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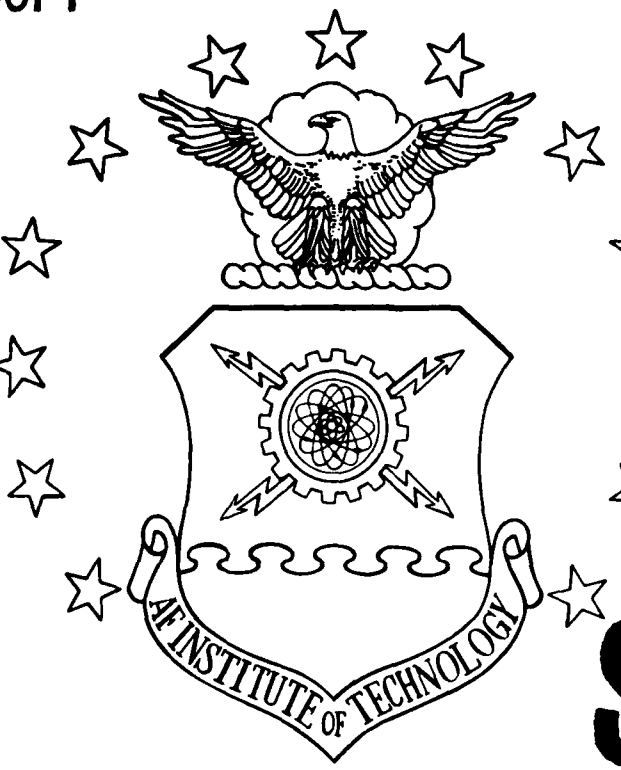

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AN EMPIRICAL TEST OF A COMPREHENSIVE MODEL FOR PREDICTING SUCCESSFUL INFORMATION SYSTEMS IMPLEMENTATION

THESIS

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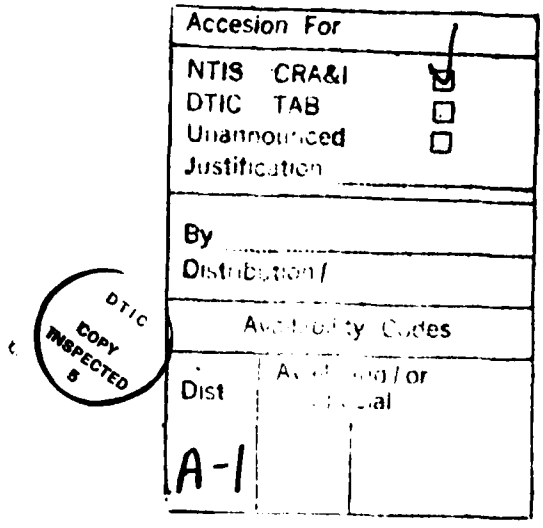

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THESIS

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Brian J. Magers, B.A.
Captain, USAF

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Abstract

This research evaluates independent variables that, when considered in computer based information system implementation, lead to end user satisfaction. Specifically, it is an empirical test of a previous study which developed a comprehensive model for predicting user satisfaction in IS implementation.

User satisfaction is considered one of the single most significant measures of IS implementation success. For users who are not satisfied with their IS will not use it thus rendering the IS implementation effort a failure. This study reviews the literature for those variables that occur most often as critical elements that must be present for IS users to be satisfied with their system. Then, based on these independent variables, survey end users regarding which variables they feel most strongly contribute to their satisfaction with their IS. These results are then compared with that of the previous study to develop a comprehensive model which could be used to predict user satisfaction in computer based information system (IS) implementation.

The study finds ten independent variables regarded as important predictors of user satisfaction. They are obtained from current literature dealing with IS factors

research, organizational change, and user involvement with implementation. The hypothesized model consists of the variables, quality of goal setting; training; user involvement; top management support; knowledge pool; job aspects; user expectations; support center; human interface; and information environment/needs.

IS end users from the United States Air Force Air Logistics Command and Air Training Command are surveyed regarding their feelings about which variables they deemed as most significant contributors to their satisfaction. The data is then analyzed using multiple regression procedures and a final model is developed based on this analysis.

The final model specifies four independent variables to be significant predictors of user satisfaction. They are training, knowledge pool, job aspects, and support center. It is recommended that this model be used as a point of departure for predicting user satisfaction in IS implementation. That by considering these aspects of IS implementation, a manager can increase his chances of having a successful information system implementation effort.

AN EMPIRICAL TEST OF A COMPREHENSIVE MODEL FOR PREDICTING SUCCESSFUL INFORMATION SYSTEMS IMPLEMENTATION

I. Introduction

General Issue

Information system (IS) research conducted since the late 1950's early 60's has focused a lot of attention on implementation. Many methodologies and their variations have been identified and tested in hopes of designing a method that can consistently produce successful results. But more and more IS professionals are discovering that to be successful one must be knowledgable about the organization as well as the technology. In fact, "the relationship between information technology and organizational change is a central concern in the field of Information Systems" (30:583). The contemporary IS manager is increasingly having to deal with structural change within an organization as new technology is introduced. Davis and Olson state, "If the systems analyst is viewed as a change agent rather than a technician under organizational change conditions, the dangers of system failure can be reduced" (7:594). So if an IS professional understands the mechanisms behind IS implementation and organizational change one can expect a better chance of IS implementation success.

The research supports this idea for Ginzberg identifies that:

> Much of the research on MIS implementation which has been conducted in the past decade has focused on identifying and measuring the organizational characteristics which appear to be particularly conducive to either success or failure of system development efforts. (17:459)

This research, and the research of ten years previous to it, have failed to identify an accepted comprehensive list of organizational characteristic variables that support the prediction of successful IS implementation. A study conducted by Robert Zmud premises the same idea.

> While researchers from a variety of disciplines have shared a common interest in examining the effect of a number of cognitive, personality, demographic, and situational variables upon information processing and decision behavior, no attempt has been made to synthesize this material as it relates to MIS. (38:966)

Therefore, the past 20 years of research conducted on information system (IS) implementation has failed to produce an accepted comprehensive model for predicting implementation success. However, an MS thesis by 1st Lt Chris Norcia, USAF, entitled, "An Integrated Model for Predicting Successful Information Systems Implementation," is a recent effort in the development of a comprehensive IS implementation model. Specifically, he studied variables that predict user satisfaction, a cognitive response which is considered paramount to successful IS implementation. User satisfaction is frequently used because "satisfaction provides a meaningful 'surrogate' for the critical but

unmeasurable result of an information system, namely, changes in organizational effectiveness' (23:785). Norcia's final model is stated as Satisfaction = Efficiency/Effectiveness + Expectancy + Communication (32:48). He based his model on a survey sample consisting of Program Managers and Logistics Managers from the United States Air Force. Categorically, this survey population consisted of students attending a professional continuing education class entitled, 'Acquisition Planning and Analysis and Logistics Management'. Due to the small number of participants Norcia's survey is one of convenience and his results cannot be extrapolated to a general population. In point, according to the author, the model is of limited value and needs further empirical testing, to either reinforce or challenge the conclusion (32:50).

Specific Problem

Given the comprehensive model, are all the independent variables significant as stated or do they require modifications and additions to better explain the dependent variable, user satisfaction? This thesis effort will test the existing independent variables for significance and determine if any additional significant independent variables emerge. An independent variable (IV) refers to any variable used to predict the dependent variable. These IVs are related in the form of a model in order to simplify and abstract from the real situation. Each IV is an

assumption from which the prediction of user satisfaction is deduced. It's important to understand that the IVs are subjective by nature and are intangible replicas of reality. The objective of this analysis is to produce a single, comprehensive model useful as a point of departure for the prediction of the successful implementation of an IS.

Research Objectives

What, if any, new independent variables will result in an effective model for predicting user satisfaction in IS implementation? To investigate and support the research objective requires close scrutiny of each independent variable. This is accomplished through further research of the literature to determine if the existing variables are significant and if there are any new independent variables that can be incorporated into the model. Then, finally, use a survey instrument based on the model to survey a larger sample population and test the data in a statistical regression analysis.

II. Analysis of the Literature

Overview

This analysis contains a review of literature dealing with how successful computer-based information system (IS) implementation relies on variables that exploit the proper management of organizational change.

An introduction of the topic is presented first, followed by a review of literature in three general areas: technology and organizational change, user involvement in IS development, and significant factor analysis. The last section is a conclusion of the material presented to include an abbreviated list of significant variables.

Introduction

Topic Statement. The main goal of this review is to produce and support independent variables significant to the prediction of the dependent variable, user satisfaction.

For the purpose of this investigation some clarification of terms is appropriate. 'End user' or 'user' is defined as any person in an organization who is involved in operating a computer-based IS or who uses computer generated reports on a daily basis. Not to be confused with 'user involvement' which 'refers to participation in the system development process by representatives of the target user group' (22:587). This user involvement is repeatedly mentioned in

the literature as a method of easing the organizational change that results from instituting a computer-based IS. Controlling this 'organizational change' is important for it involves "profound changes to the social as well as technical fabric of the organization" (5:36). The method used to institute this organizational change is 'IS implementation' which "is essentially a process whereby technical and social changes are introduced in an organization" (15:73). Finally, the success of the IS implementation process is assessed by what is referred to as the dependent variable, 'user satisfaction'. The concept of 'user satisfaction' is considered because "satisfaction of users with their information systems is a potentially measurable, and generally acceptable surrogate for utility in decision-making" (23).

Scope of Research. This literature review focuses on identifying the variables most often considered and tested as notably meaningful to the prediction of user satisfaction. It's not intended to be an extensive review of details or methods towards development or implementation of an IS. Nor is its aim to encompass any technical aspects of an IS.

Method of Treatment. This research is organized based upon three main groups of literature dealing with IS success. Each area exploits criterion that are considered beneficial to successful IS implementation. A thorough

search of this literature is used to pinpoint and support those individual variables that are considered by the IS expert as most meaningful to IS success.

Background. There are many differing opinions concerning the definition of an IS. It appears to be based upon how the IS is created and applied. But, for where this thesis is concerned, an operational definition is presented by Gordon B. Davis and Margrethe H. Olson. They define a computer-based IS as:

> An integrated, user-machine system for providing information to support operations, management, analysis and decision-making functions in an organization. The system utilizes computer hardware and software; manual procedures; models for analysis, planning, control, and decision making; and a database. (7:6)

It is designed to improve organizational performance by enhancing the decision making process through improved accessibility of pertinent information. Therefore, how an IS is construed is based upon how it is implemented.

While research on the organizational use of a computer-based IS began in the mid-1950s, IS implementation studies didn't start until the late 1960s (25:227,35:72). Implementation research was needed to deal with the problems associated with incorporating new technology into an organization. So there emerged a necessity to have a structured method to deal with the impacts of IS technology.

In fact, Daniel Robey states:

> It is surprising that 'impact' and 'implementation' have not had a longer shared history. Both areas basically concern the introduction of technical change into organizations. (35:72-73)

IS implementation is ordinarily seen as combining several related activities referred to as implementation stages (5:35). Robert W. Zmud and James F. Cox identify these stages as: initiation, strategic design, technical design, development, conversion, and evaluation (5:35).

> Initiation includes project definition and justification. Strategic design refers to establishing the scope and requirements of a project, i.e., design attributes not visible to the users. Technical design involves translating the strategic design into hardware, software, and process specifications, i.e., design attributes not visible to the users. Development concerns the acquisition of hardware, the acquisition and construction of software, and the testing of both hardware and software. Conversion relates to the insertion of the new information system into the organization. Finally, evaluation assesses the effectiveness and efficiency of the IS. (5:35)

Whether an IS will be completely beneficial to an organization or not depends upon the successful accomplishment of these stages. Thus, IS implementation success becomes an important aspect of the ever increasing incorporation of information technology.

IS implementation success has foundation in the evaluation of some predetermined criteria an organization has identified as goals of their particular system. Some organizations' criteria are based on a cost-benefit analysis but this is 'a strictly economic assessment of

system quality and is sometimes difficult and frequently arbitrary' (27:32). The perplexing dilemma facing most efforts to assess IS success include intangible benefits, unavailable data, and the complex problem of comparing alternative solutions (27:32). Actually, the literature commonly establishes that it is more effective to observe users perceptions rather than objective reality. According to a study done by Blake Ives and Margrethe Olson:

> Most empirical studies to date have used as evaluation criteria either system quality (as determined by decision-making performance or measures of perceived quality) or system acceptance (including indicators of system usage or changes in attitude or behavior). Among the more frequently used measures of 'success' are the extent of system usage and satisfaction. (22:591-593)

The focus of this research is on user satisfaction as a measure of IS implementation success. This view is taken because the literature reflects that user satisfaction is seen frequently as an indicator of both system quality and user acceptance (27:32). Consequently, the variables chosen from the literature are done so on the premise that they, if given full consideration in IS implementation, should generate user satisfaction.

The next three sections of this analysis reviews the literature for those independent variables considered most substantial in predicting the dependent variable user satisfaction.

Technology and Organizational Change

With the introduction of a computerized information system comes the need to manage the impacts the IS has on the organization. IS implementation must deal with this organizational change as an "ongoing process of preparing the organization for the new system and introducing it in such a way as to assure its successful use" (7:593). IS implementation is more than solving the technical problems as Daniel Robey points out:

> This concept recognizes that implementation is not just a matter of getting technical changes introduced on schedule with minimum resistance, but that implementation must also include managing longer term organizational changes. Changes in organizational structure, job design, communication patterns, and interorganizational relationships must be anticipated and managed as part of the implementation process. (35:76)

So the human aspects of an implementation plan are crucial to system success.

A change theory commonly used for system changes are based on Kurt Lewins' three-stage model of organizational change as illustrated in Table I:

Table I
Lewin's Three-Stage Model (7:594)

Stage	Description
Unfreezing	Increasing the receptivity of the organization to a possible change.
Moving	Choosing a course of action and following it.
Refreezing	Reinforcing the 'equilibrium: of the organization at a new level after the change has occurred.

This process is based on the idea that a well established formal and political structure of an organization must be disturbed before changes can occur (7:594). The parties involved must want to realign systems to be congruent with the new way of doing business. First, one must show the parties the need for change by, for example, emphasizing the benefits of the change (unfreezing). Then, through a choice of several methodologies, make the changes (moving). Finally, institutionalize the change through some form of reenforcement (refreeze).

Further embellishment of the Lewin model is offered by Alan Frohman and David Kolb. They offer a seven stage model where an outside consultant intervenes into the client system in the context of a change agent who facilitates a total organizational development program (16:51). The seven stage model as it relates to Lewins model is illustrated in Table II:

Table II
Kolb/Frohman Seven-Stage Model (7:595,16:53)

Stage	Description
Scouting (Unfreezing)	The client system and the consultant discuss general expectations.
Entry (Unfreezing)	Development of a mutual contract and mutual expectations
Diagnosis (Unfreezing)	Identification of specific improvement goals
Planning (Moving)	Identification of action steps and possible resistance to change
Action (Moving)	Implementation of action steps
Evaluation (Moving and Refreezing)	Evaluation to determine success of the change and the need for further action or termination
Termination (Refreezing)	Leaving the system or stopping one project and beginning another

The success of the implementation effort is based on how thoroughly one addresses each stage. If the key issues are addressed in each stage one will attain a successful change. Michael Ginzberg used the Kolb/Frohman model to try and determine the key recurrent issues in the IS implementation process. He stated, "It was believed that these recurrent issues might be the key issues requiring resolution in order to assure implementation success" (18). It is the purpose of this section of the literature review to extract those recurrent issues/variables from the literature dealing with organizational change.

A study conducted by Steven Alter and Michael Ginzberg examines an approach that deals with managing the

uncertainties inherent to IS implementation. They combine their respective empirical studies with the Kolb/Frohman theory "as a basic normative description of the change process" (1:24). They propose:

> This article suggests that the likelihood of successful MIS implementation can be increased by identifying the key uncertainties at each stage of the development process and devising strategies for coping with the range of possible results. (1:23)

These key uncertainties or "risk factors" emerge at each stage of the implementation process and can be planned for through "risk-reducing or inhibiting strategies" (1:28+).

The study offered the following inhibiting strategies:

Table III
Risk-Reducing Strategies (1:29)

Strategy	Outcome
Use Prototypes	Reduces the risk of having unpredictable impacts and technical as well as cost-effectiveness problems.
Use Evolutionary Approach	Same as above.
Use Modular Approach	To cover Technical and cost-effectiveness problems
Keep the System Simple	Same as above.
Obtain User Participation	To handle nonexistent or unwilling users, avoid lack of support, avoid unspecified purpose or usage patterns, and avoid unpredictable impact.
Obtain User Commitment	To handle nonexistent or unwilling users, avoid lack of support.
Sell the System	Same as above.
Obtain Management Support	To avoid lack of support.

The concluding idea of this study emphasizes the idea of thorough implementation planning. That designers and users 'must ask what risks are likely to be present in their particular project, and what inhibiting strategies might be employed to guard against these risks' (1:30).

Another study by Ginzberg attempts to identify generic implementation issues. He states:

> There is not a well articulated list of generic implementation issues to serve as a starting point, and identification of these issues must be by induction. (18)

Again, the Kolb/Frohman model was incorporated as a tool to help structure the implementation process. This aided in identifying recurrent issues at each stage. Then, once identified, "assess the relative importance of these issues for determining implementation success or failure" (18). As a result, three issues emerged that require attention if one is to forgo system failure. The first deals with gaining commitment to the project by "taking those actions necessary to assure that the system is a good one, and provides a solution to the organizations problem" (18). The second solicits a commitment to change through acquiring "the willingness of those involved to make the changes in behavior, procedures, etc., that are necessary for the system to work" (18). The third issue underscores attention to the extent of the project definition and planning. This issue is described as:

> Detailed consideration of organizational needs, project impacts, training requirements, and evaluation criteria, as well as care in specifying the roles of project team members, are all parts of this factor. The more thorough the planning effort, the less likely are unforeseen circumstances which could endanger the project. (18)

By monitoring these issues throughout the implementation process one can reduce the probability of failure.

One of the main aspirations of applying change theory to IS implementation is to make the IS more agreeable to people. John Burch supports this convention in a paper that deals with methods of incorporating an IS into an

organizations culture which is identified as 'the way we do things around here' (3:30). The article reveals some ways to deal with the human factors 'in order to design systems that work with people, not against them' (3:31). The following are the suggested means of overcoming resistance to systems design.

> -**Ergonomics**. A major goal of ergonomics, sometimes referred to as human factors engineering, is to optimize and make compatible the people/system interface, a crucial determinant of the effectiveness of the systems design. Their aim, of course, is to reduce the aches and pains, excessive fatigue, and stress of people working at VDTs. (3:31)
>
> -**Alternate Areas**. Design the workspace into two areas: work area and relaxation area. (3:31)
>
> -**Work Groups**. Those people who work in different departments, such as sales, accounting, personnel, or purchasing, require access to the same basic information. The information system should be designed to bring them together to encourage openness, collaboration, and sharing of work. (3:32)
>
> -**User Specification**. Some systems analysts, in trying to design a single system to satisfy all potential users, end up creating a system that satisfies no one in particular. People have different needs; consequently, the system should be designed to fit these needs. (3:32)
>
> -**Presentation and Response**. People work better with mixed presentations. Long delays on tasks that need a quick response can lead to user dissatisfaction and, ultimately, to poor performance. Moreover, the system should be easy to use, natural, and easy to understand. (3:32)
>
> -**Psychological Job Demands**. People should be proud of their work. Give employees autonomy. As a general rule, the more toil we can take out of the job, the better. (3:32)
>
> -**Information Resource Center**. Install a 'tool room' or 'open-shop computer center' where users can come to get the help they need to work with the system. (3:32)

-**Workspace Informality and Ownership**. People should have some feeling of 'ownership,' to be able to say that 'this is my workspace.' (3:32)

-**Telecommuting**. Working away from the office, for example, in the home, seems to hold a lot of promise for some information workers, such as accountants, programmers, and word processors. (3:32)

-**People/System Interface**. Sooner or later, information has to flow through the human brain to be of any value. Therefore, the better the interface between the user and the system without obstruction, outside interference, and reliance on intermediaries, the better the information flow. (3:33)

-**Information Quality and Usability**. Clearly, one of the main forces that affects the practical design of information systems and their acceptance by the user is the quality and usability of its output. (3:33)

The article stresses that by considering the above mentioned topics one will enhance IS acceptance by obliging the corporate culture and designing the system for the people who have to use it.

The importance of gaining the support of organizational members is also emphasized in a study conducted by James Cox and Robert Zmud. They point out that if major organizational change is anticipated, a change approach to IS implementation becomes necessary (5:35). That 'clearly, where substantial organizational change is intended, implementing an MIS without the support of organizational members will not be successful' (5:37). Organizational change can be anticipated based upon the circumstances surrounding the incorporation of a computerized IS.

According to Cox and Zmud:

> The change process is the preferred method when the (1) organizational activity involved is ill-defined, (2) the MIS must interface with other organizational systems, and most importantly, (3) substantial organizational change is expected. (5:36)

When this situation exists, an environment must be created in which change will be accepted by the organizational members. As described by the authors, the change approach to implementation incorporates three general areas; involvement, education, and structural considerations (5:37-41). Active involvement of the affected organizational members is a key consideration "since the eventual success of an MIS ultimately derives from the behaviors of operating managers and operating personnel" (5:38). Similarly, education is important for

> in order for participants to be able or willing to contribute to an implementation effort, they must understand why the MIS is being introduced and how the project will affect them during and after implementation. (5:39)

Also, participants need training in the new technology to perform their jobs. Finally, organizational structure is used to facilitate IS implementation by forming "interdisciplinary and interorganizational teams drawn together for specific tasks" (5:41). The incorporation of these three ideas advocates a change process considered necessary when major organizational change is predicted.

While these issues need to be addressed, one must also consider the planning and pacing of the implementation

effort. This concept is examined in an 'analysis of employees' reactions to an experiment in concurrent social and technological change' (28:29). This study follows the real time automation of a manufacturing plant from introduction to completion. The company proceeded on the premise that 'a cooperative, participative process results in a work environment where humans are in harmony with machinery, organizational systems and each other' (28:30). Although this belief has merit, it is somewhat naive. The author states, 'In any major system change, there will be a realignment of power, status, and resources. Some will gain and others will lose' (28:30). The company incorporated the following variables in it's implementation:

> -**Education**. Workforce will have advanced technical skills, problem-solving orientation, and computer literacy. (28:33)
>
> -**Job Displacement**. Workforce will have job security since company will be highly profitable. There will be a high level of trust in management. (28:33)
>
> -**Autonomy/Job Enrichment**. Every employee should have a challenging job, considerable responsibility, and control over most routine decisions. (28:33)
>
> -**Compensation**. Joint sense of 'ownership' in the firm shared by all managers and workers. Pay and benefits will function as a true motivating device, retaining and attracting skilled people. (28:33+)
>
> -**Building Involvement**. Managers and workers will be involved in and committed to changes at the firm, supporting its mission. (28:35)

-**Communication**. Information will pass freely as needed between individuals, regardless of relative job positions. Good communication will support involvement and commitment. (28:35)

-**Restructuring Departments**. Organization structure will facilitate rapid and flexible response to environmental demands and support MIS technology. (28:35)

-**Housekeeping**. A clean and orderly firm.(28:35)

But the company failed to separate vision from reality.

> In short, the company was trying to completely transform its social systems. But the team had paid little attention to the details of planning the organizational transformation, and sufficient resources were not allocated to funding the changes. The company team seemed to assume that many of these details would work themselves out once the technology was in place, and so had devoted considerably more resources to hardware and software than to organizational elements, even though they firmly believed that organizational changes were necessary if the technical systems were to be successful.
> (28:36)

In summation, it is pointed out that there must be a balance of emphasis placed on social and technological issues when planning and managing IS implementation. There must be involvement in both issues for to ignore one or the other is only doing half the job. One can have every intention of implementing an IS as efficiently as possible and not do it correctly. This is a case where the old adage, 'The road to hell is paved with good intentions' has application.

User Involvement in IS Development

User involvement 'refers to participation in the system development process by representatives of the target user

group' (22:587). It is a method that takes into consideration the social as well as technical aspects of IS implementation. User involvement is one of the most frequently sited issues contributing to IS implementation success. According to Bert Debrabander and Anders Edstrom:

> There is a rather general agreement among researchers and practitioners that user involvement is a key to the success of computer based information systems. In relation to other factors, e.g. top management support, competence of EDP staff, quality of goal setting, user involvement seems to be the only one which is consistently and significantly related to the quality of the final outcomes. (8:191)

In general, user involvement promotes user commitment to the IS and ensures accurately specified user requirements (7:595). 'The more active the users are in information requirements determination and in approval of user interface design, the more likely they are to accept the system and utilize it appropriately' (7:595). Therefore, the variables associated with user involvement are an important consideration in predicting implementation satisfaction.

User involvement is more of an 'interaction process between the user(s) and other parties than as a good which you have more or less of' (8:191). This concept is extracted from a study by Debrabander and Edstrom revealing that the interaction between the user and specialist require good patterns of communication as well as proper placement of responsibility.

Communication is treated as an exchange of information.

> By exchange of information is meant that the parties involved in a transaction do not withhold knowledge or opinions they need in order to evaluate the alternative solutions to the problem at hand. (8:192)

So in order to address all the potential problems and match user specifications as close as possible to reality one must consider good communication.

Giving users responsibility of the system tends to make them more committed to the implementation effort.

> As a general rule, since the user is the one who must live with the system after it is implemented, some researchers believe on the basis of suggestive evidence that the final success is greatest when the user receives formal responsibility. (8:196)

This usually leads to greater system use since the end user has a stake involved in the IS implementation success.

A study Edstrom performed by himself places attention on other factors that may influence IS implementation success associated with user involvement. He describes his work by stating:

> Even though, in general, user involvement can be expected to be beneficial, we need to be more specific about the kind of user and user behavior involved, as well as the characteristics of the context in which the system is developed in order to predict more precisely the impact of user involvement. (11:590)

Edstrom examines how different types of users, environments, and communication effectiveness affect project success during different stages of implementation.

He found that the relationship between user influence and communication are important points to consider for IS implementation satisfaction.

> By exchange of information the information needs of the user must be matched to technical and economic criteria. Ineffective communication will reduce the possibilities of developing a successful system. (11:591)

The functional managers also play a significant part as key actors in the implementation process.

> The influence of the functional managers, especially during the early phases of the system-development process, will be positively related to the adoption of system designs that change the existing way of doing things. (11:592)

Finally, Edstrom determined that the user(s) and specialist(s) must view the problems at hand in context. He states:

> It is more difficult to establish an effective semantic bridge between the conceptual frame work of the user and that of the system specialist when either the task or system environment is programmed, and that hence there will be a positive relationship between a programmed system or task environment and ineffective communication. (11:593)

These findings support a "well-established relationship between the influence of the user and the perceived success of the MIS" (11:605).

A study undertaken by M. C. Er examined three approaches to IS implementation; prototyping, participative, and phenomenological. Er advocates the participative approach in the following way:

> Post-evaluations of computer-based information systems reveal that users are more satisfied with the participative approach than other approaches, though the result is not conclusive. From the organizational behavior point of view, the result is quite expected, as users who have greater control of their own working environments are happier workers. (14:14)

Although user participation reinforces user satisfaction and reduces resistance in IS implementation a more important point surfaced in this study. Er states:

> The three approaches discussed in this article convey a strong message that meeting the user's requirements and expectations is the most critical success factor of computer-based information systems, and hence the importance of information analysis cannot be overstressed. (14:16)

So matching user expectations with reality is an important variable for predicting user satisfaction.

User participation also generates conflict within complex organizations due to incongruent organizational goals between functional areas. 'User participation should lead to conflicts, which should then be satisfactorily resolved' (15:74-75). A study by Dana Farrow and Daniel Robey examines how constructive conflict can be used to benefit IS implementation.

> Constructive conflict is undertaken to solve complex problems where multiple criteria for success exist and where members possess incompatible goals. Constructive conflict helps prevent domination and stagnation, raises problems and encourages their solution, stimulates interest and curiosity, and underlies creativity and innovation. (15:74)

When users are encouraged to add their influence to the conflict a resolution is possible. Conversely, 'conflict and its resolution are more likely to occur when users can

exercise their influence in the development process' (15:75). Subsequently, user participation leads to conflict which can be resolved if users are permitted to direct their influence in IS development.

Participative IS implementation has been well founded for 'improved communication, lessened resistance to new systems, decreased implementation time, and increased productivity' (20:298). R. A. Hirschheim finds that support of top management, existence of a sponsor, and facilitator are variables essential to perceived IS implementation success. He defines each in the following:

> -**Support of Top Management**. Having a personal interest in the project, expressing a willingness to consider recommendations, providing funding for the project, agreeing to have external consultants (facilitators) to help get the project running, and agreeing to allocate sufficient resources for the project, particularly in terms of manpower. (20:299)
>
> -**Sponsor**. The driving force behind participative design, and can therefore be seen as the champion of the approach. (20:299)
>
> -**Facilitator**. Helps the participative process flow smoothly, especially in the initial stages. (20:299)

Overall, his research supports that users evaluate user involvement as valuable.

An empirical study conducted by Alexander Maish examines the relationship between users behavior toward their information systems and their perception of the system staff, top management support, and several other factors (29:39). He discovered that the following

variables are important for improving system effectiveness, predicting user reactions, and bolstering positive user behavior.

-**Feelings About Staff**. Positive behavior is associated with positive feelings about the information system staff. (29:43)

-**Management Support**. Positive behavior is associated with a feeling of good management support. (29:43)

-**Prepared to Use System**. Positive behavior is associated with the feeling of being prepared to use a new system. (29:43)

-**Grade GS-12 or Better**. Positive behavior is associated with a middle to upper Civil Service grade GS-12 or better. (29:43)

-**Access**. Positive behavior is associated with good access to the information system. (29:43)

-**Gives Information Wanted**. Positive behavior is associated with a feeling that the system produces the information wanted. (29:43)

-**Ease Of Correction**. Positive behavior is associated with ease of correcting data or instructions on an on-line system. (29:43)

-**Flexible Formats**. Positive behavior is associated with the flexibility of online formats. (29:43)

-**Feelings About Staff**. Positive feelings about the system are associated with positive feelings about the system staff. (29:44)

-**Batch Quality**. Positive feelings about the system are associated with positive feelings about batch output quality. (29:44)

-**Online Quality**. Positive feelings about the system are associated with positive feelings about on-line system quality. (29:44)

-**Involved In Design or Change**. Positive feelings about the system are associated with the impression that users are involved in the design of changes or of new systems. (29:44)

-**Problems Listened To**. Positive feelings about the system are associated with the impression that user problems are well provided for. (29:44)

-**Newer Employee**. Positive feelings about the system are associated with less than five years of service with the agency. (29:44)

This study accentuates the idea that computer based IS implementation must consider the human factors. It's important to hire a capable staff who respects users ideas and needs as well as exploiting top management support of the IS.

Management problems, rather than technical, are typically at the root of IS implementation failures (36:68). This can be due to such things as lack of planning, loss of key personnel, and lack of top management support (36:68). There is also the people issue of how to keep staff interested over a long implementation period. David Stamps places emphasis on several areas, he feels "the planning at the front end, and being willing to bring in outside expertise, even it if adds to the project cost" are essential (36:71). He believes that providing functional benefits during implementation and limiting project time will keep users interested. Specifically, he provides the following tips:

-**Plan**. With adequate advance planning, you should be able to adhere closely to an overall conversion plan and budget. However expect to revise both along the way. (36:71)

-**Set Milestones And Conduct Reviews At Each Milestone**. Errors are more easily corrected if they are identified before a milestone is reached. Set criteria for exiting each phase of a project. Reevaluate the budget after each milestone. (36:71)

-**Deliver The Goods Along The Way**. Lay out a schedule that allows you to show, at key stages during the project cycle, that the conversion is yielding benefits. (36:71)

-**Don't Waste Time**. Avoid scheduling for more time than is needed. A prolonged conversion is not only more costly, it is usually more disruptive as well. Make sure to allow adequate time at the outset of the project for the conversion team to do advance planning. (36:71)

-**Don't Prolong Testing**. Calling a halt to testing can be a tough decision, particularly on a flash cutover; you never feel you've done enough testing. When you feel confident that the conversion can be made to work, even if there are minor problems, make the switch. (36:71)

-**Remember The Human Factor**. Human issues can be harder to resolve than technical ones. Any change that affects the way things have been done in the past, such as adopting new control and procedures when moving to a new database environment, will meet with resistance. (36:71)

-**Factor In 'Hidden' Costs**. Don't overlook related expenses, documentation, training, 'selling' the new system to users. These can add between $1 million and $5 million to a conversion. (36:71)

-**Watch Your Consultants' Fees**. Expect to spend more than anticipated for outside consulting costs. Though some firms will quote fixed prices for a conversion project, those prices may not include expenses, such as travel and lodging. (36:71)

So planning, not reacting, to an IS implementation effort is essential to system success. This and sensitivity to user needs and problems are the thrust of Stamps' article.

Significant Factor Analysis

Factors research is limited to determining variables that lead to the success or failure of IS implementation efforts.

> These findings essentially indicate that successful IS implementation occurs when sufficient organizational resources are directed toward, first, motivating and, then, sustaining an implementation effort. (25:228)

This research area also consumes the largest amount of the IS implementation literature.

A study conducted by Capt Steve Branch, USAF, compared several IS development methodologies. Within that study he examined the factors that contribute to organizational institutionalization of IS. Institutionalization is defined as "a behavior that . . . persists over time, and exists as a part of the daily functioning of the organization" (2:6). This article illustrates nine factors that spur institutionalization of an IS.

> -**Planning for institutionalization**. Resources should be aimed at maintenance of the program. (2:6)
>
> -**Overcoming congruence problems**. The more different the changes are from the norms and values of the organization, the more difficult it will be to make the changes persist. (2:6)
>
> -**Stating specific program goals**. (2:6)
>
> -**Developing formal procedures**. (2:7)
>
> -**Limited, short-term use of experts**. Programs should be instituted in such a way that the organization learns to handle the change without the long-term need for consultants. (2:7)

-**Participation**. Higher levels of commitment arise from voluntary participation in the programmed change. (2:7)

-**Comprehensive training**. (2:7)

-**Diffusion**. Institutionalization is enhanced by spreading the change over as wide an area in the organization as possible. (2:7)

-**Evaluation**. An accurate feedback mechanism is necessary in order to assess the validity of the program and make adjustments so that it can remain viable over time. (2:7)

These factors, when considered, will facilitate an IS implementation effort by institutionalizing the new technology.

Factors dealing with the systems/people interface are found in a study by Frank Collins. He identifies key considerations often overlooked in literature that deals with the people interface problem. These disregarded issues are grouped into four categories: individual, systematic, informational, and frailties (4:26).

Two factors are identified within the individual issues; the first deals with problem finders and problem receivers. "Problem finders are those individuals who find or identify problems and send them to people characterized as problem receivers" (4:26). The general idea is that problem solving operations require rich information flows. The second considers boundary and core requirements.

> A person in a core position typically deals with organizational technology and has little interface with people outside the organization. Alternately, a person in a boundary position would interface between people and groups outside the organization and those people within the organization. (4:27)

The situation a person is in dictates the amount of detail and type information required.

Collins establishes three factors concerning systematic issues. The first here is standardization:

> A systems designer cannot hand-tailor reporting the idiosyncrasy of every individual, but he or she should be aware that movements toward greater standardization will make the information less useful to some individuals. (4:27)

The next factor requires that the IS have flexibility:

> The official information system should be flexible enough to allow the emergence of new information reporting channels. At the very least, information executives should recognize the importance of these ad hoc information flows and tolerate them. (4:27)

Finally, he delivers a point concerning controls and control; do additional system controls afford management more control over efficiency and effectiveness? He states:

> There is a difference between controls and control. Often, increasing the former can actually decrease the latter. The moral is: When trying to obtain and maintain system control information executives should be imminently aware that true system control depends upon the support of the individuals using the system. Their support must be attained. (4:27)

Information issues deal with the quantity and quality of the information. Collins describes how better not more information is a beneficial view. He states:

> Increasing information flow in itself may not increase the quality of information. Indeed, the increased flows may actually decrease system usefulness as the increased communication volume obscures truly valuable information. (4:27)

The other information issue is to keep from getting overly specific. Collins terms this non-specific information and describes it in the following words:

> One would guess that a problem communication would directly trigger a solution communication. Yet, in fact, they found that many solutions to problems often emerged from general, ad hoc communications. (4:27-28)

So one must leave an amount of conversational capability within the IS to aid problem solving.

The frailty issues relate to human frailties or inconsistencies. The first of these refers to boredom and system changes.

> One often suspects that many system changes arise from boredom. We have noticed system changes that arise in systems that appear to be working well. (4:28)

The moral of the story here is "If it ain't broke, don't fix it". The next frailty issue illustrates organizational hostility as a factor.

> If there is a general air of cooperativeness and agreement within an organization, the information system will likely be used as intended. However, if the hostility level is high among individuals and groups in the organization, there will be a movement to subvert the system by using it merely to justify positions rather than to seek answers. (4:28)

So if one desires constructive use of the IS one must be sure that organizational hostility is calmed. The final frailty issue is termed vested interests by the author.

> Typically, these interests resist change to the system because any change affects their status and power within the organization. Some individuals have power within an organization due to the information they possess and to the extent they can control others' access to the information. (4:28)

Therefore, these individuals will resist any attempts to interfere with their control. Taken into consideration, these factors will aid in dealing not only with implementation problems but also with post-implementation management issues.

The influence of organizational factors on the adoption of an IS is the topic of a study undertaken by Fariborz Damanpour. He determined six organizational factors to be predictors of the successful adoption of technological innovations.

> -**Functional Differentiation**. This represents the extent to which an organization is divided into different units. Different technologies are possible in different units of an organization. A coalition of professionals is created within the differentiated units who would help to elaborate on the technology used by the units. Since technological innovations are primarily introduced by the technical personnel who work in these units, the more functionally differentiated the organization, the higher the rate of adoption of technological innovations. (6:679)

> -**Specialization**. This represents different specialists found in the organization. Organizational members who use different technologies are specialized in different areas and have different skills. The greater the variety of specialists, the broader the technological knowledge base of the organization. This in turn would increase the exchange of ideas, techniques, and procedures, which would positively affect the introduction of technological innovations. (6:679)

-**Professionalism**. This reflects professional knowledge of organizational members, which requires both education and experience. Professionalism brings to the organization greater boundary-spanning activities, a sense of self-confidence, and commitment to moving beyond the status quo. These conditions are conducive to adoption of innovations. As the professional level of the specialized groups increases, participation in professional activities, exposure to new ideas, and the desire for recognition from peers increases. Consequently, involvement with the introduction of innovations pertaining to the organization's technology also tends to increase. (6:679)

-**Administrative Intensity**. This variable, also referred to as the managerial ratio, is an indicator of management overhead. Since successful adoption of innovations depends largely on the leadership, support, and coordination provided by managers, administrative intensity facilitates the adoption of all types of innovations. (6:679)

-**Organizational Size**. Most empirical studies have revealed that larger organizations adopt more innovations. Large organizations have more diverse and more complex facilities that presumably foster the adoption of a larger number of innovations. In addition, they have greater resources so that the potential loss due to unsuccessful innovations can more easily be tolerated. (6:680)

-**Organizational Slack**. This is the difference between the resources an organization has and what it minimally requires to maintain operations. According to Rosner, 'The existence of slack means that the organization can afford (a) to purchase costly innovations, (b) to absorb failure, (c) to bear the costs of instituting innovations, and (d) to explore new ideas in advance of an actual need'. (6:680)

The implications of this research denote that as technological innovations are to be adopted, introducing these mechanisms will enhance the success of the project (6:687). Managers must be cognizant of these organizational factors so they may use them in their favor.

A similar study was conducted by Robert Dewar and Jane Dutton. They chose and tested factors that "were widely regarded as being associated with innovation adoption" (9:1423). In this case five organizational factors are designated as important: organizational complexity, depth of the organization's knowledge resources, centralization, pro-change, and centralization of authority.

Organizational complexity consists of the range of different occupational specialties. "The more different types of knowledge that are present, i.e., the more complex or specialized the organization, the higher the rate of radical innovation adoption" (9:1423). Analogously, the depth of the organization's knowledge resources deals with the number of technical or engineering personnel. "The greater the number of specialists, the more easily new technical ideas can be understood and procedures developed for implementing them" (9:1424).

The remaining three factors all relate to managerial attitudes. Centralization attributes technological adoption to where the majority of the decision making power exists.

> In a highly decentralized organization, it is more difficult to convert attitudes towards change into action than in a centralized one. In formal terms, centralization is hypothesized to moderate the relationship between managerial attitudes and the adoption of radical innovations. (9:1424)

Centralization of authority redirects the point of view to the operational workers aspect.

> Our argument is that centralization will have a direct negative effect on the adoption of incremental innovations. When decentralization gives individuals at lower levels increased power over their work, they will acquire a sense of work ownership and propose changes for knowledge content, there should be limited opposition, and concentrated power is unnecessary for adoption. (9:1425)

Pro-change simply points to top management support of the technological adoption (9:1424).

Top management support has occurred often in the literature as an important variable in predicting successful IS implementation. William Doll devoted his study to the issue of top management's role in guiding IS implementation. He states:

> Collectively, top management is responsible for providing general guidance for the information systems activity. Top management's involvement may be a critical factor in determining the success of MIS development efforts. (10:17)

So management of the IS implementation effort is an important component leading to user satisfaction. Many of the problems that arise during the implementation process are managerial in nature and require active involvement of top management.

Further exploration of organizational context variables is extracted from an article written by Phillip Ein-Dor and Eli Segev. They identify relevant organizational context variables and test how they impact IS success (12:1064). There are ten variables established that determine IS implementation success:

-**Size Of The Organization**. MIS projects are less likely to succeed in smaller organizations than larger ones. (12:1069)

-**Organizational Structure**. The likelihood of success in building MIS, at the corporate level is lower in decentralized than in centralized organizations. (12:1069)

-**Organizational Time Frame**. The shorter the organizational time frame, the greater the likelihood of MIS failure. (12:1069)

-**Extra-Organizational Situation**. The more plentiful the supply of requisite resources in the external environment, the greater the likelihood of MIS success. (12:1070)

-**Organizational Resources**. The budgeting of sufficient resources increases the likelihood of MIS success. (12:1070)

-**Organizational Maturity**. The more mature the organization, the greater the likelihood of successfully implementing MIS. (12:1071)

-**The Psychological Climate**. MIS projects will succeed to the extent that expectations are constrained from below by motivation and from above by reality. (12:1072)

-**Rank Of The Responsible Executive**. The likelihood of a successful MIS effort declines rapidly the lower the rank of the executive to whom the MIS chief reports and is virtually negligible if the executive responsible is more than two levels below the chief executive of the particular organization which the MIS serves. (12:1073)

-**Location Of The Responsible Executive**. The likelihood of success is increased if the responsible executive is not identified with any specific functional area. (12:1074)

-**The Steering Committee**. The likelihood of MIS success is increased by the appointment of a high level steering committee. (12:1074)

These factors supply a systematic conceptual scheme within which the environmental context issues can be addressed when implementing an IS.

Research conducted by Michael Ginzberg suggests that users will accept an IS if their expectations of the system become reality. 'Thus, the decisions which will have the greatest effect on the users' acceptance or rejection of a system are made prior to the bulk of spending on the project' (17:459). Also, user participation helps users to formulate realistic expectations about the IS. For example, 'hold seminars or training sessions throughout the development process, beginning even before the system has been designed' (17:476). So being aware of user expectations and matching them with reality will increase user satisfaction with the IS implementation. Ginzberg concluded:

> Users who hold realistic expectations prior to implementation are more satisfied with the system and use it more than users whose pre-implementation expectations are unrealistic. (17:459)

User expectations then becomes a variable to be considered.

Another aspect of IS implementation that will increase the chance of smooth transition is to assure that the IS plan matches the organizations overall goals. This topic is addressed by Leo Gotlieb where he proposes ten items that will help management to determine if the IS and organizational plans connect. He identifies the ten items as:

> -**Aligned With The Business.** Your plan should be aligned with the general direction of the business. (19:42)

-**Tangible Benefits**. To the greatest extent possible, the systems initiatives being recommended should: provide tangible benefits; yield benefits that can be verified; and deliver 'true' benefits that translate into real gains. (19:42-43)

-**User-Driven**. An information systems plan is user-driven if: the projects are user-initiated and ranked in order of priority by the users; it contains statements of benefits that have been supplied by the users; each project is sponsored by a senior user and managed by users; costs include committment of user resources (time, people, funds); and the initiatives reflect organizational needs, not just the desires of particular individuals. (19:43)

-**Effective**. An effective systems plan is characterized by: a high level of benefit; low risk; phasing and early deliverables; and flexibility. (19:43)

-**Complete**. Some absolute minimum requirements for a systems plan. Does your plan contain: strategy and objectives; a statement of deliverables; costs and benefits; a task list and schedule; roles and responsibilities of all parties; an estimate of the resources needed to complete the tasks; and a statement of impact on both the user and systems organizations. (19:43)

-**Achievable**. Ask yourself: can the tasks set forth be accomplished given the time, resources, skill levels and technology available; does the schedule provide for contingencies, training, absences and any other non-productive activities that can be anticipated; if resources are scarce, can they be acquired at an acceptable cost and within the time available; are the necessary management structure and skills in place to successfully execute this plan; and are the users committed to and capable of performing the tasks that they are responsible for? (19:44)

-**Technically Sound**. In particular: do not incorporate technology that has been promised but not delivered; do not rely on exotic skills that may be hard to acquire, expensive to retain, or non-existent; do not permit unrealistic performance objectives unless there is enough over your environment to meet stated targets; and make sure you understand the implications of relying on hardware or software that is not in the 'mainstream' of current technology. (19:44)

-**Implementable**. To succeed, your plan must be operationally acceptable, that is, it must recognize what the organization can and cannot absorb. (19:44)

-**Understandable**. At its most basic level, the plan should be understandable by users and management. Technical jargon should be kept to a minimum, and detail confined to the appendices. (19:44)

-**Supported**. The plan may meet all the above criteria and more, but if it is not supported by management and the user community, it is likely to meet the fate of many other excellent planning efforts, namely to lie "on the shelf". (19:45)

These measures help in identifying vulnerabilities and insure that the IS is moving in the same direction as the organization as a whole (19:45).

Contrary to the direction of most of the literature a study by Geoffry Howard and G. Weinroth deals with factors users' don't want from their information system. They "identify the key information system and information management problems as viewed from the perspective of a sample of management-level users" (21:30). They determined eight key information problems and listed them in order of priority.

-**Incompatibility**. Inability to access information because of incompatibilities of hardware, software and data. (21:32)

-**Poor Competitive Data**. Lack of information about customers, competitors, products, and costs. (21:32)

-**Low Information Credibility**. Accuracy of stored data is suspect. (21:32)

-**Hardware Shortages**. Access to useful information is bottlenecked because not enough microcomputers and terminals are available. (21:32)

-**Poor Computer Center Support.** The computer center has not done a good job in developing systems quickly, educating users in how to access information, and making them aware of what is available in the organization's database. (21:32)

-**Data Overload.** Existing systems provide users with too much data and not enough information in an easily usable form. (21:32)

-**Poor Top Management--Computer Center Management Understanding.** Corporate management and computer center management do not understand each other's problems and thus communicate poorly. (21:32)

-**General Computer Naivete.** People at all levels in the organization are ignorant about computer technology. (21:32)

The discovery here is that all the factors have managerial rather than technical origins and in turn concede to managerial solutions. Thus a good answer to how to attain user satisfaction is through "careful application of management judgment, guided by a thoughtfully developed agenda of information system problems and priorities" (21:34).

A study conducted by Blake Ives and others reviews measures of user information satisfaction (UIS). They base their research on an examination of several other published works dealing with developing valid and reliable UIS measures. Two important points were brought out, system acceptance and support. The issues dealing with system acceptance "focus on the content of the information system (e.g. accuracy, relevance) and the manner in which the information is presented (e.g. format, mode)" (23:786). While support dealt with "the organizational support for

developing and maintaining the system as well as the system product itself" (23:786). These subjective measures can be used in the absence of any objective measures which is often the case.

An IS evaluation model was developed by William King and Jaime Rodriguez. Their model can be applied to the IS "prior to the design of an IS, during the various phases of development, and subsequent to system implementation" (24:43). Their model involves assessments of the following variables at each stage of the IS implementation.

> -**Attitudes**. Formal assessments of the attitudes of the users and the organization's managers. An individual's intrinsic beliefs and outlooks on the world. (24:45)
>
> -**Value Perceptions**. More direct assessments related to the specific MIS. For example, an answer to a question such as "How good is the system?" is a value perception. (24:45)
>
> -**Decision Performance**. Decision performance assessments reflect the quality of the decision-making process that is supported by the MIS. Since most authors agree that a major objective of a true MIS, as opposed to a data processing system, is decision support, it is not unreasonable to expect that an MIS will have demonstrable impact on the quality of decision-making. (24:45)
>
> -**Information Usage**. An area of system value which is related to decision performance is that of information acquisition and usage. Even if a system does not impact on decision performance in readily measurable ways, it reasonably may be expected to affect user's information acquisition and usage behavior in identifiable ways. (24:45)

This study illustrates the usefulness of using a conceptual model for evaluating the success of an IS implementation

effort. The authors state that it is a feasible method of creating a better IS and evaluation methodology (24:51).

Tae Kwon and Robert Zmud attempt to consolidate a lot of research appertaining to models of IS implementation. They identified five research streams: factors research stream, a process research stream, a political research stream, and a prescriptive research stream (25:228). They identified five major forces that contribute to successful efforts to introduce technological innovations into organizations and individual variables associated with each.

-**Individual Factors**.

-**Job Tenure**. Job tenure is generally related to institutional legitimacy. A positive relationship is usually expected through increased functional or political knowledge, while a negative relationship could be argued through an individual's bounded capacity. (25:234)

-**Cosmopolitanism**. Cosmopolitanism is generally associated with receptivity to change. (25:234)

-**Education**. Education is also related to receptivity toward change. (25:234)

-**Role Involvement**. Role involvement is another factor associated with receptivity toward change. Broader involvement in managerial activities has been proposed or reported to be positively related to adoption. (25:234)

-**Structural Factors**.

-**Specialization**. Specialization refers to the diversity of specialists within the organization. (25:235)

-**Centralization**. Centralization reflects the degree of concentration of decision-making activity. (25:235)

-**Formalization**. Formalization reflects the degree of functional differentiation. Functional differentiation is believed to develop clear work definition and procedure, but less autonomy. (25:236)

-**Informal Network**. Here, research views innovation as a communication and information transfer process, in which interpersonal, informal communications among adopters are a key contributing factor to technological diffusion. (25:236)

-**Technological Factors**.

-**Compatibility**. This factor is related to an innovation's organizational 'fit' as well as its impact on individuals' attitudes regarding change, convenience of change, power shifts, etc. (25:237)

-**Relative Advantage**. Relative advantage reflects the degree to which an innovation is perceived as providing greater organizational benefits than either other innovations or the status quo. (25:237)

-**Complexity**. Complexity is related to the degree of difficulty users experience in understanding and using an innovation. (25:237)

-**Task Related Factors**.

-**Task Uncertainty**. Task uncertainty is a multi-facet construct reflecting the degree of routinization, programmability and exceptions in accomplishing organizational tasks. (25:238)

-**Autonomy**. Autonomy is concerned with the degree to which individuals exercise personal control over their assigned tasks. A higher degree of autonomy is likely to increase worker motivation, idea generation, satisfaction and performance. (25:238)

-**Responsibility**. Responsibility is related to the degree of authority invested in an individual to oversee the completion of a task and to improve existing task behaviors. Tasks with low responsibility are expected to create less worker motivation to accept and to seek work system changes. (25:238)

-**Variety**. It is commonly believed that simplified and routinized tasks are not likely to lead to higher performance and satisfaction. (25:239)

-**Identity**. Task identity ultimately refers to an individual 'internalizing' an assigned task. Increased identification with and belief in assigned work is likely to increase an individual's task involvement and, hence, lead to the potential for more innovative behaviors. (25:239)

-**Feedback**. Feedback refers to the existence of a mechanism for informing individuals of their task performance levels. (25:239)

-**Environmental Factors**.

-**Heterogeneity**. Heterogeneity refers to the similarity of environmental entities, e.g. customer diversity, with which an organization must interact. (25:240)

-**Uncertainty**. Uncertainty is related to the variability of organizational environments. (25:240)

-**Competition**. Competition is related to environmental capacity (scarcity of resources) and population density. (25:240)

-**Concentration/Dispersion**. Concentration/dispersion represents the extent to which resources are evenly spread throughout the environment. (25:240)

-**Inter-Organizational Dependence**. Inter-organizational dependence is related to the degree to which an organization has a program of sharing resources or exchanging ideas with other organizations. (25:241)

These factors should enable managers to understand better the forces that lead to IS satisfaction, resulting in them being able to develop effective ways of introducing an IS into an organization.

Top management support is a popular theme among the issues related to IS implementation success. A study by Albert Lederer and Aubrey Mendelow concentrates on just that issue. Specifically, they expound on several issues

that top management must deal with to improve IS planning. They state, "Effective systems planning is the key to capitalizing on the opportunities of information technology. Without careful planning, systems happen haphazardly" (26:73). Since computer-based IS's are taking on an increasingly important strategic role in business and industry, top management has taken an active interest in systems planning. Thus top management involvement is considered an important factor in IS implementation.

Research undertaken by John Lees investigated factors that contribute to IS success. He applies user satisfaction and system usage as measures of "success". He examines:

> IS characteristics and determines the relationship between systems development and implementation procedures and ultimately the success of the system. (27:32)

He identified seven factors that contribute to IS success.

> -**Organizational Maturity**. MIS satisfaction and usage will be greater in organizations that utilize formal systems analysis, design and implementation procedures. (27:33)
>
> -**User Involvement**. MIS satisfaction and usage will be greater in organizations that involve system users in the system analysis, design, and implementation process and in making post-implementation adjustments and enhancements to the system. (27:33)
>
> -**Availability of Resources**. MIS satisfaction and usage will be greater in organizations that possess internal technical personnel and/or hire consultants. (27:33)
>
> -**Positive User Attitudes and Perceptions**. Regard such things as the systems staff and need for the system. (27:33)

-**Length of the Firm's EDP Experience**. MIS satisfaction and usage will increase in organizations that have used computers for a long period of time. (27:33)

-**Organization Size**. MIS satisfaction and usage will be greater in organizations that are large. (27:33)

-**Benevolence of the External Business Environment**. MIS satisfaction and usage will be greater in organizations that operate in a benevolent external business environment. (27:33)

After testing the factors Lees found that all of them had positive associations with either system usage or user satisfaction.

Belden Menkus offered five factors that he discovered to contribute to a successful IS. He states,

> There are some aspects of the relationship between the competent systems professional and the successful system that seem to be generally applicable. (31:5)

He expands on the following:

-**Simplicity**. The system will be simple and straightforward in both design and function. (31:5)

-**Independent**. The system will be designed to be as self-regulating and self-monitoring as possible. (31:5)

-**Complete**. The system will be delivered to the user complete, that is, in as finished a state as possible. (31:5)

-**Training**. The people who must use the system and those who must manage their work will be prepared to use it by the time the system is ready to be used. (31:5)

-**Measurable**. The system's suitability, reliability and overall effectiveness will be measurable periodically on some obvious and easily understood basis. (31:5)

Menkus finds these issues to be paramount to avoiding system failure. He stresses that they embody a minimum effort towards IS implementation.

A more general approach to what they refer to as project implementation is studied by Jeffrey Pinto and others. They surmise that successful project implementation involves 'a two-stage process, consisting of an initial goal-setting and planning phase followed by an action-oriented, operational stage' (33:35). A ten-factor model is presented and tested of which the first three factors are strategic or planning oriented and the remaining seven are tactical or action oriented. These factors are presented and defined as follows:

> -**Project Mission**. The importance of initial, clearly defined and agreed upon goals must be spelled out in the beginning. (33:40)
>
> -**Top-Management Support**. It is necessary for top managers to get behind the project at the outset and make clear to all personnel involved that they support successful completion. (33:40)
>
> -**Project Schedule or Plan**. A detailed plan of the required steps in the implementation process needs to be developed, including all resource requirements (Money, raw materials, manpower, and so forth). (33:40)
>
> -**Client Consultation**. The clients, or parties for whom the project is ultimately intended, either inside or outside the organization, need to be consulted in order to better determine their specific needs. (33:40)
>
> -**Personnel**. Key personnel must be recruited, selected, and trained to form the project team for technical as well as logistical support in implementing the project. (33:40)

-**Technical Tasks**. The project must be well managed by people who are familiar with it, who possess adequate technical skills, and who have the technology to perform their tasks. (33:40)

-**Client Acceptance**. The ultimate success of a project rests with the client's decision of whether or not to accept it. (33:40)

-**Monitoring and Feedback**. At each stage of the project implementation process, key personnel receive feedback on how the project compares to the initial projections. (33:40)

-**Communications**. Adequate communication channels (both formal and informal) are extremely important, not only within the project team, but between the team and the organization, as well as with the project's clients. (33:40)

-**Troubleshooting**. Because problems arise in almost every project, the manager should make adequate initial arrangements for troubleshooting mechanisms. (33:41)

The authors found this process model to be useful in implementing a successful project and say it can be equally important to information systems. These factors are related to and congruent with the variables discussed thus far and add to the support of some common issues.

Additional factors can be found in a study of the relationship between organizational characteristics and the success of IS in the context of small business (34:37). This empirical study found that several factors are consistently associated to IS success.

-**EDP Experience**. It is plausible to believe that firms who have used computers for a greater length of time should have resolved more of the problems related to implementation and operation. (34:40)

-**Development**. There are two choices; to have its own EDP staff develop the software, or to acquire packaged or customized software from a vendor or a service company. (34:40)

-**Operation**. In parallel to the type of applications development chosen, a firm can process its applications either internally or externally. With in-house processing, the firm owns or rents its own computer and has its own operating staff. External processing (batch or on-line) involves a service bureau computer (or an owner-time computer in the case of affiliates). (34:40)

-**Applications**. One of the principal measures of computer sophistication of an organization is the number and nature of the applications that have been implemented. (34:40)

-**Interface**. It is expected that the greater accessibility, less output volume, and shorter response/turnaround time associated with on-line systems should have positive effects on user-managers. Note that an interactive system was defined as a system in which the user-manager actually interrogated the computer via a terminal, thus including single-user microcomputers and timesharing computers. (34:41)

-**MIS Rank**. MIS success is positively associated with the rank of the executive responsible for MIS. By locating the MIS function at a high organizational level, a firm indicates the importance it attaches to this function and insures top management involvement in all major decisions regarding computers and information systems. (34:41)

-**Region**. Firms located in more remote regions tended to have greater problems related to EDP staffing and to the support provided by vendors or service bureaus. One could argue that the human and technological resource availability is generally less favorable to firms which are not situated in or near large urban areas. (34:41)

The author found that the environment created by these issues enhances the benefits of an IS (34:50). Consideration of these issues will support successful IS implementation.

Another study looks at IS implementation as an evolving set of activities, offers methods of organizing those activities and illustrates some prototypal designs (37:79). In his study Robert Zmud developed on some basic issues that contributed to IS implementation success. He built upon each issue as the foundation of his prototypal designs stressing that they evolve with IS implementation. He explained each in the following:

> -**Delivery Systems and Systems Development**. Represent the traditional manufacturing role of assuring that mainstream information system are correctly implemented, efficiently operated, and effectively maintained. (37:80)
>
> -**Support Center and Information Center**. Represent a distribution role that serves to unite end users, end user development tools, and external products and services. (37:80)
>
> -**Research and Development, Technology Diffusion**. Represent the technology transfer roles concerned with (1) ensuring that technological innovations are recognized and assessed with regard to their organizational relevance, and (2) facilitating the diffusion of appropriate technologies into the work units. (37:81)
>
> -**Planning, Internal Auditing, and Administrative Function**. Represent an administrative function responsible for the overall planning, control, and coordination of information systems activities. (37:81)

These issues stress the necessity for an IS to evolve before and after implementation. The message for managers is to take these issues into consideration so organizational units don't begin preempting the IS. Managers must apply these issues in examining their own IS.

A second study by Zmud addresses individual differences as they affect IS success. His review of the literature found that "of the numerous factors believed to influence MIS success, the area of individual differences has by far been the most extensively studied" (38:966). He empirically examines a number of cognitive, personality, demographic, and situational variables and synthesizes them as they relate to IS. As a result he came up with the following variables:

> -**Cognitive Style**. Differences in information requirements exist between complex individuals and field-independent subjects. (38:969)
>
> -**Personality**. Differences in personality reflect differences in information needs. (38:970)
>
> -**Demographic and Situational**. The subjects status level in the organization and intelligence level reflect differences in information needs and decision making techniques. (38:970)
>
> -**Cognitive Behavior-Information**. A major role of a MIS, thus, is to both select and filter appropriate information elements for the decision maker. (38:970)
>
> -**Cognitive Behavior-Decisions Aids**. Decision performance would benefit from decision aids that direct, to a certain degree, a decision maker's behavior. (38:971)
>
> -**MIS Design Characteristics-Information**. User satisfaction with a MIS has been shown to be positively related to the degree to which information needs are perceived to be met but to be negatively related to the amount of information being received. Also, a group of MIS users receiving an unalterable report were less satisfied than another group receiving reports which could be modified. (38:971)
>
> -**MIS Design Characteristics-Decision Aids**. Format improvements were observed to be positively associated with increased MIS usage. (38:972)

-**Delivery System**. Ease of use and favorable user interfaces have both been positively associated with MIS satisfaction. On-line usage, as opposed to batch usage, has resulted in faster and more consistent performance and a higher degree of user satisfaction but only when the MIS is accessible and reliable. (38:972)

-**A Priori Involvement-MIS Success**. A priori user involvement in MIS design has consistently been observed to be positively associated with user satisfaction with a MIS. A related finding was that ineffective user-designer communication during design was negatively associated with satisfaction. (38:972)

-**MIS User Attitude-MIS Success**. Preconceived attitudes toward MIS are associated with MIS usage to a much greater extent than MIS satisfaction. Usage has been positively associated with attitudes regarding the potential of an MIS the urgency of an MIS, the extent of top management support for an MIS, and the quality of the MIS staff. Regarding MIS satisfaction, only a positive association with attitudes of top management support and mixed results regarding MIS potential have been observed. (38:972)

-**Posterior Involvement-MIS Success**. The results of a single study indicate the existence of a negative association between posterior involvement and MIS satisfaction. Apparently, MIS users involved in this modification effort tended to be those dissatisfied with the MIS. (38:973)

Zmud discovered that consideration of individual differences is an important aspect of predicting user satisfaction and the resulting IS success. So these variables become an meaningful contribution to the prediction model.

Conclusion

Building a predictive model of user satisfaction requires grouping similar issues to determine what independent variables have the most support based on

frequency of occurrence in the literature. The issues that most frequently occur are believed to be the best predictors of the dependent variable. Upon close examination of similar issues and their operational definitions, a list of 21 independent variables and their related support are listed in Table IV.

Table IV
Independent Variables and Sources

Variable	Source
Monetary Resources	
Organizational Slack	(6)
Organizational Resources	(12)
Competition	(25)
Concentration/Dispersion	(25)
Keep the System Simple	(1)
Factor in 'Hidden' Costs	(36)
Watch Consultant Fees	(36)
Quality of Goal Setting	
Specific Program Goals	(2)
Boredom and System Changes	(4)
Organizational Time Frame	(12)
Effective	(19)
Complete	(19)
Project Schedule or Plan	(33)
Project Mission	(33)
Extent of Project Definition and Planning	(17)
Commitment to the Project	(17)
Plan	(36)
Set Milestones and Conduct Reviews at Each Milestone	(36)
Don't Prolong Testing	(36)
Don't Waste Time	(36)

Use of Outside Resources/Consultants

Limited, Short-Term Use of Experts	(2)
Availability of Resources	(27)
Development	(34)
Operation	(34)
Region	(34)
Sponsor	(20)
Facilitator	(20)

Training

Training	(2)
General Computer Naivete	(21)
Complexity	(25)
Simplicity	(31)
Training	(31)
Research and Development Technology Diffusion	(37)
Education	(5)
Education	(28)
Prepared to Use System	(29)

Congruent With Business

Overcoming Congruence Problems	(2)
Vested Interests	(4)
Aligned With the Business	(19)
Compatibility	(25)

User Involvement

Participation	(2)
User-Driven	(19)
User Involvement	(27)
Client Consultation	(33)
Client Acceptance	(33)
A Priori Involvement	(38)
Posterior Involvement	(38)
Obtain User Participation	(1)
Obtain User Committment	(1)
Involvement	(3)
User Specification	(3)
Building Involvement	(28)
Participation	(15)
Conflicts and Resolution	(15)
User Involvement	(20)
User Involvement	(22)
Involved in Design or Change	(29)

Diffusion of Change

Diffusion	(2)
Functional Differentiation	(6)
Formalization	(25)
Work Groups	(3)
Structural considerations	(5)
Restructuring Departments	(28)

Top Management Support

Administrative Intensity	(6)
Pro-Change	(9)
Top Management Involvement	(10)
Rank of the Responsible Executive	(12)
Location of the Responsible Executive	(12)
The Steering Committee	(12)
Supported	(19)
Understanding	(21)
Role Involvement	(25)
Top Management Involvement	(26)
Top Management Support	(33)
MIS Rank	(34)
Planning, Internal Auditing, and Administrative Function	(37)
Obtain Management Support	(1)
Actors	(11)
Support of Top Management	(20)
Management Support	(29)
Grade GS-12 or Better	(29)
Newer Employee	(29)

Opposition to Change

Organizational Hostility	(4)
Controls and Control	(4)
Attitudes	(24)
Cosmopolitanism	(25)
MIS User Attitudes	(38)
Sell the System	(1)
Commitment to Change	(17)
Constructive Conflict	(15)

Organizational Size

Organization Size	(6)
Size of the Organization	(12)
Organization Size	(27)

Knowledge Pool

Specialization	(6)
Professionalism	(6)
Organizational Complexity	(9)
Depth of Organizations Knowledge Resource	(9)
Education	(25)
Specialization	(25)
Personnel	(33)
Technical Tasks	(33)
Demographics and Situational	(38)

Centralization of MIS Function

Centralization	(9)
Centralization of Authority	(9)
Organizational Structure	(12)
Centralization	(25)

Data Flow

Better Not More	(4)
Data Overload	(21)
Information	(38)

Organizational Maturity

Organizational Maturity	(12)
Organizational Maturity	(27)
Length of the Firms EDP Experience	(27)
EDP Experience	(34)

Benefits

Tangible Benefits	(19)
Value Perceptions	(24)
Relative Advantage	(25)
Measurable	(31)
Deliver the Goods Along the Way	(36)

Job Aspects

Job Tenure	(25)
Task Uncertainty	(25)
Autonomy	(25)
Responsibility	(25)
Variety	(25)
Identity	(25)
Psychological Job Demands	(3)
Workspace Informality and Ownership	(3)
Compensation	(28)
Autonomy/Job Enrichment	(28)
Job Displacement	(28)
Responsibility	(8)

Environmental Factors

Extra-Organizational Situation	(12)
Heterogeneity	(25)
Uncertainty	(25)
Inter-Organizational Dependence	(25)
Benevolence of the External Business Environment	(27)

User Expectations

Evaluation	(2)
The Psychological Climate	(12)
User Expectations	(17)
Achievable	(19)
Technically Sound	(19)
Implementable	(19)
Feedback	(25)
Complete	(31)
Monitoring and Feedback	(33)
Communications	(33)
Information	(38)
User's Requirements and Expectations	(14)

Communication

System Flexibility	(4)
Non-Specific Information	(4)
Informal Network	(25)
Communication	(28)
Communication	(8)
Influence and Communication	(11)
Context	(11)
Problems Listened To	(29)

Support Center

Planning	(2)
Poor Computer Center Support	(21)
Hardware Shortages	(21)
Support	(22)
Independent	(31)
Trouble Shooting	(33)
Delivery Systems and Systems Development	(37)
Support Center and Information Center	(37)
Information Resource Center	(3)
Feeling About Staff	(29)

Human Interface

Applications	(34)
Interface	(34)
Delivery System	(38)
Ergonomics	(3)
Presentation and Response	(3)
People/System Interface	(3)
Access	(29)
Batch Quality	(29)
Online Quality	(29)
Flexible Formats	(29)
Remember the Human Factor	(36)

Information Environment/Needs

Formal Procedures	(2)
Standardization	(4)
Low Information Credibility	(21)
Poor Competitive Data	(21)
Incompatibility	(21)
System Acceptance	(22)
Decision Performance	(24)
Information Usage	(24)
Cognitive Style	(38)
Personality	(38)
Decision Aids	(38)
Information Quality and Usability	(3)
Gives Information Wanted	(29)

Work Environment

Housekeeping	(28)
Telecommutting	(3)

Due to some redundancy and lack of support of some of the variables and in the interest of brevity a second look at the independent variables is in order.

Upon second deliberation it is noted that the monetary resources variable, while an important consideration, is purely a common sense one. One must ensure the resources are available before proceeding with a project. Also, this variable doesn't directly predict user satisfaction for most users aren't involved in that portion of the planning.

The use of outside resources/consultants is redundant for it mostly applies to an organizations knowledge resources. If the organization has enough internal 'experts' available the consultant is chosen from that pool of expertise. If not, an outside consultant is hired which illustrates the lack of knowledgeable personnel internal to the organization. So this variable, use of outside resources/consultants, is combined with knowledge resources.

A second look at IS implementation being congruent with business also points out its redundancy. For an IS to be congruent with business objectives it must be planned in such a way as to support business goals. This kind of planning combines organization goals with system goals. Therefore, this independent variable is combined with quality of goal setting.

The supporting literature concerned with diffusion of change closely relates to aspects of the job. Diffusion of change is based on the degree of functional differentiation between departments and the organizational structure is based on established job structure. Thus this variable is combined with aspects of the job.

The opposition to change variable was eliminated altogether for this is more of a reactive measure rather than a predictor. The literature has shown that user involvement and top management support should quell this problem when properly introduced.

The data flow variable closely relates to the data processing environment that a user must operate in and is, therefore, combined with information environment/needs.

The variable concerning system benefits is closely related to user expectations. A user expects certain benefits which should have been publicized anyway. So this variable doesn't have enough support to stand on its own and is somewhat redundant.

The communication variable, although of recognized importance, is very general in nature and not particularly useful for this study on its own. These aspects deal with how the user communicates with the system and relates to the human interface. Consequently, the communication variable is combined with the human interface.

The work environment doesn't have enough support to stand on its own and is closely related to job aspects. Thus work environment is combined with job aspects.

Organizational size, centralization of MIS function, organizational maturity, and environmental factors were all eliminated. This was done on the basis of lack of substantial support from the literature and the inability to combine them with anything else.

The final list of ten independent variables chosen as hypothesized predictors of user satisfaction are illustrated here with their operational definitions.

Quality of Goal Setting - The importance of information system goals and if these goals support organizational goals.

Training - The importance of IS education and training to user satisfaction.

Top Management Support - The importance of top management supporting the information system implementation.

User Involvement - The importance of active participation in IS information to user satisfaction.

Knowledge Pool - The availability of professionals and technological experts internal to an organization.

Job Aspects - How aspects of the job affect satisfaction with IS implementation.

User Expectations - How well expectations of the IS match with what is actually implemented relates to user satisfaction.

Support Center - How important a system support department is to user satisfaction after implementation of the IS.

Human Interface - The importance of the people/system interface to user satisfaction.

Information Environment/Needs - How important the amount and quality of information flow through the system is to user satisfaction.

In consideration of the previous empirical research conducted by Lt Norcia this research finds some support for his study but also some short comings. Norcia's communication variable deals with communication 'between the worker and his/her coworkers and supervisors, communications is likely to increase due to participation' (32:28). This independent variable finds literature support in this study by way of its relationship with user participation. Top management support is also encompassed within this independent variable. So this IV more generally represents several IVs of this study. But, on the other hand, finds no basis for any increase in user satisfaction due to any particular level of communication between users.

There is a lot of support for Norcia's expectancy variable which he defines as 'dealing directly with job design and organizational structure' (32:30). The job aspects variable supports this relationship.

His efficiency/effectiveness variable is somewhat too ominous as it encompasses a lot of different aspects in one variable. He defines it as, 'including a wide variety of measures that have been cited throughout the literature such as: cost, time, quality, quantity, effort, timeliness, and others' (32:31).

Based on this literature review Norcia's variables appear to be general in content. Each of his IVs represent several variables identified in this study. While their content is supported by the current literature they require the further breakdown this study provides.

The hypothesized comprehensive model for predicting user satisfaction is illustrated in figure 1.

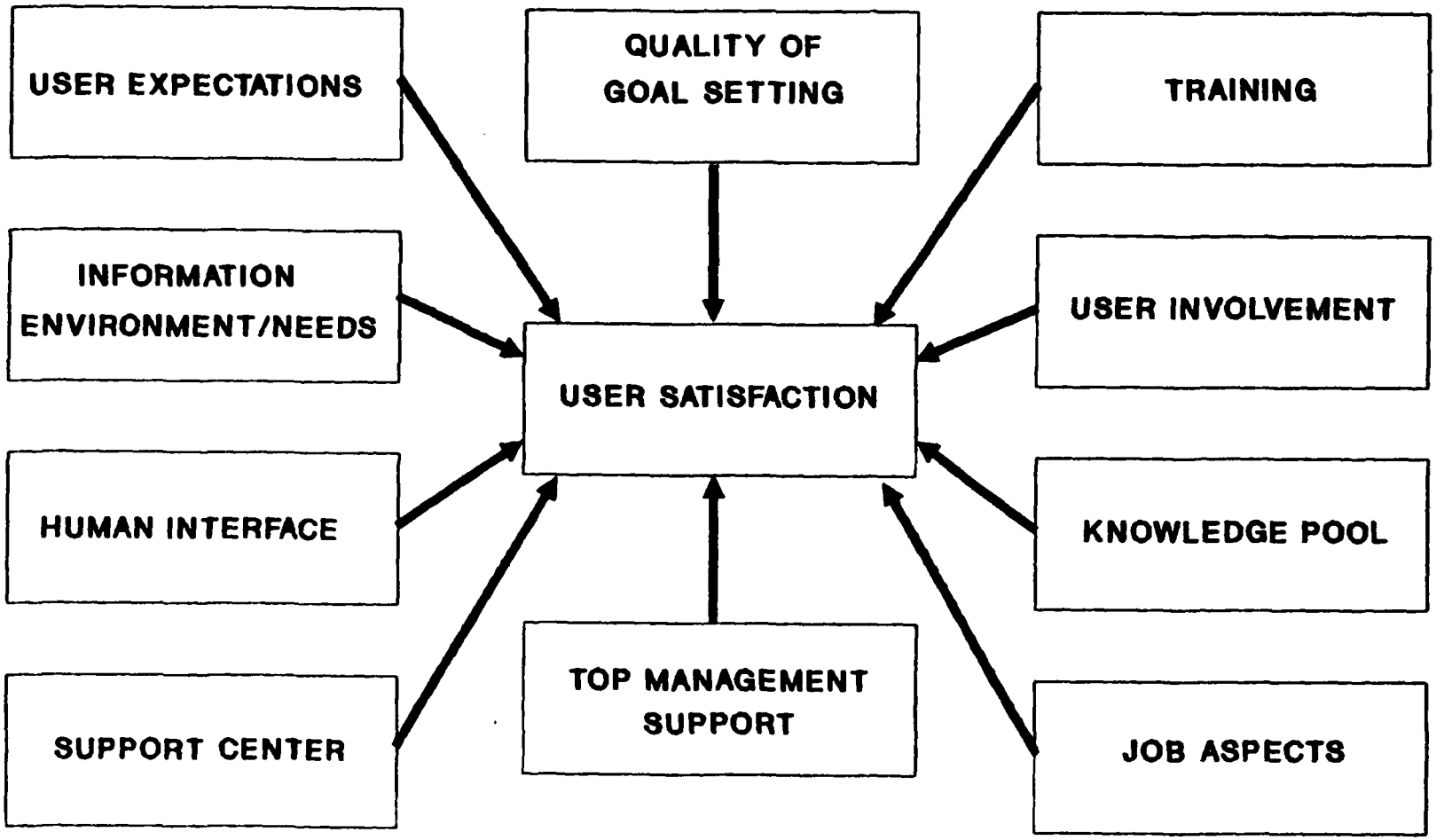

Figure 1. Hypothesized Prediction Model

III. Methodology

Overview

The general issue, as identified in chapter 1, pointed out that efforts among researchers of information system implementation (IS) and organizational change to conclusively derive a comprehensive model for predicting a successful IS have failed. Generally, these models are comprised of independent variables commensurate with a social change process. It is the intention of this thesis to further investigate one of these models.

To reiterate, the research question and problem are restated as follows: Given the comprehensive model, are all the independent variables significant as stated or do they require modifications and additions to better explain the dependent variable, user satisfaction? This thesis effort tests existing independent variables for their significance and determines if additional independent variables are necessary to form a complete model.

The objective of the research is, through examination of the literature, to determine if the existing variables are significant and if there are any new independent variables that can be incorporated into the model. Then, by using a survey instrument based on the model, survey a sample of a population. And, finally, determine what, if any, new independent variables result from this analysis.

Justification

Two main research activities are conducted in this study of IS implementation success, interviews and surveys.

The first activity is administering interviews to several IS managers to examine if existing independent variables are vital to the models usefulness. The IS managers' experience and knowledge are needed to help establish a basis for empirical validation of the survey variables and questions. A similar study conducted by Ginzberg supports this idea:

> These interviews were necessary in order to develop an instrument for measuring pre-implementation expectations. [illegible] of the key expectation areas (e.g., goals, modes [illegible], impacts) could not be assessed with general, non-specific questions. Rather, their assessment required knowledge of the details of the system and the environment in which it was being implemented. (13:465)

Therefore, the interviews potentially improve the quality of information and aid in certifying the survey instrument. In fact, C. William Emory states, "The greatest value lies in the depth and detail of information that can be secured" (13:160). These "consulting" interviews center on the development of a credible survey instrument.

The information assembled from these interviews is used to develop a survey instrument. The purpose of this survey is to study multiple organizations as a whole. To gather information concerning user satisfaction of their IS during post-implementation. Due to the amount of time and resources available, this is the most practical means of

study. Emory praises the survey as being 'versatile', and more 'efficient', and 'economical than observation' (13:158). The credibility of using the survey as a research strategy across multiple organizations is reinforced by Ives and Olson. They state, 'A survey of different systems across multiple organizations has been a common research strategy' (22:593). Their statement is supported by their review of at least 15 research efforts which were conducted through 1983. They further state, 'Most of the studies reviewed are based on survey data collected after system development has been completed' (22:600). Thus, the use of a survey is an acceptable method of researching IS success.

Instrument

As thorough an investigation of the literature as possible is conducted to insure that any potentially useful independent variables are addressed. The existing and any more significant independent variables are identified through further review of literature associated with IS user satisfaction, IS implementation and organization change, and user involvement in IS implementation. Table V is a tabular representation of the sources investigated.

Table V
Source Listing

Source Name/Type
Sloan Management Review
Journal of Management
Human Relations
Communications of the ACM
Interfaces
Business Horizons
Management Science
Journal of Systems Management
Datamation
Critical Issues in Information Systems
Data Management
Business Quarterly
MIS Quarterly
Text Books
Theses

A survey is used to test how these independent variables predict the dependent variable; the survey is exhibited in Appendix A. The significance of each of the independent variables will be determined based on user perceptions of how each one contributes to their satisfaction with the IS.

The survey statements are based on sought data concerning the attitudes respondents have concerning satisfaction with an information system. A series of statements are presented which are relevant to a particular independent variable stated and operationally defined at the beginning of each series. Each statement is focused on soliciting a disposition-behavior relationship between the independent variable and user satisfaction. Specifically,

each statement addresses a favorable or unfavorable viewpoint of user satisfaction.

The analysis of each IV is based on a Likert scale. The respondents are asked to reply to each item using a summated scale approach in terms of seven degrees of agreement. The numbers show the value to be given to each possible answer with 1 showing the least favorable degree of user satisfaction and 7 the most favorable. The appraisal of each IV has foundation on how well it differentiates between those end users with high and low levels of satisfaction.

The validity of the survey has roots in two areas: the IVs and statements are derived from published data, and verified through field testing. The field testing entails soliciting opinions and suggestions for improvement via consulting interviews with management from the target sample groups. Each manager is asked for thoughts on IV significance and statement validity. After these consulting interviews the survey is revised and retested until no further revision is requested.

Sample/Population

The survey sample consists of two separate organizations Headquarters USAF Air Training Command (ATC) and Headquarters US Air Force Logistics Command (AFLC) Plans and Programs divisions. Personnel chosen to complete the

survey are end users as defined in the topic statement section of the literature review.

The ATC organization is managed by Capt Steve Branch, USAF, Chief, Information Management and Integration, HQ ATC/DAX. This sample includes 32 personnel who use a system connected to a host server for word processing, data base management, electronic mail, and file transfer. A second group in ATC embodies 12 information system users working from terminals linked by the NOVELLE local area network.

The AFLC organization is managed by Mr. Gene Mandrell, USAF, Director of Plans, Programs, and Policies, HQ AFLC/SCX. This organization is tasked with large computer system development for the Air Force (AF). This sample includes 250 personnel from subordinate Air Logistic Commands (ALC) who have experienced the implementation of their information system and use their IS to conduct daily business.

Due to cost and time restrictions this investigation is designed based on a nonrandom, nonprobabilistic sampling. That is, each member of the sample doesn't have a known nonzero chance of being surveyed. Specifically, these are purposive quota samples designed to be representative of the population from which they are drawn. Therefore, the samples are chosen for their usefulness in representing the population of information systems users.

Mr. Mandrell, Capt Branch and Lt Col Dorothy McBride,

USAF, Program Manager of the Information Resource Management Graduate Program of AFIT, are interviewed concerning the content and legitimacy of the independent variables and their associated survey questions.

Data Collection Plan

Each survey package consists of a cover letter signed by its respective director, a survey with instructions, and an optically readable data collection form. This all placed in a 9 1/2" x 12" envelope. This makes for a complete package which will be fully understood by each recipient.

The responsibility for distribution and collection of the surveys is given to the respective directorate in order to evoke a better response from the sampling groups. The underlying idea is to highlight top management interest in this research so survey recipients take the research more seriously and take the time to answer the survey more deliberately.

Upon receipt of the completed surveys, they are grouped together into one large data file via an optical reader into a mini-computer system. The uploaded data file assumes the form of a matrix 70 columns wide by the number of returned cases (rows) long. This data file is then used as input for a multiple regression analysis to include a reliability analysis of the scales.

This plan is limited by certain aspects inherent in this type of study. The most difficult aspect of this research effort is extracting independent variables from the literature and incorporating these variables into a comprehensive model. Also, devising survey questions that solicit the proper response is a challenge.

Statistical Tests

The statistical procedure used in this study to test the significance of the independent variables as predictors of user satisfaction is multiple regression analysis. Using two or more independent variables to estimate the dependent variable supports the multiple regression analysis technique. This technique is combined with a reliability analysis of the scales which appraises the consistency of the variable measurement. The SAS data analysis software system is incorporated for this analysis.

SAS is used to conduct a full model as well as a stepwise regression analysis. These analyses are accomplished by invoking the PROC REG and the STEPWISE SAS procedures respectively.

The PROC REG procedure is used in combination with the VIF, TOL, and Durbin-Watson options. This procedure produces output consisting of the analysis of variance statistics, parameter estimates, multicollinearity tests (VIF and TOL), and a test for independence of the variables (Durbin-Watson statistic).

The STEPWISE procedure searches for the 'best' model by bringing into or taking away from the regression equation the independent variables one by one. There are three methods SAS is capable of incorporating: forward, backward, and stepwise. Forward begins with a basic regression model containing no variables, $y = Bo + E$, and adds variables one by one. It calculates the F-statistic which reflects the contribution of that independent variable to that model. Then, it compares the F-statistic with a predetermined significance level for entry into the model. If the F-statistic is more significant it's added to the model. The default significance level for SAS is $F > .5$. Once added, the variable remains in the model. The procedure repeats this comparison until all the variables have been put through the comparison. The Stepwise method is the same as the forward except that once a variable is added, it can be removed if it's significance level drops below the predetermined level. The Backward method, on the other hand, begins with all the variables in the model and eliminates them one at a time. Removal is based on the variables contribution to the model's global F-statistic. The default F-statistic is .1 or if $F > .1$ the variable is removed. Once a variable is removed it's never placed back into the model.

Further analysis of the models produced by the stepwise regression methods are conducted by testing the reliability

of each variable with the Spearman-Brown formula. Then, after establishing each variable's reliability, the results are used to determine a single prediction model for user satisfaction.

IV. Analysis and Findings

Introduction

This chapter explains the analysis procedures used to examine the data collected by the survey instrument as well as the findings resulting from the analysis. But, before examining the data, a description of the survey, its purpose, and how it was developed is presented first.

Survey Instrument

The purpose of the survey is to measure end users' perceptions and attitudes toward implementing information systems. Each independent variable is operationally defined at the beginning of a series of statements. By responding to these statements relating to each variable based on a level of agreement or disagreement (7 point Likert scale), the end user expresses his/her feelings concerning the importance or insignificance of the variable. The actual survey can be found in appendix A.

The survey variables and their associated statements originate from the literature as illustrated in Table IV. Further revision of the survey statements was accomplished through iterations of a validation process. Specifically, the variables and associated statements were reviewed by IS practitioners for correct association and wording. Upon completion of this review, the survey was field tested among information resource management graduate students. Table

VI illustrates the variables, their aliases used in the analysis, and the statement numbers associated with each variable.

Table VI
IVs, SAS Aliases, and Survey Statements

Variable	SAS Alias	Associated Statements
Quality of Goal Setting	QGS	1,2,3,4,5,6,7,8,9
Training	TRAIN	10,11,12,13,14,15,16, 17,18,19,20
User Involvement	USINVLV	21,22,23,24,25,26,27, 28,29,30
Top Management Support	TMS	31,32,33,34,35,36,37
Knowledge Pool	KNWPOOL	38,39,40,41,42
Job Aspects	JBASPCT	43,44,45,46,47
User Expectations	USEXPCT	49,50,51,53
Support Center	SUPPCNT	54,55,56,57,58
Human Interface	HUMINTR	59,60,61,62,63
Information Environment/ Needs	INFNVND	64,68
User Satisfaction	USERSAT	48,52,65,66,67,69,70

Analysis

The data is analyzed via multiple regression techniques supported by the SAS statistical software on a minicomputer. The analysis begins by performing a regression analysis on the whole model. In addition to the regression information, variance inflation and tolerance are also requested to test for multicollinearity. Also, the variables are tested for

serial correlation by including the Durbin-Watson statistic. The resultant output is illustrated in Table VII.

Table VII
Regression Output on the Full Model

ANALYSIS OF VARIANCE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	10	956.61143842	95.66114384	5.260	0.0001
ERROR	130	2364.42402	18.18787710		
C TOTAL	140	3321.03546			

ROOT MSE	4.264725	R-SQUARE	0.2880
DEP MEAN	33.20567	ADJ R-SQ	0.2333
C.V.	12.84336		

PARAMETER ESTIMATES

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR H0: PARAMETER=0	PROB>|T|
INTERCEP	1	8.14682479	4.51050279	1.806	0.0732
QGS	1	0.04126132	0.08904347	0.463	0.6439
TRAIN	1	0.14681043	0.07726061	1.900	0.0596
USINVLV	1	0.001820199	0.06855951	0.027	0.9789
TMS	1	0.009825349	0.077922	0.126	0.8999
KNWPOOL	1	0.10883531	0.08704853	1.250	0.2134
JBASPCT	1	0.16863194	0.09957095	1.694	0.0927
USEXPCT	1	-0.0941207	0.14167540	-0.664	0.5076
SUPPCNT	1	0.35987358	0.12339455	2.916	0.0042
HUMINTR	1	0.03625467	0.10860105	0.334	0.7390
INFNVND	1	-0.141185	0.15511862	-0.910	0.3644

VARIABLE	DF	TOLERANCE	VARIANCE INFLATION
INTERCEP	1	.	0
QGS	1	0.65855714	1.51847113
TRAIN	1	0.49873736	2.00506333
USINVLV	1	0.61259333	1.63240432
TMS	1	0.76106062	1.31395577
KNWPOOL	1	0.64230578	1.55689087
JBASPCT	1	0.70807849	1.41227282
USEXPCT	1	0.52295015	1.91222817
SUPPCNT	1	0.69257540	1.44388612
HUMINTR	1	0.72500204	1.37930646
INFNVND	1	0.86387243	1.15757833

SUM OF RESIDUALS -3.37508E-14
SUM OF SQUARED RESIDUALS 2364.424

DURBIN-WATSON D 2.182
(FOR NUMBER OF OBS.) 141
1ST ORDER AUTOCORRELATION -0.092

On examining this output several issues can be addressed. First, the full model F statistic (Prob>F) exhibits that, overall, every independent variable is contributing to the model. But, at this point, the real significance of each variable cannot be determined. For example, at an alpha of 0.05, and in the presence of all the other IVs, SUPPCNT (Support Center), with a PROB > |T| of 0.0042, appears to be insignificant as a predictor of user satisfaction. The actual significance of each variable is more thoroughly tested in the stepwise regression procedures presented later. Secondly, there doesn't appear to be any multicollinearity based on the VIF and TOL output. The VIF determines how much the variance is inflating the explained variation on the dependent variable user satisfaction. Similarly, the TOL measures the absence or

presence of collinearity. As long as the VIF < 5.0 and the TOL > 0.2 there isn't any multicollinearity; this appears to be the case. Finally, the Durbin-Watson (DW) statistic shows that, on consulting the DW table, 2 < DW < 4-du which equates to 2 < 2.182 < 4-1.78(2.22). This allows acceptance of the null hypothesis supporting that the IVs are independent of each other.

Having established the validity of the full model, the SAS stepwise, forward, and backward regression procedures are used to further analyze the IVs as predictors of user satisfaction. The SAS regression program and full output can be examined in appendix B. Only excerpts of the final outputs are presented here to summarize the results. The stepwise regression results are presented first.

In the stepwise procedure an IV is entered into the model based on if its PROB > F remains at or below a value of 0.15. If, through any iteration, this number goes above the 0.15 value the IV is removed. This creates a model of only the most statistically significant IVs. Table VIII is a summary of this process.

Table VIII
Stepwise Regression Procedure Summary

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)
1	SUPPCNT		1	0.1804	0.1804	12.6519
2	JBASPCT		2	0.0535	0.2339	4.8851
3	TRAIN		3	0.0345	0.2684	0.5839

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F	PROB>F
1	SUPPCNT		30.5993	0.0001
2	JBASPCT		9.6351	0.0023
3	TRAIN		6.4623	0.0121

The stepwise procedure resulted in three variables being chosen as the most important predictors of user satisfaction, SUPPCNT (Support Center); JBASPCT (Job Aspects); and TRAIN (Training). All three variables remain in the model as significant contributors to the model.

The forward regression procedure is presented next and delivers somewhat differing results. This is not unexpected for the criterion significance level is higher at a value of 0.5 and once an IV is entered it cannot be removed. A summary of these results are illustrated in Table IX.

Table IX
Summary of Forward Regression Procedure

STEP	VARIABLE ENTERED	NUM IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	SUPPCNT	1	0.1804	0.1804	12.65	30.59	0.0001
2	JBASPCT	2	0.0535	0.2339	4.88	9.63	0.0023
3	TRAIN	3	0.0345	0.2684	0.58	6.46	0.0121
4	KNWPOOL	4	0.0109	0.2793	0.59	2.05	0.1541
5	INFNVND	5	0.0042	0.2835	1.82	0.79	0.3739

As one can see, in addition to the three IVs extracted by the stepwise procedure, KNWPOOL (Knowledge Pool) and INFNVND (Information Environment/Needs) were also included as significant contributors to the model. This is not a surprise given the entry criterion and the resulting F-statistics.

Finally, the model is run through the backward regression procedure. This procedure is different from the other two for, rather than IVs being entered into the model, it begins by including the full model and subsequently eliminating IVs. The algorithm checks each variable one at a time for its contribution to the overall F-statistic and removes them based on PROB > F being less than or equal to 0.1. The summary of this procedure follows in Table X.

Table X
Summary of Backward Regression Procedure

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.55218354				
TRAIN	0.16095676	0.06331615	114.60537844	6.46	0.0121
JBASPCT	0.22662879	0.08852944	116.21717209	6.55	0.0116
SUPPCNT	0.35867550	0.11813017	163.49233115	9.22	0.0029

This procedure chose the same three IVs as the stepwise procedure. This isn't merely a coincidence given the significance levels are close to the same value. These results reinforce the use of these three IVs as predictors of user satisfaction.

Given the outcomes of the regression procedures, four independent variables are chosen as possible predictors of of user satisfaction. They are: TRAIN (Training); JBASPCT (Job Aspects); SUPPCNT (Support Center); and KNWPOOL (Knowledge Pool). All four IVs are significant contributors to the model and are analyzed further by testing their reliability.

The reliability of each IV is tested using the Spearman-Brown Prophecy Formula. The equation is:

$$rtt = \frac{2rhh}{1+rhh} \qquad (1)$$

where rhh stands for the self-correlation of a half-test and rtt is the reliability of the total test.

This test determines the reliability of an IV based on a correlation of its halves. Specifically, each IV being

tested is correlated to itself by splitting its' survey statements in half and correlating the halves. This is accomplished by using the proc corr SAS procedure which generates Pearson Correlation Coefficients for each IV half. The Pearson Correlation Coefficient is used in place of the rhh in equation 1 to determine the level of IV reliability. The closer the rtt is to one, the more reliable the IV. In this case, an rtt of 0.5 or greater is considered sufficient. Appendix C shows the complete output for all the IVs. Only the results from the IVs in question and the dependent variable are illustrated in Table XI.

Table XI
Reliability Analysis Results

	TRAIN1	TRAIN2
TRAIN1	1.00000	0.45797
	0.0000	0.0001
TRAIN2	0.45797	1.00000
	0.0001	0.0000

rtt (TRAIN) = 0.6282

	KNWPOOL1	KNWPOOL2
KNWPOOL1	1.00000	0.62360
	0.0000	0.0001
KNWPOOL2	0.62360	1.00000
	0.0001	0.0000

rtt (KNWPOOL) = 0.7682

	JBASPCT1	JBASPCT2
JBASPCT1	1.00000	0.15251
	0.0000	0.0710
JBASPCT2	0.15251	1.00000
	0.0710	0.0000

rtt (JBASPCT) = 0.2647

	SUPPCNT1	SUPPCNT2
SUPPCNT1	1.00000	0.70306
	0.0000	0.0001
SUPPCNT2	0.70306	1.00000
	0.0001	0.0000

rtt (SUPPCNT) = 0.8256

	USERSAT1	USERSAT2
USERSAT1	1.00000	0.38991
	0.0000	0.0001
USERSAT2	0.38991	1.00000
	0.0001	0.0000

rtt (USERSAT) = 0.5611

As illustrated in Table XI, all the variables except for JBASPCT have an acceptable level of reliability. Based on these results, additional testing of the IV JBASPCT is conducted to determine why it appears unreliable.

To accomplish this, each survey statement relating to the IV JBASPCT is correlated individually. Using the same SAS procedure the results are exhibited in Table XII.

Table XII
Summary of JBASPCT Individual Statement Correlation

	JBASPCT1	JBASPCT2	JBASPCT3	JBASPCT4	JBASPCT5
JBASPCT1	1.00000	0.04881	0.19326	-0.06863	0.37345
	0.0000	0.5654	0.0217	0.4187	0.0001
JBASPCT2	0.04881	1.00000	0.48935	-0.06481	0.04671
	0.5654	0.0000	0.0001	0.4451	0.5823
JBASPCT3	0.19326	0.48935	1.00000	-0.08630	0.10902
	0.0217	0.0001	0.0000	0.3089	0.1981
JBASPCT4	-0.06863	-0.06481	-0.08630	1.00000	-0.05981
	0.4187	0.4451	0.3089	0.0000	0.4811
JBASPCT5	0.37345	0.04671	0.10902	-0.05981	1.00000
	0.0001	0.5823	0.1981	0.4811	0.0000

Each statement numbered 43-47 from the survey corresponds to JBASPCT1-JBASPCT5 respectively. On examining these results, JBASPCT4 (statement 46) is negatively correlated with every other statement. This means that the survey respondents probably didn't understand the statement rendering it invalid. Thus this statement is removed from the reliability analysis and a new analysis is performed. The results of the new analysis is shown in Table XIII.

Table XIII
JBASPCT Reliability Analysis

	JBASPCT1	JBASPCT2
JBASPCT1	1.00000	0.47030
	0.0000	0.0001

rtt = 0.6397

With statement 46 removed the JBASPCT independent variable reaches an acceptable level of reliability. Therefore, statement 46 is considered invalid.

Findings

The data analysis found four independent variables that significantly contribute to the model. Specifically, the model is depicted as User Satisfaction = Job Aspects + Training + Knowledge Pool + Support Center (USERSAT = JBASPCT + TRAIN + KNWPOOL + SUPPCNT). A graphic representation of the final model is depicted in Figure 2.

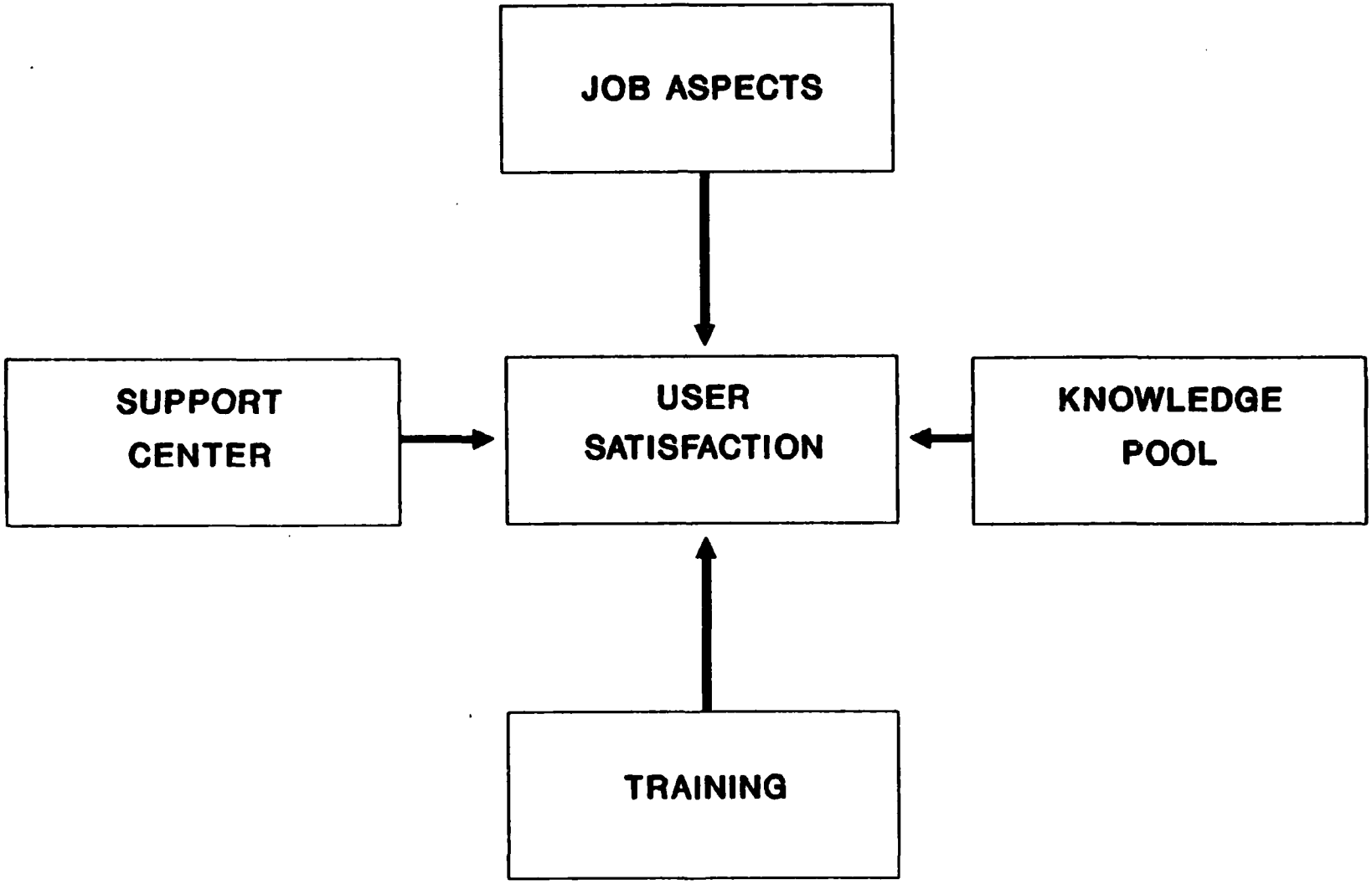

Figure 2. Final Implementation Model

These results are similar to Norcia's research in only one area, Job Aspects. This independent variable, as noted in the literature review, is similar to his Expectancy variable which he identifies as considering job composition and the structure of the organization. This study found no support for his other variables, Communication and Efficiency/Effectiveness.

Two reasons for these differences can be inferred from this research. First, Norcia's study uses a convenience sample which can't be applied to a larger sample much less a population. This study uses a much larger sample. Second, Norcia's independent variables are more general in definition perhaps encompassing several variables of this study. Although possible, both of these reasons are simply assumptions on the part of this study and by no means should be considered fact. But the findings of this research do have their own implications which are discussed in the next chapter.

V. Conclusions and Recommendations

Conclusions

Managing the organizational change that comes with computer based information system implementation is an important concept in ensuring successful implementation. This research explores and presents factors that are important to consider when confronted with such an implementation effort. Specifically, this study presents variables to address when user satisfaction is the desired end result. Ten variables are obtained from the literature and tested to ascertain their value as predictors of user satisfaction. Out of these ten variables four emerged as significant predictors of user satisfaction. They are, Training; Job Aspects; Knowledge Pool; and Support Center. These variables each contain their own implications for the IS practitioner. So, in the following text, each variable and their implications are described in more detail.

Training. This research shows that end users find the proper amount of training to be important to their satisfaction. So, when implementing an IS, one must ensure end users receive the appropriate amount of education and training. This must not only include initial training about system operations but continuing education as well. Without it, users become dissatisfied and the IS is prone to fall into disuse.

Job Aspects. Aspects of the job also surfaces as a significant consideration when implementing an IS. Users feel that more job autonomy makes it easier for them to accept new innovations. Also, users are more satisfied with an IS that increases their job variety. This concept supports the current trend of many organizations evolving toward a more process-oriented nature. Organizations are establishing work teams with more autonomy, skill variety, and task identity. This gives the operational worker more decision making authority as well as more direct communication with top management. So by taking into account the aspects of the user's job one may have to consider allowing for some changes to enhance implementation success.

Knowledge Pool. This variable takes into consideration the availability of professionals and technical experts who belong to and work closely with a user's organization. The concept is, if this knowledge pool exists and end users can talk and consult with them (formally or informally), the users are more satisfied. The advantage that this knowledge pool has over outside consultants is they are intimate with the organization and can better associate business objectives with the IS implementation. They have the capability of helping end users better understand the importance and applicability the IS has in improving daily operations.

Support Center. This variable showed the greatest level of significance out of the four. This IV reflects that, of those surveyed, end users feel having a permanent information system support center is most important to their satisfaction. This isn't surprising for, typically, most Air Force organizations cannot boast having a permanent function that provides IS assistance directly within their functional organization. The fact that this concept received so much attention implies that it requires further study. End users are expressing a desire to have IS support internal to their functional organization.

Recommendations

This research furnishes an empirically supported comprehensive model for predicting user satisfaction with IS implementation. Although the results sound rather conclusive, one should take them with some reservations. Each implementation effort will and should vary in focus from organization to organization. But a lot of the concepts are the same and this research attempts to generalize across most of them. Therefore, the greatest value of this model is mostly as a point of departure. Hopefully, it can be modified in some way to benefit most any organizational situation. Further research should be conducted to create a more solid foundation for ensuring end user satisfaction.

The existing data can be manipulated further through a factor analysis. This test would examine the variables for their forecasting efficiency in predicting any measurable aspect of daily living. In other words, reexamine the reliability of the variables.

Another recommendation is to expand the survey sample population to the civilian sector. This would add value to the model in its potential for generalizability to most any organization.

Finally, further research can be done regarding the possible development and establishment of Air Force IS support centers. Since this variable emerged as being most significant, end users must feel a need for this kind of support.

Appendix A: Information Systems Survey

GENERAL INFORMATION

The purpose of this questionnaire is to obtain information concerning your experiences and feelings about the quality of computer-based information systems (IS) you use in your work. Specifically, we are trying to determine which attributes of information systems the user considers most important.

All the information you provide will be held in strictest confidence. Your individual responses will NOT be provided to management or to any other agency. Study results will be presented to management only in terms of group averages describing what the "typical" employee would say. In addition, when the results of this study are published, readers will NOT be able to identify specific individuals or groups.

Thank you for your cooperation in participating in this study. If you have any questions, please contact the researcher at the following address:

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KEYWORDS

The following keywords will be used throughout the questionnaire.

1. User Satisfaction: The extent to which users believe the information system available to them meets their information requirements. These requirements may encompass both the information provided (i.e., useful data) and the quality of the information system that provides it to the user.

2. Information System: A computer-based system used to support operations, management, analysis, and decision-making applications within an organization.

3. Implementation: The process by which an information system is introduced into an organization. This may include stating needs, influencing design, reviewing prototypes, and beginning to use a new information system in your office or job.

INSTRUCTIONS

This questionnaire contains 70 individual "questions" and should require about 20 minutes to complete. Record your answers by filling the appropriate spaces on the machine-scored answer sheets provided. If for any item you do not find an answer that fits your situation exactly, use the one that is closest to the way you feel. There are no right or wrong answers.

Please use a "soft-lead" (No. 2) pencil, and observe the following:

1. Make heavy black marks that fill the space of the answer you select.

2. Erase cleanly any answers you wish to change.

3. Make no stray markings of any kind on the answer sheet.

4. Do not staple, fold or tear the answer sheet.

DO NOT fill in your name or social security number on the answer sheet. This way your answers will be anonymous.

Answer questionnaire items by marking the appropriate space on the answer sheet as in the following example:

SCALE:

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

Sample Item 1:

Implementing a good information system requires that I receive proper training before and during its implementation.

(If you 'moderately agree' with the statement, you would 'blacken in' the corresponding number of that statement (moderately agree = 6) on the answer sheet for the item numbered 'sample item 1.')

Sample answer: 1 2 3 4 5 6 7

Please take your time and answer freely as to your personal feelings and experience. A valid survey adds to research that will potentially help improve your next IS implementation. If you have any questions, feel free to talk with the person administering the questionnaire.

BACKGROUND INFORMATION

What is your functional office symbol? _____

How long have you been using some kind of information system? (Circle One)

A. 1-2 years
B. 2-3 years
C. 4-5 years
D. 5+ years

What role does your information system play in your job? (Circle One)

A. Major
B. Minor

I have had training on my particular information system within the last: (Circle One)

A. 1-2 years
B. 2-3 years
C. 4-5 years
D. 5+ years

My information system is: (Circle One)

A. Batch
B. Online
C. Unsure

QUALITY OF GOAL SETTING

The following statements explore the importance of information system goals and if these goals are in line with organizational goals. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

1. I think it is important to establish information system implementation goals.

2. I understand the goals for which my new information systems are being designed.

3. I am more committed to an information system development that is linked to meeting specific organizational objectives.

4. The more information system goals differ from my organizational goals, the less satisfied I am with the information system.

5. I am more satisfied with an information system that is linked to my organizational objectives.

6. I don't need to know how the goals of my information system match those of my organization.

7. I have a good understanding about where we're headed in terms of information systems in my organization.

8. There is no need to define detailed objectives for information system projects.

9. I feel that the information systems we are currently implementing will meet my requirements when they are ultimately completed.

TRAINING

This section deals with your feelings concerning information system education and training. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

10. I need to understand computer technology in general to participate effectively in implementing information systems.

11. After receiving training, I have been able to operate my information system with minimal difficulty.

12. Information systems should be simple and straightforward in both design and function so as to make training unnecessary.

13. Orientation sessions to prepare users for information system implementation are necessary.

14. Continuing education and training after implementation increases my level of satisfaction with an information system.

15. Initial education and training increases my level of satisfaction with an information system.

16. Before implementation, I should understand why an information system is being introduced and how the project will affect me during and after implementation.

17. I don't need to understand the system until it is up and running.

18. I feel the training that I have received on my information system has been sufficient to meet my needs.

19. I am more committed to using an information system when training shows how the system meets my job requirements.

20. Inadequate training on an information system leads to problems such as misuse and underutilization of the system.

USER INVOLVEMENT

This section contains statements concerning how important it is to you to participate in information system implementation. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

21. I have actively participated in implementing our information system.

22. I feel more satisfied with an information system I was involved in implementing.

23. When I participate in information system implementation, the resulting system better meets the needs of my job.

24. The success of an information system doesn't depend on whether I'm involved in implementing or not.

25. During implementation, the system developer has the responsibility for solving problems.

26. The system developer should do the lion's share of the data gathering needed to pin down the requirements for an information system project.

27. I'm more satisfied when a system developer really tries to see things my way.

28. When major system changes or new systems are planned, people from the user community should participate equally with system specialists on a design task force.

29. I have not actively participated, but other people in my office have been directly involved.

30. I should be kept thoroughly informed about an information system throughout development.

TOP MANAGEMENT SUPPORT

The following items deal with your feelings about top management supporting the information system implementation. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

31. I think that the successful implementation of an information system depends largely on the leadership, support, and coordination provided by managers.

32. My topline managers have supported information systems being introduced into my organization.

33. I feel more confident about an information system that is supported by top management.

34. I am more satisfied with an information system that receives top management support.

35. Top management involvement in information systems implementation does not affect implementation success.

36. In evaluating an information system, management should be interested in different measures from the ones users consider.

37. Top management stays aware of the information systems we use and understands what we need to do our jobs in this organization.

KNOWLEDGE POOL

Sometimes there are people who belong to and work closely with your organization who are information system professionals or possess a high level of knowledge concerning information systems. This section of the questionnaire considers how available these professionals and technical experts are to you within your organization. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

38. Organizations need a broad technological knowledge base to support the exchange of ideas, techniques, and procedures affecting the introduction of an information system.

39. The greater the number of information system specialists, the more easily new technical ideas can be implemented.

40. I am more satisfied with an information system that is implemented by experts internal to my organization.

41. My organization has technical experts available who understand both our work and the capabilities provided by modern information systems technologies.

42. The people from our office who are directly involved in developing information systems are highly knowledgeable about the work I do and the information I need to do my job.

JOB ASPECTS

This section contains a number of statements that relate to your feelings concerning how aspects of your job affect satisfaction with information system implementation. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

43. Having control and responsibility for my job increases my willingness to accept new innovations.

44. If I see something wrong in my information system, I feel I can get it fixed easily and quickly.

45. I know who to call for help with our information system.

46. Aspects of my job have nothing to do with my satisfaction with an information system.

47. I am more satisfied with an information system that leads to greater job variety.

USER EXPECTATIONS

These statements refer to how well your expectations of the information system match with what was actually implemented. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

48. The information system in our office is meeting the requirements we defined prior to development.

49. I dislike or am dissatisfied with an information system that doesn't perform to the level promised.

50. I am satisfied with an information system when it performs as expected.

51. It's important that I know the benefits and performance capabilities of an information system prior to implementation.

52. The information system installed in my office has given me new ideas about how to do my job better, cheaper, and faster.

53. After using our information system for a while, I often come up with additional requirements I hadn't thought of before.

SUPPORT CENTER

A system support department is a permanent function that provides information system assistance directly within a functional organization. This section solicits your feelings on how important a system support department is after implementation of the IS. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

54. I think a permanent system support department for developing and maintaining the information system is important.

55. It's important that expert help be readily available in operating an information system.

56. I feel that a system support department is a waste of resources.

57. I'm more satisfied with an information system when I have available a system support department where I can get the help I need to work with the system.

58. A system support department is important for handling any problems that arise after the system is installed.

HUMAN INTERFACE

This section examines how you perceive the importance of the people/system interaction. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

59. My terminal is easy to use and the user's manual meets my needs.

60. I am more satisfied with an information system that is easy to use and easy to understand.

61. The technical documentation for my information system is easy to use and helps me understand the systems I use in my work.

62. I don't care how the screen looks or what keys I have to push as long as it gets the job done.

63. I think that my information system should be flexible enough so I can be free to alter certain aspects of it to better suit my needs.

INFORMATION ENVIRONMENT/NEEDS

This final section deals with your feelings about how much importance you place on the amount and quality of information flow through the system. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

64. There seems to be too much useless data in my organization's information system.

65. We have more information requirements in our office than our information system is meant to provide.

66. Information systems provide too much data and not enough information in an easily usable form.

67. I am more satisfied with an information system that meets my information needs while not overwhelming me with too much information.

68. The layout or format of an information systems output means nothing to me as long as I can understand it.

69. The information system I use has high quality data that is accurate and up to date.

70. Our information system helps me do my job in less time or with less overall cost.

INFORMATION ENVIRONMENT/NEEDS

This final section deals with your feelings about how much importance you place on the amount and quality of information flow through the system. Use the rating scale given below to indicate the extent to which you agree or disagree with the statements below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

64. There seems to be too much useless data in my organization's information system.

65. We have more information requirements in our office than our information system is meant to provide.

66. Information systems provide too much data and not enough information in an easily usable form.

67. I am more satisfied with an information system that meets my information needs while not overwhelming me with too much information.

68. The layout or format of an information systems output means nothing to me as long as I can understand it.

69. The information system I use has high quality data that is accurate and up to date.

70. Our information system helps me do my job in less time or with less overall cost.

DEP VARIABLE: USERSAT

ANALYSIS OF VARIANCE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	10	956.61143842	95.66114384	5.260	0.0001
ERROR	130	2364.42402	18.18787710		
C TOTAL	140	3321.03546			

ROOT MSE	4.264725	R-SQUARE	0.2880
DEP MEAN	33.20567	ADJ R-SQ	0.2333
C.V.	12.84336		

PARAMETER ESTIMATES

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR H0: PARAMETER=0	PROB>|T|
INTERCEP	1	8.14682479	4.51050279	1.806	0.0732
QGS	1	0.04126132	0.08904347	0.463	0.6439
TRAIN	1	0.14681043	0.07726061	1.900	0.0596
USINVLV	1	0.001820199	0.06855951	0.027	0.9789
TMS	1	0.009825349	0.077922	0.126	0.8999
KNWPOOL	1	0.10883531	0.08704853	1.250	0.2134
JBASPCT	1	0.16863194	0.09957095	1.694	0.0927
USEXPCT	1	-0.0941207	0.14167540	-0.664	0.5076
SUPPCNT	1	0.35987358	0.12339455	2.916	0.0042
HUMINTR	1	0.03625467	0.10860105	0.334	0.7390
INFNVND	1	-0.141185	0.15511862	-0.910	0.3644

VARIABLE	DF	TOLERANCE	VARIANCE INFLATION
INTERCEP	1	.	0
QGS	1	0.65855714	1.51847113
TRAIN	1	0.49873736	2.00506333
USINVLV	1	0.61259333	1.63240432
TMS	1	0.76106062	1.31395577
KNWPOOL	1	0.64230578	1.55689087
JBASPCT	1	0.70807849	1.41227282
USEXPCT	1	0.52295015	1.91222817
SUPPCNT	1	0.69257540	1.44388612
HUMINTR	1	0.72500204	1.37930646
INFNVND	1	0.86387243	1.15757833

SUM OF RESIDUALS -3.37508E-14
SUM OF SQUARED RESIDUALS 2364.424

DURBIN-WATSON D	2.182
(FOR NUMBER OF OBS.)	141
1ST ORDER AUTOCORRELATION	-0.092

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE USERSAT

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE SUPPCNT ENTERED R SQUARE = 0.18042134
C(P) = 12.65186780

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	599.18568222	599.18568222	30.60	0.0001
ERROR	139	2721.84977877	19.58165308		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	17.42530881				
SUPPCNT	0.58941231	0.10655238	599.18568222	30.6	0.0001

BOUNDS ON CONDITION NUMBER: 1, 1

STEP 2 VARIABLE JBASPCT ENTERED R SQUARE = 0.23390966
C(P) = 4.88510932

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	776.82228511	388.41114255	21.07	0.0001
ERROR	138	2544.21317588	18.43632736		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	13.28692779				
JBASPCT	0.27392785	0.08824846	177.63660289	9.64	0.0023
SUPPCNT	0.49081031	0.10815916	379.64279887	20.59	0.0001

BOUNDS ON CONDITION NUMBER: 1.094398, 4.377591

STEP 3 VARIABLE TRAIN ENTERED R SQUARE = 0.26841859
C(P) = 0.58391331

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	891.42766355	297.14255452	16.76	0.0001
ERROR	137	2429.60779744	17.73436348		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.55218354				
TRAIN	0.16095676	0.06331615	114.60537844	6.46	0.0121
JBASPCT	0.22662879	0.08852944	116.21717209	6.55	0.0116
SUPPCNT	0.35867550	0.11813017	163.49233115	9.22	0.0029

BOUNDS ON CONDITION NUMBER: 1.381043, 11.64951

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE USERSAT

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)
1	SUPPCNT		1	0.1804	0.1804	12.6519
2	JBASPCT		2	0.0535	0.2339	4.8851
3	TRAIN		3	0.0345	0.2684	0.5839

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F	PROB>F
1	SUPPCNT		30.5993	0.0001
2	JBASPCT		9.6351	0.0023
3	TRAIN		6.4623	0.0121

FORWARD SELECTION PROCEDURE FOR DEPENDENT VARIABLE USERSAT

STEP 1 VARIABLE SUPPCNT ENTERED R SQUARE = 0.18042134
C(P) = 12.65186780

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	599.18568222	599.18568222	30.60	0.0001
ERROR	139	2721.84977877	19.58165308		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	17.42530881				
SUPPCNT	0.58941231	0.10655238	599.18568222	30.60	0.0001

BOUNDS ON CONDITION NUMBER: 1, 1

STEP 2 VARIABLE JBASPCT ENTERED R SQUARE = 0.23390966
C(P) = 4.88510932

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	776.82228511	388.41114255	21.07	0.0001
ERROR	138	2544.21317588	18.43632736		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	13.28692779				
JBASPCT	0.27392785	0.08824846	177.63660289	9.64	0.0023
SUPPCNT	0.49081031	0.10815916	379.64279887	20.59	0.0001

BOUNDS ON CONDITION NUMBER: 1.094398, 4.377591

STEP 3 VARIABLE TRAIN ENTERED R SQUARE = 0.26841859
C(P) = 0.58391331

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	891.42766355	297.14255452	16.76	0.0001
ERROR	137	2429.60779744	17.73436348		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.55218354				
TRAIN	0.16095676	0.06331615	114.60537844	6.46	0.0121
JBASPCT	0.22662879	0.08852944	116.21717209	6.55	0.0116
SUPPCNT	0.35867550	0.11813017	163.49233115	9.22	0.0029

BOUNDS ON CONDITION NUMBER: 1.381043, 11.64951

STEP 4 VARIABLE KNWPOOL ENTERED R SQUARE = 0.27930303
C(P) = 0.59645803

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	927.57525591	231.89381398	13.18	0.0001
ERROR	136	2393.46020508	17.59897210		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.81643420				
TRAIN	0.14145196	0.06452558	84.57487639	4.81	0.0301
KNWPOOL	0.10695870	0.07463114	36.14759237	2.05	0.1541
JBASPCT	0.19603612	0.09073747	82.14594577	4.67	0.0325
SUPPCNT	0.35548275	0.11769946	160.53710099	9.12	0.0030

BOUNDS ON CONDITION NUMBER: 1.445341, 20.79089

STEP 5 VARIABLE INFNVND ENTERED R SQUARE = 0.28352742
C(P) = 1.82510015

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	941.60461821	188.32092364	10.68	0.0001
ERROR	135	2379.43084278	17.62541365		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.83346865				
TRAIN	0.15016264	0.06530797	93.18172273	5.29	0.0230
KNWPOOL	0.10544127	0.07470655	35.11099817	1.99	0.1604
JBASPCT	0.18181764	0.09219352	68.55049172	3.89	0.0506
SUPPCNT	0.34541242	0.11832744	150.19113813	8.52	0.0041
INFNVND	-0.13006031	0.14577918	14.02936230	0.80	0.3739

BOUNDS ON CONDITION NUMBER: 1.478383, 31.68093

NO OTHER VARIABLES MET THE 0.5000 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SUMMARY OF FORWARD SELECTION PROCEDURE FOR DEPENDENT VARIABLE USERSAT

STEP	VARIABLE ENTERED	NUM IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	SUPPCNT	1	0.1804	0.1804	12.65	30.59	0.0001
2	JBASPCT	2	0.0535	0.2339	4.88	9.63	0.0023
3	TRAIN	3	0.0345	0.2684	0.58	6.46	0.0121
4	KNWPOOL	4	0.0109	0.2793	0.59	2.05	0.1541
5	INFNVND	5	0.0042	0.2835	1.82	0.79	0.3739

BACKWARD ELIMINATION PROCEDURE FOR DEPENDENT VARIABLE USERSAT

STEP 0 ALL VARIABLES ENTERED R SQUARE = 0.28804614
C(P) = 11.00000000

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	10	956.61143842	95.66114384	5.26	0.0001
ERROR	130	2364.42402257	18.18787710		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.14682479				
QGS	0.04126132	0.08904347	3.90538759	0.21	0.6439
TRAIN	0.14681043	0.07726061	65.67189918	3.61	0.0596
USINVLV	0.00182020	0.06855951	0.01281990	0.00	0.9789
TMS	0.00982535	0.07792200	0.28917303	0.02	0.8999
KNWPOOL	0.10883531	0.08704853	28.43143632	1.56	0.2134
JBASPCT	0.16863194	0.09957095	52.16706139	2.87	0.0927
USEXPCT	-0.09412072	0.14167540	8.02719105	0.44	0.5076
SUPPCNT	0.35987358	0.12339455	154.69989475	8.51	0.0042
HUMINTR	0.03625467	0.10860105	2.02694404	0.11	0.7390
INFNVND	-0.14118453	0.15511862	15.06705569	0.83	0.3644

BOUNDS ON CONDITION NUMBER: 2.005063, 153.3206

STEP 1 VARIABLE USINVLV REMOVED R SQUARE = 0.28804228
C(P) = 9.00070486

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	9	956.59861852	106.28873539	5.89	0.0001
ERROR	131	2364.43684247	18.04913620		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.17863113				
QGS	0.04119903	0.08867240	3.89631042	0.22	0.6430
TRAIN	0.14727972	0.07492404	69.74288103	3.86	0.0514
TMS	0.01002895	0.07724740	0.30422806	0.02	0.8969
KNWPOOL	0.10890622	0.08667506	28.49531693	1.58	0.2112
JBASPCT	0.16827268	0.09827018	52.92246786	2.93	0.0892
USEXPCT	-0.09283482	0.13263017	8.84287531	0.49	0.4852
SUPPCNT	0.36023374	0.12217789	156.90616105	8.69	0.0038
HUMINTR	0.03614315	0.10810509	2.01751169	0.11	0.7387
INFNVND	-0.14198492	0.15157940	15.83654763	0.88	0.3506

BOUNDS ON CONDITION NUMBER: 1.900115, 119.3998

STEP 2 VARIABLE TMS REMOVED R SQUARE = 0.28795067
C(P) = 7.01743183

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	8	956.29439047	119.53679881	6.67	0.0001
ERROR	132	2364.74107053	17.91470508		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.32669742				
QGS	0.04197683	0.08813971	4.06336470	0.23	0.6347
TRAIN	0.14785932	0.07451188	70.54334079	3.94	0.0493
KNWPOOL	0.11278923	0.08104779	34.69464989	1.94	0.1664
JBASPCT	0.16958402	0.09738501	54.32444007	3.03	0.0839
USEXPCT	-0.09256772	0.13211944	8.79418049	0.49	0.4848
SUPPCNT	0.36034193	0.12171921	157.00772320	8.76	0.0036
HUMINTR	0.03523869	0.10747789	1.92579924	0.11	0.7435
INFNVND	-0.14253668	0.15095449	15.97242654	0.89	0.3468

BOUNDS ON CONDITION NUMBER: 1.893369, 93.95856

STEP 3 VARIABLE HUMINTR REMOVED R SQUARE = 0.28737079
C(P) = 5.12331550

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	7	954.36859123	136.33837018	7.66	0.0001
ERROR	133	2366.66686976	17.79448774		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.46664636				
QGS	0.04570032	0.08711125	4.89751253	0.28	0.6007
TRAIN	0.15189788	0.07323973	76.54123162	4.30	0.0400
KNWPOOL	0.11652813	0.07997184	37.78095665	2.12	0.1474
JBASPCT	0.17850778	0.09319004	65.29212662	3.67	0.0576
USEXPCT	-0.09645363	0.13114451	9.62548172	0.54	0.4633
SUPPCNT	0.36266822	0.12110385	159.58373397	8.97	0.0033
INFNVND	-0.14187544	0.15043371	15.82740073	0.89	0.3473

BOUNDS ON CONDITION NUMBER: 1.841627, 71.00512

STEP 4 VARIABLE QGS REMOVED R SQUARE = 0.28589610
C(P) = 3.39258896

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	949.47107871	158.24517978	8.94	0.0001
ERROR	134	2371.56438229	17.69824166		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	9.26548155				
TRAIN	0.16460184	0.06893347	100.91115201	5.70	0.0183
KNWPOOL	0.12227396	0.07900378	42.39380086	2.40	0.1241
JBASPCT	0.18363978	0.09242421	69.87022730	3.95	0.0490
USEXPCT	-0.08622757	0.12933662	7.86646050	0.44	0.5061
SUPPCNT	0.36047022	0.12070359	157.84415560	8.92	0.0034
INFNVND	-0.15023674	0.14918197	17.94939135	1.01	0.3157

BOUNDS ON CONDITION NUMBER: 1.640303, 50.19922

STEP 5 VARIABLE USEXPCT REMOVED R SQUARE = 0.28352742
C(P) = 1.82510015

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	941.60461821	188.32092364	10.68	0.0001
ERROR	135	2379.43084278	17.62541365		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.83346865				
TRAIN	0.15016264	0.06530797	93.18172273	5.29	0.0230
KNWPOOL	0.10544127	0.07470655	35.11099817	1.99	0.1604
JBASPCT	0.18181764	0.09219352	68.55049172	3.89	0.0506
SUPPCNT	0.34541242	0.11832744	150.19113813	8.52	0.0041
INFNVND	-0.13006031	0.14577918	14.02936230	0.80	0.3739

BOUNDS ON CONDITION NUMBER: 1.478383, 31.68093

STEP 6 VARIABLE INFNVND REMOVED R SQUARE = 0.27930303
C(P) = 0.59645803

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	927.57525591	231.89381398	13.18	0.0001
ERROR	136	2393.46020508	17.59897210		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	7.81643420				
TRAIN	0.14145196	0.06452558	84.57487639	4.81	0.0301
KNWPOOL	0.10695870	0.07463114	36.14759237	2.05	0.1541
JBASPCT	0.19603612	0.09073747	82.14594577	4.67	0.0325
SUPPCNT	0.35548275	0.11769946	160.53710099	9.12	0.0030

BOUNDS ON CONDITION NUMBER: 1.445341, 20.79089

STEP 7 VARIABLE KNWPOOL REMOVED R SQUARE = 0.26841859
C(P) = 0.58391331

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	891.42766355	297.14255452	16.76	0.0001
ERROR	137	2429.60779744	17.73436348		
TOTAL	140	3321.03546099			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	8.55218354				
TRAIN	0.16095676	0.06331615	114.60537844	6.46	0.0121
JBASPCT	0.22662879	0.08852944	116.21717209	6.55	0.0116
SUPPCNT	0.35867550	0.11813017	163.49233115	9.22	0.0029

BOUNDS ON CONDITION NUMBER: 1.381043, 11.64951

ALL VARIABLES IN THE MODEL ARE SIGNIFICANT AT THE 0.1000 LEVEL.

SUMMARY OF BACKWARD ELIMINATION PROCEDURE FOR DEPENDENT VARIABLE USERSAT

STEP	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	USINVLV	9	0.0000	0.2880	9.0007	0.0007	0.9789
2	TMS	8	0.0001	0.2880	7.0174	0.0169	0.8969
3	HUMINTR	7	0.0006	0.2874	5.1233	0.1075	0.7435
4	QGS	6	0.0015	0.2859	3.3926	0.2752	0.6007
5	USEXPCT	5	0.0024	0.2835	1.8251	0.4445	0.5061
6	INFNVND	4	0.0042	0.2793	0.5965	0.7960	0.3739
7	KNWPOOL	3	0.0109	0.2684	0.5839	2.0540	0.1541

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
USERSAT	141	33.205674	4.8704909	4682.0	19.0	46.0
QGS	141	42.503546	4.9880201	5993.0	28.0	55.0
TRAIN	141	58.666667	6.6059137	8272.0	27.0	69.0
USINVLV	141	48.425532	6.7169658	6828.0	31.0	63.0
TMS	141	32.971631	5.3022142	4649.0	17.0	47.0
KNWPOOL	141	25.453901	5.1664787	3589.0	13.0	35.0
JBASPCT	141	24.744681	4.3018339	3489.0	5.0	34.0
USEXPCT	141	23.439716	3.5180530	3305.0	10.0	28.0
SUPPCNT	141	26.773050	3.5099223	3775.0	5.0	35.0
HUMINTR	141	23.460993	3.8978341	3308.0	14.0	33.0
INFNVND	141	6.673759	2.4999899	941.0	2.0	14.0

Appendix C: SAS Correlation Program

```
options linesize=78;

data one;
infile THESIS;
input @1

     Q1 1 Q2 2 Q3 3 Q4 4 Q5 5 Q6 6 Q7 7 Q8 8 Q9 9 Q10 10
     Q11 11 Q12 12 Q13 13 Q14 14 Q15 15 Q16 16 Q17 17 Q18
     18 Q19 19 Q20 20 Q21 21 Q22 22 Q23 23 Q24 24 Q25 25
     Q26 26 Q27 27 Q28 28 Q29 29 Q30 30 Q31 31 Q32 32 Q33
     33 Q34 34 Q35 35 Q36 36 Q37 37 Q38 38 Q39 39 Q40 40
     Q41 41 Q42 42 Q43 43 Q44 44 Q45 45 Q46 46 Q47 47 Q48
     48 Q49 49 Q50 50 Q51 51 Q52 52 Q53 53 Q54 54 Q55 55
     Q56 56 Q57 57 Q58 58 Q59 59 Q60 60 Q61 61 Q62 62 Q63
     63 Q64 64 Q65 65 Q66 66 Q67 67 Q68 68 Q69 69 Q70 70;


     QGS1=Q1+Q3+Q5+Q7+Q9;
     QGS2=Q2+Q4+Q6+Q8;
     TRAIN1=Q11+Q13+Q15+Q17+Q19;
     TRAIN2=Q10+Q12+Q14+Q16+Q18+Q20;
     USINVLV1=Q21+Q23+Q25+Q27+Q29;
     USINVLV2=Q22+Q24+Q26+Q28+Q30;
     TMS1=Q31+Q33+Q35+Q37;
     TMS2=Q32+Q34+Q36;
     KNWPOOL1=Q39+Q41;
     KNWPOOL2=Q38+Q40+Q42;
     JBASPCT1=Q43+Q45+Q47;
     JBASPCT2=Q44+Q46;
     USEXPCT1=Q49+Q51;
     USEXPCT2=Q50+Q53;
     SUPPCNT1=Q55+Q57;
     SUPPCNT2=Q54+Q56+Q58;
     HUMINTR1=Q59+Q61+Q63;
     HUMINTR2=Q60+Q62;
     INFNVND1=Q64;
     INFNVND2=Q68;
     USERSAT1=Q48+Q52+Q66+Q70;
     USERSAT2=Q65+Q67+Q69;

Proc Corr;
     Var QGS1 QGS2;
Proc Corr;
     Var TRAIN1 TRAIN2;
Proc Corr;
     Var USINVLV1 USINVLV2;
Proc Corr;
     Var TMS1 TMS2;
```

```
Proc Corr;
     Var KNWPOOL1 KNWPOOL2;
Proc Corr;
     Var JBASPCT1 JBASPCT2;
Proc Corr;
     Var USEXPCT1 USEXPCT2;
Proc Corr;
     Var SUPPCNT1 SUPPCNT2;
Proc Corr;
     Var HUMINTR1 HUMINTR2;
Proc Corr;
     Var INFNVND1 INFNVND2;
Proc Corr;
     Var USERSAT1 USERSAT2;
```

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
QGS1	141	28.035461	4.2651601	953.0	10.0	35.0
QGS2	141	14.468085	2.8624495	2040.0	9.0	22.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	QGS1	QGS2
QGS1	1.00000	-0.06163
	0.0000	0.4678
QGS2	-0.06163	1.00000
	0.4678	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
TRAIN1	141	25.673759	3.1384629	3620.0	13.0	32.0
TRAIN2	141	32.992908	4.5505046	4652.0	14.0	41.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	TRAIN1	TRAIN2
TRAIN1	1.00000	0.45797
	0.0000	0.0001
TRAIN2	0.45797	1.00000
	0.0001	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
USINVLV1	141	23.652482	4.1472638	3335.0	13.0	34.0
USINVLV2	141	24.773050	3.6962699	3493.0	12.0	34.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	USINVLV1	USINVLV2
USINVLV1	1.00000	0.46497
	0.0000	0.0001
USINVLV2	0.46497	1.00000
	0.0001	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
TMS1	141	18.723404	3.0754939	2640.0	11.0	27.0
TMS2	141	14.248227	3.0918234	2009.0	4.0	21.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	TMS1	TMS2
TMS1	1.00000	0.47826
	0.0000	0.0001
TMS2	0.47826	1.00000
	0.0001	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
KNWPOOL1	141	9.936170	2.5584950	1401.0	3.0	14.0
KNWPOOL2	141	15.517730	3.1681514	2188.0	9.0	21.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	KNWPOOL1	KNWPOOL2
KNWPOOL1	1.00000	0.62360
	0.0000	0.0001
KNWPOOL2	0.62360	1.00000
	0.0001	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
JBASPCT1	141	17.290780	2.8624141	2438.0	3.0	21.0
JBASPCT2	141	7.453901	2.8042702	1051.0	2.0	14.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	JBASPCT1	JBASPCT2
JBASPCT1	1.00000	0.15251
	0.0000	0.0710
JBASPCT2	0.15251	1.00000
	0.0710	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
USEXPCT1	141	11.624113	2.2694839	1639.0	2.0	14.0
USEXPCT2	141	11.815603	1.8189590	1666.0	5.0	14.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
HO:RHO=0 / N = 141

	USEXPCT1	USEXPCT2
USEXPCT1	1.00000	0.47450
	0.0000	0.0001
USEXPCT2	0.47450	1.00000
	0.0001	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
SUPPCNT1	141	12.638298	1.8680647	1782.0	2.0	14.0
SUPPCNT2	141	14.134752	1.9354581	1993.0	3.0	21.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
HO:RHO=0 / N = 141

	SUPPCNT1	SUPPCNT2
SUPPCNT1	1.00000	0.70306
	0.0000	0.0001
SUPPCNT2	0.70306	1.00000
	0.0001	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
HUMINTR1	141	14.248227	3.5539837	2009.0	6.0	21.0
HUMINTR2	141	9.212766	1.7920798	1299.0	6.0	14.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
HO:RHO=0 / N = 141

	HUMINTR1	HUMINTR2
HUMINTR1	1.00000	-0.05097
	0.0000	0.5484
HUMINTR2	-0.05097	1.00000
	0.5484	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
INFNVND1	141	3.5602837	1.7128456	502.0	1.0	7.0
INFNVND2	141	3.1134752	1.7691491	439.0	1.0	7.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	INFNVND1	INFNVND2
INFNVND1	1.00000	0.03073
	0.0000	0.7176
INFNVND2	0.03073	1.00000
	0.7176	0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
USERSAT1	141	18.971631	3.3422475	2675.0	8.0	27.0
USERSAT2	141	14.234043	2.4716631	2007.0	6.0	21.0

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER
H0:RHO=0 / N = 141

	USERSAT1	USERSAT2
USERSAT1	1.00000	0.38991
	0.0000	0.0001
USERSAT2	0.38991	1.00000
	0.0001	0.0000

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Thesis Chairman: Kenneth R. Jennings, Major, USAF
Assistant Professor of Management and Organizational Behavior

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This research evaluates independent variables that, when considered in computer based information system implementation, lead to end user satisfaction. Specifically, it is an empirical test of a previous study which developed a comprehensive model for predicting user satisfaction in IS implementation.

User satisfaction is considered one of the single most significant measures of IS implementation success. For users who are not satisfied with their IS will not use it thus rendering the IS implementation effort a failure. This study reviews the literature for those variables that occur most often as critical elements that must be present for IS users to be satisfied with their system. Then, based on these independent variables, survey end users regarding which variables they feel most strongly contribute to their satisfaction with their IS. These results are then compared with that of the previous study to develop a comprehensive model which could be used to predict user satisfaction in computer based information system (IS) implementation.

The study finds ten independent variables regarded as important predictors of user satisfaction. They are obtained from current literature dealing with IS factors research, organizational change, and user involvement with implementation. The hypothesized model consists of the variables, quality of goal setting; training; user involvement; top management support; knowledge pool; job aspects; user expectations; support center; human interface; and information environment/needs.

The final model specifies four independent variables to be significant predictors of user satisfaction. They are training, knowledge pool, job aspects, and support center. It is recommended that this model be used as a point of departure for predicting user satisfaction in IS implementation. That by considering these aspects of IS implementation, a manager can increase his chances of having a successful information system implementation effort.