HOSPITAL INFORMATION SYSTEM

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An Abstract Presented to the Faculty of the Graduate School of Lindenwood College in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

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ABSTRACT

The focus of this thesis is the criteria which contribute to the overall success of a patient care hospital information system. A review of the literature discusses each stage of the implementation process in depth as the success of the final implementation is dependent upon the success of each individual phase. There are five major phases which are evident. These include planning, selection, development, training, and conversion. Each phase possesses many elements necessary for the successful completion of that particular phase and for the entrance into the next phase.

As our society progresses out of the "Industrial Age" and into the "Information Age", automation becomes increasingly important. Hospitals are extremely dependent upon computers for the accumulation, assimilation, and retrieval of information. This dependence has led to a rapidly growing technology in hospital information sys-

tems. With such widespread use of computers, it is imperative that the process of implementation of any hospital information system be successful to maximize efficiency and cost effectiveness in today's competitive healthcare industry.

Current research is limited in the determination of what factors are involved in the success of a hospital information system. The purpose of the present study is to investigate the individual phases of a patient care (clinical) hospital information system, as well as the criteria within each phase, to determine the most important elements to the success of a hospital information system.

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TABLE OF CONTENTS

List of Tables

Chapter I

INTRODUCTION

History of Hospitals

The earliest resemblance of hospitals has been traced to the times of the Egyptian temples, more than 4000 years ago (McGrew 134). Most cultures at that time equated medicine with religion, and treatment involved a mystical experience. During the third century B.C., institutions were specifically created for the ill in Hindustan and Rome. Hospital facilities expanded dramatically through the fourteenth century primarily due to crusades (136). The ideology of hospital care evolved into concern for the poor, the displaced, the indigent, and the insane by the end of the sixteenth century. The foundations of the modern hospital system were first established between 1700 and 1850. "The number of hospitals increased, the quality of medical practice improved, specialization advanced, and the emphasis shifted from care toward treatment and cure" (138).

The first hospital in the American colonies

was founded in Philadelphia in 1751 (139). American hospitals focused on the sick, poor, and mentally ill. They also showed an orientation from the beginning toward treatment and cure. The Civil War (1861-1865) introduced the germ theory of disease and antiseptic methodology (141). From this point forward, hospitals have progressively expanded at a rapid rate. "In 1873, the United States had only 178 hospitals and fewer than 50,000 beds, even including mental institutions . . . in 1939 there were 6991 hospitals with 1,186,262 beds" (141).

Until World War II, hospitals served the needs of the community regardless of the patient's ability to pay. At that time, payment for services rendered was received from the patient or not at all. In the United States, private health insurance became the preferred method of reimbursement to the hospital. "It was estimated in 1962 that 141 million Americans had some form of health insurance, with at least 38 million Americans carrying major medical expense coverage" (142). The healthcare industry prospered infinitely from the insurance reimbursement process.

Healthcare costs soared for the next decade. There are many reasons surrounding the rise in healthcare costs. America prevailed with the philosophy that healthcare was a right for all people. Neither the consumer, the insurance payor, or the government closely regulated the hospital industry. The healthcare population continued to rise due to rapid technological advances which kept people living longer and an increase in the elderly population which comprised an ever-growing percentage of total healthcare services provided (Randall 70). Products of new technological advancements became very expensive to acquire. Another contributing factor to the rise in healthcare costs has been the inclusion of social problems such as alcoholism and drug addiction into the medical sphere. The combination of these ingredients facilitated healthcare's rise to power and wealth.

Trends in Healthcare Today

The government and other regulatory institutions became more actively involved in the regulation of the hospital industry which resulted in

the gradual decline of hospital freedom. Federal healthcare regulations were enacted which placed pressure on hospitals to decrease operating costs. Diagnosis Related Groups (DRGs) were developed which placed a ceiling on acceptable therapeutic expenditures (Donne 49).

> The main purpose of DRGs is to reduce the amount of money the federal government is spending on Medicare. The prospective payment rate for a given DRG is the entire payment that a hospital will receive for the Medicare inpatient operating costs (Smeltzer and Flores 43).

In addition, non-government regulated payors are also demanding discounts and prospectively determined prices which may have no relationship with the actual cost. This group comprises a wide variety of insurers, including Prospective Payment Organizations (PPOs), Health Maintenance Organizations (HMOs), Preferred Provider Associations (PPAs), employers, and credit unions. Individually, they offer a hospital the right to provide services to a defined population segment for a predetermined level of payment in exchange for a commitment of service and preferential group pricing (Benz 24). Collectively, this powerful

collusion by third-party payors has provided hospitals with the incentive to drastically decrease their operating costs to maintain a profit margin necessary for their existence. Examples of efforts contributing to this decrease in operating costs include the following: shorter patient length of stay (LOS), an increase in outpatient surgery, hiring freezes, reduction in benefits, employee layoffs, hospital consolidation, and purchasing agreements (24).

In today's healthcare environment, there is direct competition for a steadily declining inpatient market. Competition has increased due to an emerging trend toward larger and more complex hospital organizations, which is the result of acquisitions, mergers, and consolidation (Robertson 61). This increase in hospital size alone yields a substantially greater marketing presence, negotiating power, and management expertise (61). The end results are increased flexibility, vertical integration of services, and resources to establish satellites for convenience of location and market penetration (61). A by-product of the competitive nature of the hospital

environment is growing consumer strength. Coupled with a heightened consumer preoccupation with lower costs and a desire for increased convenience, hospitals are experiencing a dramatic decrease in loyalty from their patient population.

The combination of these constraints has increased the Joint Commission for Accreditation of Hospitals' (JCAH) requirements for documentation of quality assurance and risk management (Donne 49). JCAH has taken the responsibility of assuring the public that quality of patient care will not be compromised due to strong incentives to reduce operating costs. Rigid guidelines have been developed to provide accurate quality assurance documentation to demonstrate compliance with acceptable patient care standards. Emphasis has been placed on infection control, equipment maintenance, and standardization (49). Incident reports, nursing care plans, and patient records must be legible and immediately accessible for prompt review (49). If hospitals are to keep pace with the rapid changes occurring in the industry, they must take advantage of the increasing computer technology to enhance efficiency and improve

the number and quality of services to remain financially stable in a fiercely competitive environment.

Emergence of Automation

Originally, computer technology penetrated the healthcare industry to perform accounting functions. These included accounts payable, accounts receivable, general ledger, and billing functions. The entrance of third parties in the reimbursement process necessitated data processing systems which could address the complexity of individual third party payors. However, these systems were simple in structure, format, and execution. During the late 60's and early 70's, hospital information systems focused primarily on the requirements placed by the government upon providers (Childs 20). The increased reporting requirements were a consequence of newly enacted Medicare and Medicaid insurance laws. "These requirements were the genesis of most financial systems which began to flourish in the early '70s" (20).

During the era between 1976 and 1980, the data processing industry introduced fourth-generation computers and software languages. Microcomputers were also introduced with increased availability and user-friendly software. This instigated the migration of computers in the healthcare industry out of the financial dimension and into the departmental applications. A variety of hospital and ancillary departments began to take advantage of the information access and assimilation provided by microcomputers and software packages. As additional departments began to realize the scope of computer functionality, a "Tower of Babel" approach ensued (Gelinas 51). It entailed the progressive growth of numerous, independent islands of automation located throughout the hospital organization (51). In order for these various systems to communicate, the data processing department has traditionally developed complex and costly interfaces.

In 1983, changes in the Social Security Administration Act and Tax Equity Financial Reconciliation Act (TEFRA) legislation changed the healthcare industry's business methodology (Bex

84). The shift toward prepaid care requires computer systems to re-orient from retrospective to prospective functions (Robertson 62). "Applications for monitoring member eligibility, analyzing utilization and tracking outside referrals will be mandatory" (62). These needs substantiate the importance for the interfacing of information between departments to maintain efficiency and reduce cost. Data processing systems have become more complex to accommodate these changes. DRG regulations force both for-profit and not-for-profit businesses to pursue courses of action that avoid a financial loss. Institutions must implement a broad range of cost control and profit enhancing computer systems which currently exist in a multitude of forms within the manufacturing and general industry (Randall 70). "And computer cost systems abound, which help these capitalists identify, perceive and optimize profit avenues and opportunities" (70). High processing speeds and reliable performance under the heaviest conditions are paramount to cost-effective management.

> One recent study of a 250-bed acute care community hospital, utilizing a shared financial system only, analyzed over 4,000 activities within 26 departments representing 86 percent of the labor force. This study showed that more than 33 percent of all workload activities were devoted to managing data--not patients! Of these activities, almost 90 percent were involved with either forms processing, record keeping or phone communications. With enhanced information management systems, the potential labor savings alone totalled more than $4 million annually; and this amount doesn't include potential benefits associated with decreased inventories, improved cash flow, increased revenue, and reduced length of stay and others (DiGiulio and Zinn, Idea Has Come 20).

Healthcare institutions also demand up-to-date marketing information to help better understand the marketing/patient mix and how it is best serviced profitably (Robertson 62). "Indeed, the support of mega structures demands comprehensive, innovative hardware and software solutions, able to accommodate the complex requirements associated with increased volume and diversity of application needs" (62). It is essential to provide the end user immediate access to information from the database in order to facilitate the decision-making process.

"A complete management information system will address both operational activities, those involved in the delivery of care/service to consumers, and business activities, such as accounting and marketing" (62). According to a survey conducted by Shared Data Research in Hudson, Ohio, 56.7% of hospitals with greater than 200 beds installed some level of computer automation to aid nursing (Packer 60). However, only a small number (21%) of these hospitals have installed computers with full functional capability (60). Increased competition in the hospital industry necessitates computerization for enhancing the quality of patient care.

> In some way, 75 percent of all jobs now involve computers to collect, control and manage the knowledge we need to produce goods and services. Since nurses, in particular, devote one-third of their time to information building, computers offer many opportunities to simplify, redefine and extend nursing practice (Happ 18).

With computer capability, the nurse becomes the central point at which patient information can be immediately accessed. Patient information is integrated from a variety of sources, including

laboratory, dietary, physicians, medical records, and accounting. This enables the nurse to acquire vital patient and business information necessary for the efficient but quality patient care demanded in today's society. Information is available on a 24 hour basis because hospitals cannot afford to tolerate the loss of data that may effect the well-being of their patients. Nurses can efficiently plan their care on menu-driven computer screens. Thereby, charting and retrieval of information can be effectively channeled to save time and to gain accuracy, thoroughness, and communicability. Automation has improved the safe administration of medication in many hospitals. Order entry programs dictate the exact medication, dose, and frequency for each individual patient. Modern technology allows verification of patient allergies and potential drug interactions. Programs can also be devised to notify nursing personnel of the medication administration times for each patient. Nursing data bases can also provide assessment, care planning, implementation, quality assurance, scheduling, staffing, and research capabilities. "In hospitals which have

been using them [computers] for years, they have not eliminated nursing positions" (Happ 20). Systems with comprehensive functionality have saved time, promoted accuracy and consistency, increased the effective use of limited nursing resources, and enhanced the quality of patient care by expanding the capability for planning, prompt intervention and continuous attention. Making the transition from a manual to an automated system streamlines data processing which in turn increases productivity, and ultimately raises department revenue.

Purpose of Study

The success of a hospital information system is directly related to the success of each individual phase of the implementation. Each phase possesses an interrelatedness to the previous and following phase. It is the sum of the parts rather than any single phase of the process that distinguishes a successful hospital information system from an unsuccessful one. The major stages of a hospital information system installation include the following: planning, system selec-

tion, design and configuration, testing, training, implementation approach, support, and evaluation. Each of these major categories contains many important steps necessary to the successful completion of each phase. Depending on the needs and requirements of an individual hospital, some steps may be added or deleted or the sequence may vary. It is the success of each individual phase which determines the overall success of a hospital information system. Therefore, each individual stage will be discussed in depth to explain the level of importance to the ultimate goal of the organization in an effort to determine the most important criteria to the success of a patient care (clinical) hospital information system.

Chapter II

LITERATURE REVIEW

Planning

The most basic element, as well as the most critical, in any successful project implementation is planning. However, the organization must first identify the appropriate people to formulate the plan. The first step in the development of a long-range plan consists of the formulation of a Management Information System Steering Committee with representation from administration, finance, nursing, ancillary departments, the medical staff, and Management Information Systems at a minimum (Tobias and Levine 46). The committee should be small in number to facilitate the decision-making process. The purpose of this committee is to provide total involvement of the hospital in the identification of information requirements and to provide direction, guidance, and approval of the hospital information system (46).

The steering committee generally selects a project team to prepare a detailed implementation

plan. This team is usually headed by the information systems project manager and is generally composed of representatives from one or more user areas. Some institutions prefer outside leadership to govern the team and often include an outside consultant for objectivity. The initial duties of the team include determining information requirements of the various user departments. Information gathering can be accomplished by one-on-one and group interviews, review of current documentation, a literature search, and time management studies. Only at this time can the team develop realistic goals and objectives for each user area. "Establishing specific and measurable objectives is a critical element in the entire planning process" (Ivancevich, Donnelly, and Gibson 77). Based upon the overall corporate plan, the project team needs to establish priorities for their objectives with appropriate verification from management.

The long-range plan is generally developed by the Information System's department with recommendations from the project team. It encompasses all aspects of the patient care system but also

includes system hardware, system software, staffing, budgeting, and many other issues. It is imperative that the hospital information system's strategic plan facilitates all corporate goals, strategies, and business plans. Due to the dynamic nature of the hospital industry and the rapidly improving technology in the computer industry, the proposed plan should maintain flexibility. The plan should be comprehensive and it should include both short and long term goals. Top management should review the long-range plan regularly to assure its responsiveness to the institution's environment and to maintain congruence with the corporate strategy. This is necessary to take advantage of new business opportunities that may enhance the computer project and the overall efficiency of the organization. According to a recent poll conducted by Computers in Healthcare and Healthcare Research Group, almost 400 respondents unanimously agreed that planning is the most significant criteria for the successful implementation of a hospital information system (DiGiulio and Zinn, Criteria for Success 41).

Selection

Once the planning process is complete, a list of needs will be available by priority to initiate the selection process. These needs are critical in determining system requirements for a specific hospital.

> The requirements document, drawn from the business functions of the company, and approved by the Information Systems Steering Committee, is the yardstick by which each of the candidate systems will be measured. The final determination of system rankings will be a representation of how closely and comprehensively each system meets the specified requirements (Huling and Hill, Part IV 40).

There are many objectives during the selection process. First, it is necessary to manage and improve the quality of care so that the information coming out of the system is useful (Pollock 23). Information must be accurate and timely. The system should control operating costs and improve cash management (25). It should also expand market share and increase revenues and reimbursements (25). The computer should provide defined quality assurance data as well as deliver readily accessible cost analysis reports, physi-

cian case analysis and labor analysis (25). Redundancy of data should also be eliminated to promote efficiency by reducing duplicate work effort. One of the most important objectives is to maintain flexibility and to remain user friendly.

When the selection of a hospital information system requires the use of existing hardware, the existing system must be carefully documented (43). It is important to provide information to the vendor regarding model numbers, storage and memory constraints as any software that could not execute on said equipment would be eliminated immediately (43). In those situations where existing hardware is not a factor, requirements for software become the controlling force for selecting and purchasing hardware (43). Market surveys are often used to locate systems which best match the hospital's needs and requirements (Meyer and Sunquist 23). Initial screening can be accomplished by gathering information from project team and task force members, advertisements, brochures, articles in professional journals, trade shows, and consul-

tants. Many companies can be eliminated after the initial screening process (23).

"A request for proposal (RFP) or request for information (RFI) should be developed and sent to companies on the screened list. The RFP contains information identifying the prioritized needs and the organization's informational requirements" (23). A third area of the RFP provides space for the vendor to indicate a response (Huling and Hill, Part IV 40).

> Structuring the RFP so that the responses may be indicated directly on the document will ensure that the responses are uniform and complete, and that they are specifically limited to the information which is important to the organization. This will greatly reduce the effort which might otherwise be required to evaluate them (40).

"The business agreement (contract) is the most overlooked significant factor in the overall decision process" (Bex 84). The RFP should specify the business agreement requirements to the proposed vendor (84). The business agreement includes requirements of the vendor to license the software, to sell the hardware, to provide hardware and software maintenance, to identify the

standards of performance, and solutions or consequences of non-performance (84).

The most reliable sources of information about a computer system are the individuals who are using it (40). Therefore, the project team should spend considerable time contacting as many references as possible (40). Based on these contacts, the project team should select one or two users of a specific hospital information system who will demonstrate it at their site (40). The main objective of the on-site demonstration is to confirm that a system will perform as promised and have the needed flexibility to work in a specific hospital setting (Meyer and Sunquist 23). Although hospital information

> systems seem to have common features, their architecture differs dramatically. Features are the things that the vendor claims the system does. Even though the features are there, using the system on a day-to-day basis may be cumbersome, unfriendly, and laborious (the very characteristics that hide themselves so well until you go live). System architecture is how the system actually performs those features. This distinction may sound trivial, but it marks the difference between a system that will or won't work for you. The key to successful selection is finding the system that not only will perform but (because of its architecture) also will be flexible enough to meet your needs for years to come (Lant 37).

Based on this information, it is extremely helpful to spend a significant amount of time at the user site without the vendor present to assure a clear and accurate impression of the system (37). Clients usually will not candidly discuss problems with the system or the vendor while the vendor is present (37). References should be asked the following questions. How long did it take to get their system up and running? How long have they had the system? How valuable was the training? Did they have any problems? If so, how long did it take the vendor to correct them? Did the problem ever reoccur?

Another area requiring careful evaluation is the qualifications of the vendor. These qualifications include the financial stability of the vendor, the level and quality of support provided, and the vendor's reputation (Huling and Hill, Part III 44). The requirements may be defined as the number of years in business, the number of successful installations of the product, the availability of references, and more (44).

References should resemble the buyer hospital in number of employees, number of beds, amount of revenue, number of hospital sites, and similarity of goals and objectives (Mahigan and Broz 26). Mahigan and Broz identified the following issues which also must be addressed by the vendor to the satisfaction of the buyer: application trained personnel, pro-active maintenance, training (on and off site), complete documentation, warranties on all software, toll-free telephone assistance, software modification services, consulting (application, technology, interfacing), and extended maintenance plans (26).

The final selection is based on each of the areas previously discussed as well as a formal

cost-benefit analysis by the organization. The successfulness of the final decision is based upon thorough planning and reliable documentation acquired during the selection process. One of the principle reasons for failure of the selection process is a lack of overall project organization (Huling and Hill, Part II 20). Huling and Hill identified the following three symptoms of an unorganized project: lack of an effective project structure, absence of a true project manager, and failure to effectively define and allocate project responsibilities (20).

The ingredients of the selection process lay the groundwork for contract negotiation. Typically, negotiations begin with a RFI/RFP. Terminal response time, performance demonstration requirements, and payment terms are explored at this time (Kleinschmidt 31). The next step towards an effective and successful negotiation is the formation of a negotiating team. The team should be limited to three organizational representatives whose primary goal is the acquisition of a hospital information system (31). Usually, the team consists of a department manager, an information

systems manager, and a representative from finance or administration (31). It is mandatory to involve the legal department to review the contract and to submit legal advice. Next, the team should define and prioritize its negotiating objectives which are identified as mandatory or desirable (32). As previously discussed, the vendor should be thoroughly researched. Common vendor problems include too few orders with impending financial burden or too many orders complicating the implementation process (32). Finally, the contract should be revised to incorporate the corporate goals and objectives for the hospital information system.

Design and Configuration

The development of a task force for each user department is instrumental in the design phase. It is documented in the literature that the appropriate level of user participation is another key to a successful implementation (Gay 30). It is the responsibility of the task force and the respective analyst to design each individual screen in each user pathway. The goal is to have the

user participate in the external design and tailoring of the system (30). This allows the actual users to control how the software functions work. The "garbage in, garbage out" phenomenon applies in this situation. If a systems analyst who has no clinical knowledge completely designs the system without any input from the users, there may be little functionality to the system. It will become a hindrance more than an asset. If the hospital information system cannot meet the needs of the end users, it has become an expensive waste of time. However, who could best determine the necessary functionality but the end users themselves?

Customization requires flexibility of software and able personnel with the time to accomplish the task. A frequent temptation is to try and design the ultimate system for some time in the future rather than design a system that will run the department now (30). However, this can be controlled by formalized sign-offs specifying departmental functions. The sign-off also helps to set realistic expectations and provides a method of measuring the timeliness of the project

schedule (30). Many hospitals elect to implement a software package as sold or with minimal changes to facilitate the implementation process. In this case, customization may take place several months after the initial activation to allow users time to become familiar with the software before making it more complex. On the other hand, it may be easier for users to learn the system once no matter how difficult, than to change to a new procedure. After the design of all screens is completed, the coder/analyst must prepare each screen via configuration. This process interprets the English language on the screen to machine language using the binary system. Most computers are not yet capable of interpreting human language into computer language, even though research is making vast improvements in this area.

Following configuration, the task force becomes a necessary element again. Each member spends time, individually as well as a group, testing each individual screen to assure that it functions exactly as planned. Time is spent correcting typographical errors and rearranging the format or sequence of data to provide the most

logical and efficient presentation of information. It is also important for members to check that each item follows the proper sequence in the pathway. With systems that utilize lightpens, the lightpen selectable items are evaluated to determine if all information selected displays in the data accumulation area and scrolls appropriately off the screen. Items are entered on specific pseudo patients to allow verification of information retrieval and proper display of information on reports. It is at this time that functionality can be determined as successful.

Training

A comprehensive training program is critical to the success of the actual activation in each department and nursing division. The training schedule should coincide with the conversion schedule, and both should be confirmed as soon as the software readiness date is given by the vendor (Tarrent 26). It is preferable that a training coordinator be selected to undertake this monumental task. First, a list of training needs should be identified jointly with the project team.

These include varying classes of personnel who will have access to different pathways in the computer. For example, nurse attendants are not allowed to enter physician orders and housekeeping personnel are denied access to confidential patient information.

Next, the training coordinator and the respective analysts must decide on the training requirements of each user class so each personnel level can be thoroughly trained in the use of screens and pathways they need to access. During an extensive activation, consultants suggest nurses and unit secretaries have a minimum of sixteen hours of training, preferably 24 hours of training if the charting function will be implemented. Nurse attendants and other departmental users usually require four to six hours of training due to limited computer access. Nursing generally requires the most functionality due to the broad nature of their job requirements; therefore, nursing personnel require the most extensive training. Nursing personnel enter physician orders for all departments (lab, pharmacy, x-ray), act upon these orders, including nursing treat-

ments and medication administration, and then document in the patient chart (now automated) that the orders were completed. Other departments, such as the clinical laboratory, need only those functions related to laboratory orders.

As a rule, each class should be limited to ten employees per instructor to allow identification and resolution of individual needs during the training time. It is preferable to divide training time in four-hour blocks. One main reason for this is to minimize fatigue and strain created by the influx of a large amount of information in a short period of time, and to prevent eyestrain from using a computer terminal for an extended period of time. Another reason for using four-hour training blocks is the current shortage of personnel in the healthcare field. Releasing them from their patient care responsibilities for a prolonged period of time becomes difficult; it creates a scheduling dilemma for management to find qualified coverage.

Management needs to designate a specific training room. Training should be accomplished using a tiered approach (Tarrent 26). This in-

cludes the training of a small number of "lead trainers" who will be responsible for training the bulk of the hospital staff (26). Schutz recommends the same approach but entitles it the "train-the-trainer" concept (28). These trainers can also assist with compiling the written documentation such as policy and procedure manuals and user manuals. A policy must be developed identifying training as mandatory and preventing any employees from accessing the computer until their education is satisfactorily completed. The training coordinator must then develop training schedules for all employees and also develop teaching plans for each area. Schutz strongly suggests that the training schedule be published and posted close to the actual start of the training (29). Her reasoning includes showing management commitment to the project and reinforcing to the staff that they must attend training (29).

Generally, people tend to think of training only in a classroom setting. However, there is a new innovative product on the market called CBT, Computer-Based Training. "CBT has been defined as an interactive learning experience in which the

computer provides the majority of the stimulus, the learner must respond, and the computer analyzes the response and provides feedback to the learner" (Farrell 24). CBT is a new concept in the healthcare industry. CBT software is designed for non-data processing personnel. It is easy to use and usually has full color and graphics capabilities, as well as extensive context-sensitive on-line help (24). However, these features are vendor specific and variable.

> Studies indicate that CBT courses produce better results, in a shorter period of time, and with greater student acceptance than traditional methods of instruction. Moreover, students' scores are typically 10 to 15 percent higher in CBT courses and because the computer is always available, tireless and non-judgmental (24).

In addition to a significant reduction in student training time, CBT provides a 66-79 percent decrease in trainer time (Perez and Willis 29). These time reductions collectively result in a twofold advantage, a quantitative decrease in cost and a qualitative decrease in user frustration and resistance. Another advantage to CBT is that each employee can work at his or her own pace. Each

individual can proceed as slow or as fast as his or her comfort level permits. CBT also allows greater flexibility in scheduling. An employee from one department can train side by side with an employee from another department, each using his or her own specific CBT courseware. Of course, the instructor must always be available to answer any questions.

One important note to remember is that CBT is usually sold as a generic package. If the hospital has customized screens in the actual pathways to meet their individual needs, CBT must also be customized to depict these customizations. Otherwise, personnel would become confused and frustrated by screens on the live system that were drastically different from the training system. In the event that hospitals elect not to maintain consistency between their training screens and their actual screens in the live environment due to a shortage of time or personnel, it is important to increase the training time to clarify these differences.

Conversion Approach

There are a variety of activation approaches available in the hospital setting. However, any conversion approach utilized must be consistent with the hospital's needs. There are many factors that affect the decision on how the conversion will best be accomplished. For example, is this a multi-hospital facility or a single hospital facility? How many licensed beds are in the facility? What is the extent of the computer functionality desired? How many departments and/or nursing divisions are involved? Is this institution computerized now? How many interfaces with stand-alone computers will be needed? It is crucial to the success of the activation to analyze these and many more factors thoroughly and then to select the approach that best meets the individual hospital's needs.

Conversions involve a large number of hospital personnel and a major change in the way information is processed across a broad cross-section of departments. These elements add to the workload and stress of those who already feel overworked and underappreciated. Conversions

create significant changes within the hospital organization which can generate serious resistance to the computer project (Bolesta, Anderson, and Zeni 848). It is imperative to plan for, identify, and manage this resistance before it adversely effects the success of the project (848).

There are three basic conversion approaches with many variations of each. The first approach is entitled "Big Bang". Big Bang brings all nursing divisions and user departments live simultaneously. Logically, it is much easier to accomplish this in a small hospital environment with limited capabilities than a large medical center with many nursing divisions and full functionality. This approach requires that all users be trained in advance of the initial activation date. Depending on the number of users, some may receive their training months before the actual activation. Due to an individual's learning curve and associated retention rate, it is preferable to train as close to the actual activation as possible. A major pitfall of Big Bang is the potential lack of user support. In order to have a smooth transition from a manual

system to an automated system, it is important that experienced users be available to resolve any potential problems that may occur.

The "Phased-by-Function" approach activates one user department function at a time on all nursing divisions. This approach may cause much confusion in order entry. For example, if the lab department were activated, physicians and nursing personnel could only enter lab orders into the computer and all other orders (nursing treatments, medications, x-ray and other procedures) would have to be entered manually. There is the potential for errors and lost orders when attempting to maintain two different methods of work flow. It is important to avoid error at all costs in the hospital environment as patients' lives may be at stake. Again, this approach fails to provide adequate user support.

The "Phased-by-Nursing-Unit" approach provides all departmental functionality on one nursing unit at a time. This approach is preferable as it allows a broad base of support for the users on each shift of the activating division. Therefore, a positive climate envelopes the nurs-

ing division due to the reduction in frustration and error rates. The Phased-by-Nursing-Unit approach allows early experimentation with a pilot site. The pilot unit is the first nursing unit to go live in the hospital. It should be carefully chosen as it serves as the model for the remainder of the implementation process and the staff provides a valuable resource to the rest of the personnel (Bauer 47). Many organizations choose a busy floor as the pilot unit in order to learn as much as possible about the potential pitfalls of the new computer system (47). It is also manageable in case of major program or application failures. The biggest disadvantage of the Phased-by-Nursing-Unit approach is the huge expense caused by the amount of time and personnel involved to complete the entire activation process hospital-wide. Another problem arises when the functional departments must run two computer systems side by side until the last nursing unit is activated. This requires tedious as well as confusing tasks to be accomplished.

Regardless of the type of conversion, there are numerous methods available to reduce user

frustration and anxiety and to promote the efficient and effective utilization of the hospital information system. Tarrent suggests that departmental meetings be conducted prior to the conversion to review the exact procedures and answer any pending questions (27). A checklist is recommended to assure continuity and thoroughness (27). It is also advisable to review downtime procedures with the staff and to assure that manual backup requisitions are available (27). A problem/question log should be provided which includes date, time, problem description/question, and the name of the person who identified the problem (27). Answers to these questions should be incorporated in the company newsletter and distributed to all of the user departments (27).

A common thread to any activation is user support. Usually, departmental task forces have become "super-users" and they are used as the resource support during the actual activation. A minimum of one support person per shift per unit is suggested with a preference of three support people per shift per unit depending on the size of the unit. Support must continue 24 hours a day,

seven days a week on each nursing division and in each department during initial activation. It has proven beneficial for installation team members to make rounds on each converted unit one to two times daily for approximately two months (28). Repercussions due to the lack of support include low morale, negativity, confusion and frustration, poor quality of patient care, physician anger and lack of support, and incorrect, nonexistent, or duplicate orders. Regardless of the method of activation, a competing factor relating to its success is adequate user support.

Benefits of Successful Automation

In order to accomplish the objectives of the hospital to make the overall implementation successful, it is important to have unlimited support from top management, including the Chief Executive Officer, the Chief Operating Officer, and the Chief Financial Officer. This support must be evident throughout each phase of implementation. Implementation is a series of phases which accomplishes a common goal. The success of the final implementation is dependent upon the success of

each individual phase. To determine the actual success of the total implementation process requires the comparison of the actual comprehensive performance of the hospital information system to the expected level of performance. This performance can be measured in many ways. However, it is best measured by the benefits derived from the hospital information system by the end users themselves and by the patients who are the primary concern of a hospital.

The benefits of a successful implementation are broad and encompass every aspect of a hospital organization. This includes the patients, the nursing division and department level staff, the physicians, and the hospital-wide management team. The benefits to patients are a by-product of the advantages to the nursing staff. An article in the American Journal of Nursing estimated that a staff nurse spends 36 percent of her time processing patient data (Cook and McDowell 46). "All patient care information is automated so the hospital's medical professionals can spend more time with patients and less time with paperwork" (Carter, El Camino 84). By the effective use of a

hospital information system, some hospitals have decreased the amount of nursing time devoted to clerical duties by 60 to 90 minutes per nurse per 8-hour shift (Lappa 76). This results in more nursing time each day that can be spent in delivering quality patient care. Nursing feels that the time is better utilized in accomplishing the tasks for which nurses were trained. This promotes job satisfaction and an overall positive climate on the nursing division.

It is estimated that physicians can eliminate one to one and one-half hours per day of the time spent writing admission orders (76). To physicians, time is precious. The hospital information system promotes greater flexibility and efficiency in patient care. Physicians can access information and write orders on any patient in the hospital from any terminal in the hospital, including their office if the system is so designed. Lab results can be accessed immediately to speed the process of diagnosis and treatment, again a benefit to the patient. The computer system provides a valuable resource to each physician and therefore to each patient.

Providing quality care is the primary purpose of a health care facility, but providing this care at a cost people can afford is a concern of hospital personnel and the surrounding community. El Camino Hospital in Mountain View, California calculated savings of eight hours per nursing unit per shift or $720 per day through the improved management of nurses via a staff productivity capability (Carter, El Camino 86). This can be a substantial amount of savings, especially for larger hospital systems which may have 20-30 nursing units or more. Another area of potential savings to the organization is insurance reimbursement. "Systems that update the status of a medication when a nurse signs on the system to enter data can increase accuracy and decrease third-party denials of medication reimbursement" (Lappa 76). Another advantage to insurance reimbursement involves length of stay (LOS). Typically, insurance companies pay a fixed amount per specific diagnosis. If a patient exceeds the time limit without appropriate documentation, the insurance provider refuses additional payments to the hospital who in turn must absorb the cost.

MacNeal Hospital in Berwyn, Illinois decreased their length of stay to 7.8 days compared with 13.5 days prior to the installation of a case-mix system (Carter, Hospitals 62). Other benefits include staffing reductions or reorganization, decreased budgets for paper supplies, lower inventory rates, increased cash flow, and increased revenue. Ultimately, this should result in lower cost to the patient. The benefits accomplished at MacNeal Hospital are just a sample of the potential benefits of a hospital information system. One important point to remember is that any benefit achieved through automation is not inherent in the technology, but depends on the institution's willingness to change the basic way things are done (DiGiulio and Zinn, Idea Has Come 20).

Statement of Hypothesis

A broad review of the literature strongly suggests that planning is the most important phase to the overall success of a hospital information system. This view is reiterated in every college management text. However, on-the-job experience reveals that the process of evaluation is para-

mount to the success of the hospital information system. Many projects have succeeded in the end, even after the failure of individual phases including the planning phase. The key is the ongoing evaluation of the critical success factors within each phase. This evaluation allows the prompt identification of problems. Unless these problems are identified, they cannot be resolved. It is the identification and resolution of these problems which allows the recovery of any specific phase so it does not adversely impact the overall success of the project. It is the purpose of this research to prove that evaluation, as opposed to planning in the literature review, is the most important element critical to the success of the overall patient care hospital information system.

Chapter III

RESEARCH METHODOLOGY

Subjects

The survey encompassed four categories of personnel at one specific hospital in the St. Louis area. The four categories were: 1) the hospital information system vendor, 2) hospital management, 3) management information system (MIS) management, and 4) the technical support staff. The vendor for this particular hospital was Technicon Data Systems (TDS), in Atlanta, Georgia. The vendor persons represented in the survey were those directly involved in the computer installation at this particular hospital. These included the TDS project managers, the individual departmental consultant staff, and the training instructors. There have been two TDS project managers involved in this particular computer project. The original project manager left the TDS organization midway through the project and has since returned. In this case, both she and her successor were surveyed because each dealt

with different issues specific to the beginning and ending of a project. The departmental consultant staff represented database management, ancillary departments, medical records and admitting, nursing and physicians, laboratory, and pharmacy. The TDS training instructors were involved in the initial training of the TDS implementation project team. This training occurred off-site at the vendor corporate headquarters in Atlanta, Georgia. A total of fifteen people from the vendor category were sent surveys.

Hospital management involved in the survey encompassed a broad range of management personnel from the Chief Executive Officer to line supervisors. Specifically included were: Patient Care Coordinators, Head Nurses, Nursing Supervisors, and Directors of Nursing at both hospitals; all Department Heads and Supervisors of any ancillary department activating on the computer; all Vice Presidents and Assistant Vice Presidents controlling user departments; Administrators at both hospitals; the Chief Operating Officer, the Chief Executive Officer, and the Chief Financial Officer. Collectively, this group comprises the

overall strategic and operational decision-making layer of hospital management. A total of 69 managers were sent surveys.

MIS management included the Corporate Director of Management Information Systems, two Assistant Directors, a Programming Manager, two Data Processing Managers, and two Project Leaders. A total of eight surveys were sent to MIS management.

The technical support staff was comprised of the project team and all MIS programming and system analyst support staff who contributed to the new computer system in any capacity. It also included the nursing task force, the Operating Room (OR) task force, and the Emergency Room (ER) task force. The nursing task force was developed early in the development process to complete data collection, screen design, testing, and policy recommendations. The nursing task force had eight members from functionally different and clinically different nursing divisions at both hospital sites to provide a comprehensive nursing perspective. The ER and OR task forces were instituted midway through the project to determine efficient work

flow in their respective departments and develop the appropriate policy and procedures.

The TDS implementation project team members were selected to design and configure the new computer system for their respective departments. There were seven members of the Project Team. These included the following: a nursing/physician analyst, a laboratory analyst, an ancillary analyst, a medical records/admitting analyst, a pharmacy analyst, and two database managers. The MIS programming and system analyst staff provided hardware, software, and interface support. The sum total of people surveyed in this category was thirty-three.

A grand total of 125 surveys was sent from the four respondent categories. The total population of each of the four categories was sampled. Originally, there was to be a fifth category included which was titled the end users. However, there were no representatives from this category who had been exposed to the computer system at this phase in the computer project. Due to the depth of the survey, it was necessary that the respondents have a baseline knowledge of the

computer system in order to provide meaningful survey results. It would have been preferable to include nurses, secretaries, and other technical staff from various ancillary and nursing departments if they had acquired the desired level of computer knowledge.

Instrument

An investigator-designed survey (Appendix A) was used to collect the data. The goal of the survey was to determine the most important criteria to the success of a patient care (clinical) hospital information system. The survey began with the following three open-ended questions.

1. What do you feel is the single most important element to the success of a patient care (clinical) hospital information system?
2. If you could change anything in the entire process of developing and implementing our new computer system, what would it be?
3. In your opinion, what could have been done differently, if anything, to

prevent the delays in activation which have occurred?

The purpose of placing these questions early in the questionnaire was to gain the respondent's interest and to stimulate some spontaneous thought which would lay the groundwork for the remaining questions.

The questionnaire asked the respondents to prioritize, in terms of criteria for success, the major implementation phases of a hospital information system. These phases include: conversion, development, planning, selection, and training. A brief description of each phase was included to eliminate any question or variance between the respondents. For example, conversion was defined as the process of activating the computer system within each department.

Within each implementation phase, respondents were also requested to rank eight elements according to their level of importance to the overall success of the project. Examples included within the selection phase are: selection of hardware and software, quality of the RFP, reliability and quality of the vendor, comprehensiveness of the

actual contract, involvement of consultants in the selection process, and evaluation and control of the selection phase. These elements were ranked in numeric order sequence with "1" being the most important item and "8" being the least important item. These criteria provided a mechanism to determine the factors contributing to the success of each phase of the hospital information system process.

The remaining questions were fixed alternative questions. These questions were designed to obtain information to determine the respondent's level of experience with computers as well as any significant demographic information that might have an impact on the individual survey groups. Examples include selecting the number of years of clinical experience in the hospital, the number of years of direct experience with a Patient Care Information System, their appropriate age group, and if they currently own or have access to a computer for personal use.

Procedure

All hospital personnel were contacted in person at the hospital site. Top management personnel were approached individually by prearranged appointments to facilitate the completion of their surveys. The nursing managers and nursing task force personnel were approached during scheduled meetings and requested to complete the survey. This ensured a successful response rate to the survey. The vendor surveys were mailed to the individual respondents at the Atlanta, Georgia office. Each survey included a cover letter (Appendix B) explaining the reason for the survey and any pertinent instructions. The vendor surveys also included a stamped, addressed envelope to expedite the return of the questionnaires. The cooperation of the TDS nursing consultant was enlisted to encourage participation of the other vendor survey participants. The vendor category was the most uncertain in terms of receiving a return response. They traveled frequently and had an excessive amount of responsibilities due to staffing shortages. This is an example of the typical vendor problem previously described. Too

many clients and not enough personnel to adequately support present clients and/or acquire new clients is fast becoming the norm, not the exception in the MIS vendor class.

Data Analysis

All survey questions were analyzed according to each of the four major respondent groups and as an aggregate total. The four respondent groups included hospital management, management information system management, the technical support staff, and the vendor. The groups provided a basis for comparison for the survey questions.

The corresponding answers to the three open-ended questions were categorized according to content. Examples of these categories are: expeditious delivery of patient care, easy to use and understand, communication and cooperation, adequate training, end user involvement and acceptance, speed and accuracy, improved planning, and corporate commitment. The categories were not structured or prepared in advance to allow the development of natural divisions in the tabulation process. It was necessary to place the data into

broad but similar categories for the ease of tabulation. Due to the open-ended type of questioning and the inability to quantify these opinions, the results for the first three questions could not be analyzed.

The critical success factors included within each question were placed on an ordinal scale by the respondents. Descriptive statistics were used to quantify each individual data element. The median was determined for each element within each sample and for the total population. This allowed a basis for comparison between the four respondent groupings, as well as the totality of the entire survey group. The lowest median score within each question was the average response of the most important element for that category.

The last five survey questions were fixed alternative questions because they required the respondent to choose only one response from among several possible alternatives. These structured questions provided the capability of analyzing the data within each sample according to several variables. The variables included the respondent's level of clinical experience, their level of

computer experience--home and work, their job position, and their age group. All survey questions were analyzed by percentages to establish any patterns or trends that might exist within each sample. This allowed further evidence as to why the participants responded as they did.

Chapter IV

RESULTS

Survey Response

A total of 125 surveys were sent to the following four sample groups: 1) the hospital information system vendor, 2) hospital management, 3) management information system management, and 4) the technical support staff. The survey had a 68% response rate. Of the 85 surveys returned, seven [8%] were excluded from the analysis because they were answered incorrectly. All seven surveys were answered in the same manner by rating each individual element in each question instead of placing the elements in rank order. The resulting sample size consisted of 78 respondents [62%].

Fifteen surveys were sent to the hospital information system vendor. Only five surveys [33%] were returned.

Hospital management had a sample size of 69 personnel from a St. Louis area hospital. Forty-one surveys [59%] were returned. Two surveys [4.8%] were eliminated due to improper rating

within each question. A total of 39 surveys [56.5%] were used in the analysis.

Management information system management encompassed a total sample size of eight. However, nine surveys were returned specifying this category of MIS management. Three surveys [33%] were invalidated due to incorrect rating of the elements within each question. Six surveys [67%] were used in the final analysis.

The technical support staff had a sample size of thirty-three. Thirty surveys were returned, providing a 91 percent return rate. Two of the surveys [6%] were negated due to the inadequate completion of the survey. The total sample size, from all categories, was twenty-eight.

Open-ended Questions

The first three survey questions were open-ended questions. The first survey question asked, "What do you feel is the single most important element to the SUCCESS of a patient care (clinical) hospital information system?" A percentage analysis of the aggregate of all samples provided the following results. Open communication, coop-

eration, and adequate support comprised the highest percentage, 25.6 percent. Adequate training ranked second at 20.5 percent. The next four elements were ranked closely within five percent of each other, 11.5%, 9%, 9%, and 7.7%. The corresponding elements included: ease of use and understanding; expeditious delivery of patient care; selection of a system which meets the needs of the user; and system accuracy, reliability, and speed. Other low ranking elements included end user involvement and acceptance, improved planning, corporate commitment, and knowledge of the installation team.

Sixty percent of the vendor sample respondents felt that open communication, cooperation, and adequate support were the most important elements of a successful hospital information system. Corporate commitment and end user involvement/acceptance both rated 20 percent in the vendor category.

The hospital management sample yielded a variety of answers to the first question. The leading percentage was adequate training at 30.8 percent. The next percentages were 17.9 percent,

15.4 percent, and 12.8 percent with the respective categories of easy to use and understand, system accuracy, reliability, and speed, and expeditious delivery of patient care. Open communication, cooperation, and adequate support followed at 7.7 percent. The selection of a system that fits individual department needs was next at 5.1 percent. The following categories were all rated at 2.6 percent: end user involvement/acceptance, improved planning, and knowledge of the installation team.

Management information system management rated the single most important element of success as expeditious delivery of patient care at 33.3 percent. Only two other elements were identified, both at 16.7 percent. These were the selection of a system which meets individual department needs and open communication, cooperation, and adequate support.

The technical support staff sample overwhelmingly agreed that open communication, cooperation, and adequate support was the most important category at 46.4 percent. The following two categories both were rated at 7.1 percent: easy to use

and understand and improved planning. Three categories were rated at 3.6 percent. These were end user involvement/acceptance, corporate commitment, and knowledge of the installation team.

The second open-ended survey question was stated as follows. "If you could change anything in the entire process of developing and implementing our new computer system, what would it be?" A wide array of answers were received for this question across all samples. All samples combined agreed to change the implementation plan to a less centralized structure, to minimize software, to minimize activated departments, and to minimize customization at 20.5 percent. Increased end user involvement/acceptance ranked second highest at 14.1 percent. Improved training methods/increased training time was next at 12.8 percent. The remaining categories all ranked below 10 percent. They included the following: decreased time schedule before activation, change the project leader, increased research prior to system selection, improved planning, increased testing, utilization of on-site consultant, and

open communication, cooperation, and adequate support.

The vendor group's top percentage was improved training methods/increased training time at 40 percent. Only two other categories were identified for this question; both were rated at 20 percent. These were to decrease the time schedule from development to activation and to change the project leader.

The hospital management sample rated changing the implementation plan at 25.6 percent. This was followed by increased end user involvement and acceptance at 17.9 percent. The next two categories included improved training methods/increased training time and decreased time schedule prior to activation at 12.8 percent and 10.3 percent respectively. All other categories rated below 5 percent. These included changing the project leader, improved planning, increased communication and cooperation, and performance of more research prior to system selection.

Thirty-three percent of the management information system's management sample did not respond to question number two. The following four cate-

gories were all rated at 16.7 percent: change the project leader, increase end user involvement and acceptance, increase research prior to system selection, and increase communication, cooperation, and support.

The top-ranking element for the technical support staff was to change the implementation plan, at 21.4 percent. This category included changing to a distributive implementation from a centralized implementation and minimizing the amount of software, number of departments, and degree of customization upon implementation. Improved communication and cooperation rated 14.3 percent. Both improved training methods/increased training time and increased end user involvement/acceptance were rated at 10.7 percent. The remaining categories were below 10 percent. They included the following: decreased time schedule from development to activation, change the project leader, improved planning, increased research prior to system selection, utilization of an on-site consultant, and thorough testing before activation.

The last open-ended question was stated as follows. "In your opinion, what could have been done differently, if anything, to prevent the delays in activation that have occurred?" Twenty-eight (28.2) percent of the respondents did not answer the question. The highest category percentage was 15.4 percent in favor of knowledgeable, realistic planning. Fourteen (14.1) percent of the sample stated that nothing could have been done to prevent the delays in activation. All other categories were rated below 10 percent. These include increased research before system selection, project manager with experience and stronger supervision, changed implementation plan, prioritized employee input, increased negotiation with and response from the vendor, increased communication and cooperation, improved training process, utilization of on-site consultant, and increased software testing before activation.

Forty percent of the vendor group responded that knowledgeable, realistic planning before commitment to an activation date would have prevented the delays in activation. Twenty percent did not answer the question. The last two cate-

gories were both rated at 20 percent. These included changing the implementation plan and utilizing an on-site consultant.

Forty-one percent of the hospital management sample did not answer the question. Another 17.9 percent stated that nothing could have been done to prevent the delays in activation. The category which included a project manager with experience and stronger supervision was the third highest percentage at 15.4 percent. Knowledgeable, realistic planning and prioritized employee input both rated at 7.7 percent. The remaining categories were all less than 5 percent. These included increased research prior to system selection, improved training process, changed implementation plan, increased negotiation with the vendor, and quicker response from the vendor.

The majority of MIS management agreed that increased research prior to the selection process would have prevented the delays in activation that have occurred. Sixteen and seven-tenths of the respondents did not answer the question. The same percentage (16.7) also stated that nothing could have been done to prevent the delays in activa-

tion. The last two categories include changing the implementation plan and increasing negotiation with the vendor and response from the vendor, also at 16.7 percent.

The highest percentage in the technical support staff category was 25 percent which selected knowledgeable, realistic planning before commitment to an activation date. Fourteen and three-tenths percent of the respondents did not answer the question. The same percentage (14.3) stated that increased research prior to system selection would have prevented the delays in activation. Another 10.7 percent of the sample stated that nothing could have been done to prevent the delays. The same 10.7 percent also stated that increased communication and cooperation might have helped prevent delays. All remaining categories were rated below 10 percent. These include changing the implementation plan, better negotiation with the vendor and response from the vendor, a project manager with experience and stronger supervision, prioritized employee input, and increased testing of the software.

Rank Order Questions

The survey was distributed to system vendors, hospital management, MIS management, and technical support staff. This questionnaire first asked the respondents to prioritize, in terms of criteria for success, the major phases of a hospital implementation. These phases included conversion, development, planning, selection, and training. Question four had only five items to rank. Within each implementation phase category, respondents were also asked to rank eight variables which might influence the successful completion of that implementation phase. Examples of these variables include adequate determination of needs and system requirements, reliability and quality of the vendor, degree of application functionality, utilization of computer-based training (CBT), detailed implementation plan, and evaluation and control of each phase. Questions five through nine each listed eight elements that were ranked from "1" to "8" according to their level of importance to the overall success of the computer project, with "1" being the most important item and "8" being the least important item.

Implementation Phases

Planning is the most significant implementation phase critical to the overall success of the computer project, as unanimously agreed upon by all categories of respondents according to Table 1.

TABLE 1

Rank Phases of Hospital Information System Samples by Median Score
Bold=lowest median score

PHASES	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Conversion	4.000	4.000	5.000	5.000	4.000
Development	5.000	3.000	3.500	3.000	3.000
Planning	**2.000**	**2.000**	**1.000**	**1.000**	**2.000**
Selection	3.000	**2.000**	2.000	2.000	**2.000**
Training	**2.000**	3.000	3.500	4.000	3.500
	n=5	n=39	n=6	n=28	n=78

However, two categories of respondents also stated another implementation phase was just as important as planning to the overall success of the project. The vendor sample selected training, as well as planning, as the most important phase, both with a median score of 2.000. Hospital management identified the selection phase as equally important to

the planning phase in the overall success of the project, the median score also being 2.000.

Planning Phase

Across all survey samples, adequate determination of needs and system requirements was the most important criteria to the success of the planning phase as indicated in Table 2.

TABLE 2

Rank Elements of Planning Phase
Samples by Median Score
Bold=lowest median score

ELEMENTS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Mgmt/Resource Commit	3.000	3.000	4.000	3.500	3.000
Org Structure	7.000	7.000	7.000	6.500	7.000
Level MIS Experience	6.000	5.000	5.500	6.000	5.000
Effective Long Range Plan	6.000	6.000	6.000	5.000	5.000
Adeq Needs Det/System Req	**1.000**	**2.000**	**2.000**	**2.000**	**2.000**
Develop Realistic Goals/Obj	2.000	**2.000**	**2.000**	3.000	**2.000**
Congruence MIS/Corporate	5.000	6.000	5.500	5.500	6.000
Eval/Control Planning Phase	5.000	5.000	6.000	7.000	5.000
	n=5	n=39	n=6	n=28	n=78

The lowest median scores ranged from 1.000 to 2.000. However, hospital management and MIS management agreed that the development of realistic goals and objectives was of equal

importance to the success of this implementation stage.

Selection Phase

Table 3 reveals major differences in opinion as to the most important criterion to the success of the selection phase.

TABLE 3

Rank Elements of Selection Phase
Samples by Median Score
Bold=lowest median score

ELEMENTS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Select Hardware/Software	6.000	4.000	4.000	3.500	4.000
Quality of RFP	**2.000**	5.000	**1.000**	4.000	4.000
Demos at actual Hosp Sites	3.000	4.000	5.000	4.000	4.000
Reliabilit/Quality Vendor	3.000	**3.000**	2.000	**3.000**	**3.000**
Comprehensive Contract	6.000	5.000	5.500	5.500	5.000
Consultant involved w/Selec	8.000	4.000	8.000	5.500	5.500
Structured Selection Proces	5.000	5.000	5.000	5.000	5.000
Eval/Control of Select Phas	4.000	6.000	6.500	5.000	5.000
	n=5	n=39	n=6	n=28	n=78

The overall total, including surveys from all samples, showed that reliability and quality of the vendor was clearly most important in determining the success of this phase, with a median score of 3.000. The hospital management sample and the technical support staff sample

concur with this decision, also with a median score of 3.000. However, MIS management and the system vendor feel differently. Both MIS management and the system vendor ranked the quality of the RFP above and beyond all other criteria in determining the successful completion of the selection phase, with median scores of 1.000 and 2.000 respectively.

Development Phase

A qualified project leader and implementation team was the criterion identified by the aggregate of all samples as most important to the overall success of the computer project within the development phase with a median score of 1.500. All samples identified in Table 4 recognized this criterion as the most important.

TABLE 4

Rank Elements of Development Phase
Samples by Median Score
Bold=lowest median score

ELEMENTS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Qualified Project Leader	**2.000**	**2.000**	**2.000**	**1.000**	**1.500**
Comprehensive Testing	6.000	5.000	5.000	5.000	5.000
Level of User Involvement	4.000	4.000	**2.000**	4.500	4.000
Efficient Design of Pathway	**2.000**	4.000	4.500	3.500	4.000
Flexibility for Change	4.000	**2.000**	4.500	4.000	3.000
Complete Documentation	5.000	6.000	5.000	6.000	6.000
Degree of Applications Func	5.000	5.000	4.500	5.000	5.000
Eval/Cont of Develop Phase	8.000	7.000	8.000	7.000	7.000
	n=5	n=39	n=6	n=28	n=78

However, three of the four sample groups also identified another criterion of equal importance with no consistency between the three groups. The vendor determined that the efficient design and configuration of the pathways was equally important in successfully completing the development phase with a median score of 2.000. Hospital management focused on the flexibility for change with regard to the ability to customize software as equally as important as a qualified project leader and implementation team, with a median score of 2.000. MIS management differed in that they felt the level of user involvement was

of equal importance to the successful completion of this phase, also with a median score of 2.000.

Training Phase

According to the summarized data in Table 5, all respondents had difficulty in identifying the most important success criterion in the training phase.

TABLE 5

Rank Elements of Training Phase
Samples by Median Score
Bold=lowest median score

ELEMENTS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Training immed before Activ	4.000	5.000	4.000	3.500	4.000
Experienced Training Mgr	5.000	**3.000**	3.500	**2.000**	3.500
Utilization of CBT	7.000	5.000	6.500	6.000	6.000
Comprehensive Training Plan	**2.000**	**3.000**	**2.000**	3.000	**3.000**
Efficient Training Schedule	6.000	4.000	6.000	4.500	5.000
Train Modules specific User	**2.000**	**3.000**	**2.000**	3.000	**3.000**
Length varies w/User Funct	5.000	5.000	5.000	5.000	5.000
Eval/Cont of Training Phase	7.000	7.000	4.500	7.000	7.000
	n=5	n=39	n=6	n=28	n=78

Three of the four sample groups identified several criteria of equal importance to the successful completion of this phase. The aggregate totals for all groups identified that a comprehensive training plan and training modules specific to

individual user needs were equal in determining success, with median scores of 3.000. The system vendor and MIS management both endorsed the aggregate totals. The hospital management group agreed with the above, with the addition of a third criterion, experience of the training coordinator. The hospital management group felt that all three criteria were of equal importance to the success of the training phase with median scores of 3.000. The technical support staff stood firm with their decision that the experience of the training coordinator was the most important element to the success of this phase with a median score of 2.000.

Conversion Phase

No single success criterion was identified in all four sample groups according to Table 6.

TABLE 6

Rank Elements of Conversion Phase
Samples by Median Score
Bold=lowest median score

ELEMENTS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Congruent Conv w/Hosp Needs	3.000	4.000	4.500	3.000	3.500
Detailed Implement Plan	2.000	**3.000**	**1.500**	**2.500**	**3.000**
Adhere to Implem Time Sched	7.000	6.000	5.500	7.000	6.500
Quality/Quantity User Supp	4.000	**3.000**	4.500	3.500	3.500
Presence Contingency Plan	6.000	5.000	6.000	5.000	5.000
Develop Down-time Procedure	5.000	5.000	7.000	6.000	6.000
Level of Mgmt Support	**1.000**	**3.000**	3.000	3.000	**3.000**
Eval/Cont of Convers Phase	8.000	8.000	4.000	6.500	7.000
	n=5	n=39	n=6	n=28	n=78

However, three of the four groups specified that a detailed implementation plan was the most important criterion to the successful completion of the conversion phase. These three groups were MIS management, the technical support staff, and hospital management. MIS management and the technical support staff agreed that a detailed implementation plan was the only indicator of success within this phase, with median scores of 1.500 and 2.500 respectively. Hospital management expressed the opinion that three elements were critical to the success of the conversion phase, each with a median score of 3.000. In addition to a detailed implementation plan, this group also

identified the quality and quantity of user support and the level of management support for the implementation plan as indicators of success. The system vendor, with a median score of 1.000, firmly stated that the level of management support for the implementation plan was the sole measure of success for this phase.

Fixed Alternative Questions

The last four questions in the survey were included to provide the capability of analyzing the data within each sample according to several variables. The variables included the respondent's level of clinical experience, level of computer experience, job position, and age group. These variables offered further evidence as to why the participants responded as they did.

Clinical Experience

The years of clinical experience in the hospital ranged from less than 1 year to 16 years or more as shown in Table 7.

TABLE 7

Clinical Hospital Experience in Years
Samples by Percentage
Bold=highest percentage

YEARS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Less than 1	**40.0%**	2.6%	**50.0%**	21.4%	15.4%
1-3	0.0%	7.7%	0.0%	10.7%	7.7%
4-6	20.0%	7.7%	16.7%	7.1%	9.0%
7-10	20.0%	25.6%	16.7%	21.4%	23.0%
11-15	20.0%	**30.8%**	16.7%	**35.7%**	**30.8%**
16 or more	0.0%	25.6%	0.0%	3.6%	14.1%
	n=5	n=39	n=6	n=28	n=78

As an aggregate of all the samples, there were respondents in each years of experience category with the bulk of the respondents in the 11 to 15 year range at 30.8 percent.

The majority of the vendor sample was located in the less than one year range at 40 percent. The remainder of the sample group was evenly divided among three ranges with 20 percent in each. These ranges were 4 to 6 years experience, 7 to 10 years experience, and 11 to 15 years experience.

The hospital management group concentrated in the 7 to 16 years experience range. There were 25.6 percent of the respondents in both the 7 to 10 year range and the 16 years or more range. The

majority of respondents were located in the 11 to 15 years experience range at 30.8 percent. Only 2.6 percent of the surveyed persons had less than one year of clinical experience.

Fifty percent of MIS management had less than one year of clinical experience. The remainder was evenly divided in three groupings, each with 16.7 percent. The three groupings were 4 to 6 years experience, 7 to 10 years experience, and 11 to 15 years experience.

The technical support staff had a wide variety of clinical experience with respondents in each year category. The majority (35.7%) of this sample had 11 to 15 years of clinical experience. The following two groups tied for second place at 21.4 percent: less than 1 year experience and 7 to 10 years experience. The remaining 21.5 percent were divided into three groups; 10.7 percent with 1 to 3 years experience, 7.1 percent with 4 to 6 years experience, and 3.6 percent with 16 years or more experience.

Patient Care Information System Experience

Overall, there were respondents in every category of direct experience with a patient care information system as indicated in Table 8.

TABLE 8

Direct Experience with *PCIS in Years
Samples by Percentage
Bold=highest percentage

YEARS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Less than 1	0.0%	23.0%	16.7%	3.6%	14.1%
1-3	0.0%	15.4%	0.0%	21.4%	15.4%
4-6	**40.0%**	10.3%	**33.3%**	25.0%	19.2%
7-10	20.0%	**30.8%**	16.7%	**39.3%**	**32.1%**
11-15	**40.0%**	15.4%	16.7%	7.1%	14.1%
16 or more	0.0%	5.1%	16.7%	3.6%	5.1%
	n=5	n=39	n=6	n=28	n=78

*Patient Care Information System

The majority of respondents were in the 7 to 10 years experience range at 32.1 percent. All other categories were close in comparison of percentages except the 16 years or more category at 5.1 percent.

The system vendor had 40 percent of the respondents in both the 4 to 6 year range and the 11 to 15 year range. The remainder of the

respondents were all in the 7 to 10 years experience range at 20 percent.

The majority of the hospital management sample was concentrated in the 7 to 10 year range at 30.8 percent. Following closely was the less than 1 year experience range at 23 percent. Both the 1 to 3 year range and the 11 to 15 year range tied at 15.4 percent.

MIS management has the greatest percentage of experience in the 4 to 6 year range. The following four categories each had 16.7 percent: less than 1 year experience, 7 to 10 years experience, 11 to 15 years experience, and 16 years experience or more.

The technical support staff category rated most highly in the 7 to 10 year range at 39.3 percent. The two other highest experience categories were 4 to 6 years and 1 to 3 years at 25 percent and 21.4 percent, respectively. The other three categories had percentages of less than 10 percent.

Computer Access for Personal Use

Collectively across all sample groups, Table 9 revealed that the majority of respondents owned a computer or had access to a computer for personal use at 56.4 percent.

TABLE 9

Computer Owner/Access for Personal Use
Samples by Percentage
Bold=highest percentage

RESPONSE	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
Yes	**100.0%**	48.7%	**50.0%**	**60.7%**	**56.4%**
No	0.0%	**51.3%**	**50.0%**	39.3%	43.6%
	n=5	n=39	n=6	n=28	n=78

Only 43.6 percent of all respondents did not have access to a computer for their own use. The vendor category yielded 100 percent yes responses to the question. The majority of the technical support staff also owned a computer or had access to one for personal use at 60.7 percent. MIS management was divided evenly on this question. Hospital management was very closely divided with 48.7 percent having access to a computer and 51.3 percent not having access to a computer.

Age Group

As an aggregate, there were respondents in each age group except the less than 20 year range as indicated in Table 10.

TABLE 10

Age Group
Samples by Percentage
Bold=highest percentage

YEARS	VENDOR	HOSP MGMT	MIS MGMT	TECH SUPP	TOTAL
less than 20	0.0%	0.0%	0.0%	0.0%	0.0%
21-25	0.0%	2.6%	0.0%	0.0%	1.3%
26-35	**60.0%**	28.2%	**50.0%**	**60.7%**	**43.6%**
36-45	40.0%	**53.8%**	33.3%	21.4%	39.7%
46-55	0.0%	15.4%	0.0%	17.9%	14.1%
56 or more	0.0%	0.0%	16.7%	0.0%	1.3%
	n=5	n=39	n=6	n=28	n=78

More than 83.3 percent of all respondents were within the 26-45 year range. Sixty percent of the vendor sample were in the 26-35 year range and the other 40 percent were in the 36-45 year range.

The majority of hospital management was within the 36-45 year range at 53.8 percent. This was followed closely by the 26-35 year range and the 46-55 year range at 28.2 percent and 15.4 percent respectively.

The bulk of the MIS management group and the technical support staff group were in the 26-35 year age range, at 50 percent and 60.7 percent respectively. Thirty-three and three-tenths percent of the MIS group were in the 36-45 year age range and 21.4 percent of the technical staff were in the 36-45 year age range. MIS management trailed with 16.7 percent in the 56 years or more age range and technical support trailed with 17.9 percent in the 46-55 year age range.

Chapter V

DISCUSSION

Discussion

The planning phase was selected by every sample group as one of the most significant criteria to the overall success of the computer project according to Table 1. However, the vendor sample also selected training as an equally important implementation phase. Hospital management identified the selection phase to be of equal importance to planning. Planning has retained the top position in the hierarchy of importance for centuries in management texts. The sample results reiterate its continued importance. However, there is some discrepancy as to whether planning should remain the single most important indicator of success or if this can be shared with other phases depending on a given business situation, allowing multiple indicators of success. Clearly, hospital management has an equal concern with the selection phase. If the selected vendor does not meet the hospital's needs and system requirements, the project indeed will

not culminate in success. The vendor representatives are not concerned with the selection since the system has already been selected or purchased. A vendor representative may be concerned with selection if employed by a very small company with few accounts. However, Technicon Data Systems Healthcare Corporation (TDS) is a medium-sized company with international accounts. Small firms struggle to efficiently manage their existing accounts and can ill afford to add to this predicament by increasing the number of clients. TDS provides a high degree of support throughout all phases of the implementation process. The phase over which they have little control is the training phase. Although they assist in developing the training plan and schedules, the success of the training phase depends on the receptiveness and attitudes of the trainees. There are many uncontrollable variables which may effect the willingness of the trainees to learn the system such as work schedules, personal conflicts, fear of the unknown, and resistance to change. In addition to the planning phase, it is understandable why the vendor indicated that the

training phase is of equal importance to the success of the overall computer project.

Across all survey samples, adequate determination of needs and system requirements was the most important criterion to the success of the planning phase as indicated in Table 2. Hospital management and Management Information System's (MIS) management also agreed that the development of realistic goals and objectives was equally important to the success of this stage. Management, whether MIS or hospital, has a tendency to be goal-oriented rather than task-oriented due to the requirements of the job. This would be a pertinent part of any planning phase for any project. Therefore, management perceives the two elements to be of equal importance since they are dependent upon each other. It was interesting that the vendor did not select the development of realistic goals and objectives in addition to the adequate determination of needs and system requirements. This could be due in part to the fact that the vendor considers goal-setting a client function. The vendor may also interpret the meaning of goals and objectives

differently than management. The vendor has preset goals established for any computer project which define step-by-step actions necessary to complete each phase. Management sets individual goals and objectives for its hospital at the beginning of a project which last the duration of the project.

Table 3 reveals that the primary determinants of success were evenly divided in the selection phase. Hospital management and the technical support staff specified that the reliability and quality of the vendor is paramount to the success of the selection phase. However, MIS management and the vendor feel that the quality of the RFP is the major determinant of success. The technical support staff and hospital management were not involved in the development of the RFP. Thereby, they would not have a vested interest in its purpose or content. However, it would make sense that they would focus on reliability of the vendor since performing their jobs depend upon it. The RFP is a working document for the prospective client and the vendor. A well-defined RFP states exactly what the client wants. The vendor can

only satisfy the hospital's needs if they are made aware of them. The vendor's existence is justified by the content of the request for proposal (RFP). To Management Information Systems (MIS), the system can only be reliable if it meets the needs of the users. These needs should be defined in the RFP. If the RFP is incorporated into the purchase contract, MIS can legally force the vendor to comply, if the vendor's response is specific in nature.

A qualified project leader and implementation team was the criterion identified in Table 4, by the aggregate of all samples, as the most important to the overall success of the computer project within the development phase. However, three out of the four sample groups also identified another criterion of equal importance with no consistency between the three groups. The vendor determined that the efficient design and configuration of the pathways was equally important in successfully completing the development phase. These criteria complement each other, since the achievement of efficient pathways is dependent in part upon the qualifications of

the implementation team. The vendor merely views these two elements as inseparable.

Hospital management focused on the flexibility for change as an equally important criterion. This concern for flexibility appears directed at the software, possibly due to changing government regulations and insurance requirements. The hospital under study was under a design freeze several months prior to activation for functions and pathways. However, the freeze has never been fully enforced because of user pressure for changes. Management at this particular hospital has extreme difficulty making a decision and accepting responsibility for it. Due to the corporate structure, no one other than the Senior Executive Officer has the authority to make high level decisions. This causes much indecisiveness among the lower and middle management ranks. Therefore, there is a lot of fluctuation in decisions over time. This also creates the need for flexibility to accommodate these frequent changes in decision-making.

MIS management differed in that the level of user involvement was of equal importance to a

qualified project leader and implementation team. The element of user involvement was quite a surprise. It appeared that throughout the first few phases of the project MIS preferred to keep the user's involvement at a minimum or only superficial. It was interesting to learn that often information was purposefully kept from the user departments to avoid any alteration of the MIS plan. It is quite possible that MIS management learned from its mistakes during this computer project and now realize the importance of the end user to the success of the entire system.

The system vendor, MIS management, and hospital management identified in Table 5 that a comprehensive training plan and training modules specific to individual user needs were both equal in determining the success of the training phase. The hospital management group recognized a third criterion of equal importance to the other two, that being the experience of the training coordinator. It would seem that the three criteria are inseparable since an experienced training coordinator would develop a comprehensive training plan and create training modules which

were specific to individual user needs. The hospital has undergone a previous computer installation, utilizing Burrough's hardware and in-house developed software, in which the current training coordinator played an active role. It may be inferred that the vendor and MIS management did not feel that the experience of the training coordinator was a necessity since on-site and off-site training were provided to the training coordinator in preparation for this position.

Both MIS management and the technical support staff agreed in Table 6 that a detailed implementation plan was the only indicator of success within the conversion phase. Hospital management expressed the presence of three elements jointly critical to the success of this phase. In addition to a detailed implementation plan, it also identified the quality and quantity of user support and the level of management support for the implementation plan as indicators of success. The system vendor firmly stated that the level of management support for the implementation plan was the sole measure of success for the conversion phase. Hospital

management, however, must deal with the realities of patient care on each nursing unit. The implementation plan is important but it is of no value if there is insufficient support on the nursing unit to provide quality patient care. Hospital management must view the conversion from a broader perspective than MIS whose focus is on the technical and operational aspects of the conversion. Hospital management must answer to patients, families, and the staff itself. If there is no management support, there will be no user support. Management support provides the financial resources for additional FTE's and material resources such as computer desks and chairs.

The vendor's response generated a challenge to explain. Possibly the vendor feels that it does not matter how detailed an implementation plan may be; if there is no management support, there will not be enough resources and decision-making power to carry it out. Another possibility is that the vendor is dismayed with the management support on this particular project. Two questions arise when discussing management support. Is this

MIS or hospital management? Is this top-level management or line supervisory level management? These questions must be answered before an intelligent response can be delivered. Perhaps the survey could have asked for management in this question to be clearly defined.

Summary

The planning phase was determined as the most important implementation phase by every respondent category. Two respondent categories proposed that the training phase and the selection phase were equally as important. It is truly dependent upon the perspective of the individual categories as their places in the computer project are very unique. Each phase contained elements crucial to its success for prioritizing by each individual sample. None of the categories of respondents for any of the five implementation phases selected evaluation and control as the most important determinant of success to the overall computer project. Therefore, the hypothesis was rejected.

Many computer projects have succeeded despite the failure of individual phases of implementa-

tion. Close evaluation of each phase, to determine if the goals and objectives are being met, allows the identification of any potential problems. Once identified, these problems can be resolved allowing the successful completion of the phase. It is possible that management performs this evaluation as an automatic function and does not consider it an element in and of itself. It is a common thread that spreads through every phase of any computer project, inseparable from any specific element. Perhaps its commonality prevents its consideration as a unique indicator of success.

Each implementation phase contained eight elements which were ranked in order of priority to its importance to the overall success of the computer project. Evaluation and control was the last element in each question. It is possible that respondents did not read all of the items before they started placing them in rank order. If so, it is possible that evaluation and control were placed at the end of every category due to its position in the questionnaire. It is also possible that the questionnaire was so tedious and

time-consuming that the respondent's attention span had deteriorated by the time the questions were finished. Regardless, due to the lack of evidence that evaluation and control ever attained the lowest median score in any of the questions, it cannot support the hypothesis postulated in this document.

Limitations

The questionnaire was quite detailed and lengthy. It required a background knowledge of computer implementation in order to thoroughly understand each question. If the questionnaire had been shorter and less complicated, there might have been a greater response. If the questionnaire had been less complicated, it might have allowed consistent interpretation of the elements within each question by the respondents. There were several elements which could be interpreted in a variety of ways. For example, the level of management support for the implementation plan did not explain if it meant hospital management or MIS management. It was left open for the reader to decide. Flexibility

for change could mean many things to many people. Some might feel flexibility would allow major design changes whereas others might relate it to software and interface capability. Some words were vague and ambiguous, paving the way for potential misuse. For example, what does quality, reliability and comprehensiveness really mean? Each of these words have several meanings attributed to them, and are difficult to quantitate.

Another difficulty with the questionnaire was that seven respondents rated each element instead of placing them in rank order. The directions should have been clear enough to prevent this rating error from happening. However, it is possible that the directions were clear and the respondents simply did not read them.

The vendor sample only had a 33 percent response rate. This was the most difficult group to track as they are based in Atlanta, Georgia. Although the nursing consultant encouraged participation in the survey, all the consultants travel frequently and were often inaccessible.

It was very difficult to determine the most appropriate data analysis tool for the rank order questions. After much thought, it was suggested that the median score be utilized to determine the most frequently selected element. However, this method often resulted in two or three scores with the lowest median. This detracted from the process of analysis as there was not one single indicator of success across all categories.

Suggestions for Future Research

It would have been enlightening to get the response from the end users. This would include all appropriate management personnel after training on the system, all departmental users including professional and secretarial staff, all nursing users including RNs, LPNs, unit secretaries, clerks, and nurse attendants. It would also be interesting to receive input from the physician users after some experience with the computer system. These personnel could not be utilized due to the detailed questioning included in the survey. The survey could be simplified with clearer explanations so this category of

respondents could deliver their opinions also. After all, it is the end users alone who put the implementation plan into action. It would have been valuable to have surveyed additional hospitals with this system who are activated and hospitals with other hospital information systems for comparisons in response.

Different methods of data analysis should be explored to provide not only the most frequent response to each question but also a method of prioritizing these responses to analyze the second and third most important choices. It would be helpful if only single indicators were analyzed as opposed to multiple indicators to avoid confusion.

APPENDIX A

RESEARCH QUESTIONNAIRE

1. What do you feel is the single most important element to the SUCCESS of a patient care (clinical) hospital information system?

_____

_____

_____

2. If you could change anything in the entire process of developing and implementing our new computer system, what would it be?

_____

_____

_____

3. In your opinion, what could have been done differently, if anything, to prevent the delays in activation that have occurred?

_____

_____

_____

Please answer the following questions by ranking the criteria included within each question from "1" to "8" according to their level of importance--with "1" being the most important item and "8" being the least important item. (Question 4 only has five items to rank.)

4. Please rank the following PHASES of implementing a Hospital Information System according to their level of importance to the overall SUCCESS of the computer project:

____ Conversion approach (process of activating computer system within each department)
____ Development (process of developing screens and pathways for needed functions)
____ Planning (approval process; development of goals and objectives for computer system)
____ Selection (process of choosing hardware/software)
____ Training (education of employees on use of computer)

5. Please rank the following elements of the PLANNING PHASE according to their level of importance to the overall SUCCESS of the project:

____ management/resource commitment
____ organizational structure
____ level of Management Information Systems experience
____ effectiveness of long range plan
____ adequate determination of needs & system requirements
____ development of realistic goals & objectives
____ congruence of MIS plan w/corporate strategy
____ evaluation and control of the planning phase (identify if objectives were met within each phase; identify problems and their resolution)

6. Please rank the following elements of the SELECTION PHASE according to their level of importance to the overall SUCCESS of the computer project:

____ selection of hardware & software
____ quality of RFP (request for proposal) &/or RFI (request for information)
____ involvement in demonstrations at actual hospital sites
____ reliability & quality of vendor
____ comprehensiveness of actual contract
____ involvement of consultants in the selection process
____ structured selection process
____ evaluation and control of the selection phase

7. Please rank the following elements of the DEVELOPMENT PHASE according to their level of importance to the overall SUCCESS of the computer project:

____ qualified project leader and implementation team
____ comprehensive testing process
____ level of user involvement
____ efficient design & configuration of pathways
____ flexibility for change (ability to customize software)
____ completeness of documentation
____ degree of application functionality (software)
____ evaluation and control of the development phase

8. Please rank the following elements of the TRAINING PHASE according to their level of importance to the overall SUCCESS of the computer project:

____ training conducted immediately prior to activation
____ experience of training coordinator
____ utilization of CBT (computer-based training)
____ comprehensive training plan
____ efficient training schedules
____ training modules specific to individual user needs
____ variation in length of training depending on level of user functionality
____ evaluation and control of the training phase

9. Please rank the following elements of the CONVERSION PHASE according to their level of importance to the overall SUCCESS of the computer project:

____ congruence of conversion approach to hospital's needs
____ detailed implementation plan
____ adherence to implementation time schedule
____ quality & quantity of user support
____ presence of a contingency plan
____ development of "down-time" procedures
____ level of management support for implementation plan
____ evaluation and control of the conversion phase

In the following questions, only select the one answer that most applies to you at the present time.

10. Select the following category which applies most to you at the present time:

____ CEO, COO, CFO, Vice Presidents, Asst Vice Presidents, Department Heads, Directors of Nursing
____ Patient Care Coordinators, Head Nurses, Nursing Supervisors
____ Director of MIS, Assistant Directors of MIS, MIS Project Leaders, MIS Managers
____ MIS Project Team (lab, PAD, ancillary, pharmacy, DBM)
____ Task Force Members (nursing, OR, ER)
____ Vendor (TDS employees)

11. Select the number of years of your clinical experience in the hospital:

____ less than 1 year
____ 1-3 years
____ 4-6 years
____ 7-10 years
____ 11-15 years
____ 16 years or more

12. Select the number of years of your direct experience with a Patient Care Information System (including Burroughs):

____ less than 1 year
____ 1-3 years
____ 4-6 years
____ 7-10 years
____ 11-15 years
____ 16 years or more

13. Do you currently own a computer or have access to a computer for personal use?

____ yes ___ no

14. Please select your appropriate age group:

____ less than 20 years
____ 21-25 years
____ 26-35 years
____ 36-45 years
____ 46-55 years
____ 56 years or more

THANK YOU VERY MUCH FOR YOUR TIME AND COOPERATION. IT IS GREATLY APPRECIATED. PLEASE RETURN TO ROBIN HENSON, C/O INFORMATION SYSTEMS, 4TH FLOOR PFD BEFORE **OCTOBER 15, 1990**.

APPENDIX B

DATE: October 1, 1990

TO: Survey Participants

FROM: Robin Henson, R.N., B.S.N.

SUBJECT: Explanation of Survey

I am currently working on my master's thesis at Lindenwood College in St. Louis, Missouri. I am researching the importance of each stage of a patient care information system to the overall success of the computer project, as well as the elements of each stage.

I would appreciate your honesty and openness when responding to the survey questions as I hope to obtain a realistic perception of our employees. The future of our success is dependent upon the feedback from everyone involved with the new computer system, directly or indirectly.

ALL SURVEY FORMS ARE COMPLETELY **CONFIDENTIAL** so please be open and frank with your answers. Please do **NOT** write your name or the name of your company on this survey form.

It is **EXTREMELY IMPORTANT** that you **ANSWER EVERY QUESTION** throughout the entire survey and that you **RANK EVERY ITEM** within questions **4** through **9**. If not, it will disrupt the scoring procedure and compromise the integrity of the entire survey. If you have any questions, please do not hesitate to call me at 314-355-2300, extension 5860. My digital beeper number is 829-9722 (wait for the tone, enter the number for me to call, and press the "#" sign).

PLEASE RETURN THE COMPLETED SURVEY VIA INTER-OFFICE MAIL TO ROBIN HENSON, C/O INFORMATION SYSTEMS, 4TH FLOOR PFD, BEFORE **OCTOBER 15, 1990**. Thank you very much for your cooperation and support. I truly appreciate your time and effort.

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