System User Perceptions and Enterprise Resource Planning (ERP) Implementation Success: An Exploratory Study

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System User Perceptions and
Enterprise Resource Planning (ERP) Implementation Success:

An Exploratory Study

A Thesis

Presented to the

College of Information Science and Technology

and the

Faculty of the Graduate College

University of Nebraska

In Partial Fulfillment

of the Requirements for the Degree

Masters of Science in Management Information Systems

University of Nebraska at Omaha

by

Shirley R. Shouse

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THESIS ACCEPTANCE

Acceptance for the faculty of the Graduate College,
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University of Nebraska at Omaha

Committee

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Date 7/14/03
System User Perceptions and Enterprise Resource Planning (ERP) Implementation Success:
An Exploratory Study
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University of Nebraska, 2003

Advisor: Dr. Peter Wolcott

The study reports the results of a survey undertaken to verify and quantify the potential relationship between system users' perceptions of the quality and utility of five variables of Enterprise Resource Planning (ERP) implementation that influence ERP implementation success. Based on previous research four of the variables (Organizational Alterations, Training, Key System Users' Involvement, and Project Management) were proposed to positively influence successful ERP implementation. One variable (Technical Alterations) was proposed to negatively influence successful ERP implementation.

Results gleaned from a survey of 56 system users who took part in an ERP implementation at a mid-sized manufacturing concern supported just one of the propositions. Statistical analysis of survey responses supported the assertion that system users' perceptions of the quality and utility of project management efforts positively influences successful ERP implementation. Implications of the negative and positive results are discussed.
Acknowledgements

When they first arose in the late 12th and early 13th centuries, universities organized students and faculty into guild-like communities of scholars known as "nations." This notion of a university as community has always appealed to me for it has been my experience that things of lasting value are rarely created in isolation. I would like, therefore, to take this opportunity to acknowledge the incalculable contributions made by the members of my "nation."

First, I would like to thank the members of my graduate committee who not only challenged me every step of the way to give my very best, but who also gave their very best: Dr. Peter Wolcott, Dr. Deepak Khazanchi, Dr. Philip Craiger, and Dr. Lotfollah Najjar. Next, I want to thank my co-workers and the senior management of Corporate Express Document and Print Management whose candor and encouragement provided me both the access and the information necessary for my study. Then, of course, there was the boundless support and encouragement of my loving husband, Michael, and my children, Jennifer, Andrew and Heather. Finally, I want to acknowledge the most recent addition to my nation, my editor, David Dechant, who rendered my occasionally rambling prose readable.
# Table of Contents

I. INTRODUCTION ............................................................................................................. 1

II. HYPOTHETICAL MODEL .................................................................................................... 7

III. OPERATIONAL DEFINITIONS .............................................................................................. 9
    A. SUCCESSFUL IMPLEMENTATION ...................................................................................... 9
    B. ORGANIZATIONAL ALTERATIONS .................................................................................... 13
    C. TECHNICAL ALTERATIONS ............................................................................................... 16
    D. SYSTEM USER TRAINING .................................................................................................. 20
    E. KEY SYSTEM USERS ........................................................................................................... 21
    F. PROJECT MANAGEMENT ...................................................................................................... 24

IV. METHOD .......................................................................................................................... 27
    A. COOPERATING ORGANIZATION ....................................................................................... 27
    B. PARTICIPANTS AND SAMPLE ........................................................................................... 29
    C. INSTRUMENT ...................................................................................................................... 29
        1. Validity ............................................................................................................................. 30
        2. Reliability .......................................................................................................................... 31
    D. PROCEDURE ....................................................................................................................... 32

V. ANALYSIS OF RESULTS ................................................................................................... 33

VI. HYPOTHESES AND DISCUSSION ....................................................................................... 38
    A. ORGANIZATIONAL ALTERATIONS .................................................................................... 39
    B. TECHNICAL ALTERATIONS ............................................................................................... 41
    C. TRAINING ............................................................................................................................ 42
    D. KEY USERS .......................................................................................................................... 43
    E. PROJECT MANAGEMENT ..................................................................................................... 44

VII. STUDY LIMITATIONS AND IMPLICATIONS ..................................................................... 45
    A. LIMITATIONS ....................................................................................................................... 45
    B. IMPLICATIONS ..................................................................................................................... 46

VIII. CONCLUSION .................................................................................................................. 48

REFERENCES .......................................................................................................................... 50

APPENDIX A: SURVEY INSTRUMENT ..................................................................................... 54

APPENDIX B: SURVEY COVER LETTER ................................................................................. 58

APPENDIX C: ANALYSIS OF RESPONSES BY VARIABLE AND SITE ..................................... 59
I. Introduction

According to Bingi, Sharma, and Godla (1999), business organizations cannot compete successfully in today's fast-paced and highly competitive global economy without the ability to capture and manage information in real time. Within the last ten years, Enterprise Resource Planning (ERP) has emerged as one of the most popular information management tools for securing, storing, tracking, and utilizing business data (Jones, 2003). Unlike traditional, dedicated systems that support individual business functions, ERPs integrate business processes into a unified, flexible, organization-wide structure. Senior managers applaud ERPs for their perceived ability to help firms improve planning, increase scalability, augment productivity, reduce transaction and bureaucratic costs, effectively manage inventories, and enhance customer service, which, in turn, boosts organizational revenues and profits (Eline, 1999; Gill, 1999; Hill, 1998; Soh, Kien, & Tay-Yap, 2000).

Holland and Light (1999) define Enterprise Resource Planning (ERP) as an integrated system capable of automating all aspects of an organization's business processes. ERPs consist of modules linked through a single database that support business functions such as sales, finance, planning, distribution, manufacturing, human resources, and materials management (Bingi, Sharma, & Godla, 1999). The obvious advantage of such a system, according to Mousseau (1998), is that it creates a centralized repository with the potential for increased business data accuracy and availability. Yet, as Al-Mudinigh and his associates (2001) note, what makes ERPs novel is their underlying information management strategy. Unlike earlier, stand-alone, dedicated
systems that support individual functional processes (e.g., sales, accounting, production, etc), ERPs are built around business processes that traverse traditional functional boundaries, creating a more integrated system. Such systems offer management the control and employees the flexibility needed to compete in an increasingly complex, dynamic, and competitive global economy.

Anecdotal evidence supports the contentions of many senior managers that ERPs are worth the time and expense of implementation. Burnell (1999), for example, reports that one firm witnessed a 75% increase in product shipped the day its ERP went online. Another boasted its ERP allowed it to maintain productivity despite a 50% staff reduction. Other organizations attribute equally impressive outcomes to their ERPs including significantly lower transaction and bureaucratic costs, increased productivity, improved customer service, reduced inventories, and more effective planning (Eline, 1999; Gill, 1999; Hill, 1998; Soh, Kein, & Tay-Yap, 2000). Given the widespread perception among top managers that ERPs help organizations achieve competitive advantage, it should come as no surprise to IS professionals that many of these same managers are pushing hard for ERP implementation at their own firms.

Numerous vendors have entered the ERP market, among them SAP, Oracle, People Soft, J. D. Edwards, and Baan. Evaluating the advantages and disadvantages of these products is beyond the scope of this study. Suffice to say that a given vendor’s system must be carefully aligned with a given organization’s business processes to ensure a successful implementation as well as an acceptable return on investment (Hong & Kim, 2002).
Nevertheless, what ERPs have in common is that they are costly and time-consuming to develop and implement. Precise ERP development and implementation costs are difficult to ascertain given the proprietary nature of such endeavors. Still, valid approximations are possible. A recent survey of randomly selected United States manufacturing firms by the American Inventory Control Society, Inc. established $50 million as the dividing line between “low cost” and “mid-priced” ERP installations while the boundary between “moderately-priced” and “high-priced” ERP installations was set at $150 million (Mabert, Soni, & Venkataramanan, 2000). ERP development and execution also demands a significant investment of time. Some firms in as little as three months have effectively implemented ERPs. However, other ERP efforts have taken as long as eight years to complete (Flextronics, 2000).

The size of these expenditures begs the question: why are ERPs so costly and time-consuming to execute? As Hong and Kim (2002) note, ERPs are incredibly complex systems that integrate business processes across functional departments and organizational divisions. To describe their implementation as Herculean is not an exaggeration. These undertakings can be further complicated by one or more of the following considerations (Hong & Kim, 2002):

- The number, diversity, and complexity of business processes being integrated
- Whether significant hardware upgrades are needed to support the proposed ERP
• Whether consultants must be hired to assist the vendor and the organization's in-house IS staff in developing and implementing the ERP
• The extent of senior management's involvement in the ERP development and implementation process

Couple these concerns with Davenport's observation (1998) that, having installed an ERP, most organizations go through a two to three year acclamation period before they realize the full benefits of their investment and it becomes clear why IS professionals are keen to understand the dynamics of effective ERP development and implementation.

This desire to master ERP development and implementation is further fueled by the reality that such efforts are typically plagued by unforeseen problems and unintended consequences, despite the best intentions and efforts of senior management and IS professionals. Fully 90% of ERP development and implementation projects run into serious time and cost overruns (Holland & Light, 1999; Scheer & Habermann, 2000). Even more disheartening is that seven out ten ERP ventures ultimately fail to meet senior management’s hopes for significant improvements in organizational efficiency, productivity, and customer service (Lucas & Vecchiarello, 1998; Scheer & Habermann, 2000). If the full potential of ERPs to help organizations create and maintain competitive advantage is to be realized, the factors underlying their successful development and implementation must be identified and proactively managed.

A useful first step in such an investigation might be to clarify the concept of “successful implementation.” Given the enormous commitment of time and money required to install ERP, past research has logically appropriated senior management’s
definition of successful implementation: i.e., the ERP installation has been completed on
time and within budget (Hill, 1998). This choice of definition of "success" has been
validated to some extent by numerous observations by IS researchers and practitioners
and is reflective of the fact that top management support is critical in the effective
transition to an ERP environment (Akkersman & van Helden, 2002; Al-Mudinigh, Zairi,
& Al-Mashari, 2001; Holland & Light, 1999). However, given that ERP systems
integrate entire organizations, consequently affecting every member’s efforts, a more
valid measure of successful ERP implementation might be system users’ perceptions of
the new system, particularly its influence—for ill or good—on people’s ability to
contribute effectively as well as other aspects of their work lives such as compensation,
job security, etc. Al-Mudinigh and his colleagues (2001) support such a shift in
definitional focus when they note that system users’ resistance to change is one of the
major obstacles to successful ERP implementation. This view is also supported by
Larsson and his fellow investigators (2001) who opine that system users’ beliefs
concerning a given ERP’s utility and it potential impact on their jobs guide their approval
and use of the system. Naturally, this new definition, based as it is on human perception,
lacks the elegant simplicity of such objective measures as dollars and deadlines. Still,
vulnerable as they are to bias and misinformation, system user perceptions of ERP quality
and utility provide a definition of successful implementation that more clearly and validly
links ERP installation to valued outcomes than do external resource-based criteria such as
input costs and timelines.
Using this shift to a user-based definition as a starting point, management information systems scholars and practitioners have identified a number of possible correlates of successful ERP implementation. One such correlate is system users' perceptions of the relative quality and utility of selected elements of the ERP development and implementation process. These elements include:

- Alterations made by the organization to its fundamental business processes before and during the development and implementation process (Hong & Kim, 2002)
- Alterations made by systems analysts, system developers, and other IS professionals to the ERP software in order to meet the idiosyncratic needs and desires of the organization in question (Gill, 1999)
- ERP system user training (Eline, 1999)
- Key system user involvement in and acceptance of the development and implementation effort and its outcomes (Larsson, Lowstedt, & Sharri, 2001)
- The project management process employed during the development and implementation process (Mousseau, 1998)

This study reports the findings of a system user survey undertaken in order to confirm and quantify the relationship between the aforementioned correlates and the successful execution of an ERP in a mid-sized manufacturing concern. Its goal is to further the discipline's understanding of the forces that shape the successful completion of such systems in the hope of developing, in time, viable theories of effective ERP implementation. The remainder of this paper then (a) outlines an initial model of
successful ERP implementation along with the operational definitions and theoretical assumptions that shaped the questions contained in the survey, (b) describes the resulting instrument and its administration, (c) discloses the results, and (d) discusses the implications of its unexpected findings.

II. Hypothetical Model

Based upon the observations and speculations of the numerous IS researchers and practitioners referenced in the preceding introduction, the author offers the following preliminary model of the relationship between organizational alterations, technical alterations, system user training, key user involvement, and project management and successful ERP implementation (see Figure 1).

Figure 1: Hypothetical Model

- Organizational Alterations
- Technical Alterations
- System User Training
- Key User Involvement
- Project Management

At this stage of IS’s development, it is naïve at best and impertinent at worst to offer a hypothetical model of successful ERP implementation. This is especially true when the
study presented for its partial validation is both exploratory and observational in nature (i.e., "quasi-experimental") with all the shortcomings in validity inherent in any study in which treatments cannot be manipulated or participants randomly assigned (Pedhazur & Pedhazur-Schmelkin, 1991). Still, on the road to understanding, one must begin somewhere, and exploratory studies such as the one described here are "tolerable" for building support for a causal model when "better designs are not feasible" (Campbell & Stanley, 1963, p. 204) and treatments are "abrupt and precisely dated" (Cook & Campbell, 1979, p. 296). Certainly, ERP implementation within a laboratory environment is unfeasible if for no other reason than the staggering financial costs associated with such systems. ERP implementation, however, is an event whose elements can be accurately dated—a necessary prerequisite for inferring causation, according to Cook and Campbell (1979), given that "effects follow causes in time, even though they may be instantaneous on the level of ultimate micromediation" (p. 35).

Micromediation in this instance is defined by Cook and Campbell (1979) as "the specification of causal connections at a level of smaller particles that make up the [larger and often complex] objects and on a finer time scale" (p. 32). Of course, a comprehensive exploration of both causation itself and the promises and pitfalls associated with drawing causal inferences from quasi-experimental designs is far beyond the scope of this paper. For a clear and concise summary of the overarching issues and their implications, see Cook and Campbell (1979).
III. Operational Definitions

A. Successful Implementation

Any meaningful investigation of successful ERP implementation must, of course, locate the construct within the larger paradigm of management information system success. Unfortunately, a single, comprehensive definition of MIS success has eluded the discipline since its infancy (Keen, 1980). The problem is that information is simultaneously the output of an information system, the message of a communication system, and the driving force behind a chain of events that begins with information production and ends with system performance changes (Shannon & Weaver, 1949; Mason, 1978; DeLone & McLean, 2001). The consequence of this is that a valid metric of MIS success must address information at the technical or production level, the semantic or product level, and the effectiveness or influence level (DeLone & McLean, 2001). It should come as no surprise, therefore, that efforts to operationalize MIS success have yielded no less than 114 conceptually distinct dependent variables in the last 25 years (DeLone & McLean, 2001).

Fortunately, a clear and complete articulation of MIS success is emerging. Acknowledging that “different researchers have addressed different aspects of success, making comparisons difficult and the prospect of building a cumulative tradition for [IS] research equally elusive” (p. 60), DeLone and McLean introduced a comprehensive taxonomy of MIS success in 2001. This classification drew upon the work of early communication and information system theorists as well as literally hundreds of empirical studies. In essence, DeLone and McLean blended Shannon and Weaver’s
(1949) recognition that information, both as information system output and communication system message, can be measured at the technical level, the semantic level, and the effectiveness level with Mason's (1978) subsequent reconceptualization of "effectiveness" as "influence" and his operationalization of the new construct as a series of "influence" events that begins with the production of information and end with an observable change in recipient behavior and subsequent system performance. The result of DeLone and McLean's efforts is a multidimensional classification of MIS system success that accounts for such relevant yet diverse facets as information system quality, information quality, information use, and user satisfaction as well as the impact of output on upon individual users and the organization as a whole.

Having articulated their taxonomy, DeLone and McLean (2001) go on to note that:

In reviewing these [dimensions], no single measure is intrinsically better than another; so the choice of a success variable is often a function of the objective of the study, the organizational context, the aspect of the information system which is addressed by the study, the independent variables under investigation, the research method, and the level of analysis, i.e., individual, organization, or society. (p. 80)

Based on the above context, the following discussion describes the issues and development of the operational definition for the dependent variable for this study, "ERP implementation success".
Hong and Kim (2002) assert that, because it supports business processes rather than functions, Enterprise Resource Planning (ERP) significantly affects the tasks, structure, and culture of an organization. More importantly, however, ERP affects its users, the people who employ the system to perform the daily work that drives the organization towards its goals and objectives (Larsson, Lowstedt, & Shari, 2001). It is reasonable to assume, therefore, that system users’ perceptions of the utility of an ERP and its impact—positive or negative—on their jobs is a valid indicator of the effectiveness of a new system and, hence, the success of its development and installation. Systems that make more work for system users—i.e., that require that orders be reentered, that demand more effortful searches for customer information, that make it harder to track misplaced orders, etc.—will naturally be regarded by users as useless and, hence, unsuccessful.

Yet, even if the system proves its ability in helping users become more efficient and productive, system users may still reject the new system if its implementation leads in the end to a loss of pay, prestige, or even jobs. Typically, rejection of the new system is manifested in system user feelings of fear, mistrust, and insecurity (Larsson, Lowstedt, & Shari, 2001). Conversely, user acceptance of a new system is typified by system user perceptions of personal challenge, growth, and current and potential system utility (Larsson, Lowstedt, & Shari, 2001). Consequently, for the purposes of this study, successful ERP implementation is defined as the system users’ perception that the ERP is a useful tool for performing necessary job functions and has the potential to help the user make even more efficient and productive use of the system in the future.
Viewed within this context, this study's definition of successful ERP implementation captures several facets of DeLone and McLean's (2001) definition of MIS system success. First, it directly addresses issues of system quality as it gauges user perceptions of the ERP's usefulness now and in the future. Second, it indirectly addresses issues of information use as it implies that users will be motivated to make "even more use" of the ERP as it becomes operational and "proves" its value. Third, and most importantly, the study's definition of successful ERP implementation clearly confronts the issue of user satisfaction. Missing from this study's dependent variable, however, are elements of DeLone and McLean's definition of MIS success that measure information quality as well as the impact of the system on the individual user and the organization as a whole.

Clearly, this study's definition of successful ERP implementation represents, at best, a subset of DeLone and McLean's (2001) comprehensive concerns. Yet, it is difficult for it to be otherwise. First, DeLone and McLean's definition, as operationalized in the 180 empirical studies they reviewed, incorporates some 114 distinct measures, plainly too many to be assessed effectively in a single, valid, and reliable questionnaire. Second, the exploratory nature of this study demands that the study focus its attention on a small number of variables and the potential relationships among them. Furthermore, as a clear model of MIS success has yet to be established (DeLone & McLean, 2001), there is no theoretical basis for preferring one aspect or a given combination of aspects over another. Third, the focus of the study, the implementation stage of an ERP, precludes examination of aspects of DeLone and McLean's definition—specifically information
quality and the impact on the system on individuals and the organization—that require that the system under consideration be operationalized for a period of time sufficient for respondents to make adequate judgments. Fourth, the study's individual level of analysis reduces respondents' judgments on global issues such as overall system quality, information use, and organizational impact to mere speculation and, hence, irrelevance. Consequently, while the study's definition of ERP implementation success may not be comprehensive, it is sufficiently representative of the relevant issues to be theoretically and empirically useful in this context.

B. Organizational alterations

Because they support business processes, there is a high degree of social interaction between ERPs and organizational members, i.e., system users (Hong & Kim, 2002). Consequently, an ERP implementation can be said to be successful to the extent that it helps create an acceptable coexistence between systems users and the new technology. While the products and services as well as the technology used to produce them often vary dramatically between organizations, there are significant similarities in the underlying business processes that support a given value creation model (Cahn, 1999). For example, successful organizations within a given industry tend to market their products in similar ways as can be seen in Dell and Gateway Computers' strategy of selling their custom-made personal computers via the Internet rather than through retail outlets (Daft, 2001). Vendors consequently model their ERP software on a given industry's "best" business practices. If an organization's business processes conform to its industry's best practices then there is little or no need to modify ERP software during
an implementation. Such an occurrence is described in IS vernacular as a "vanilla" implementation. Vanilla ERP implementations are, naturally, more likely to be completed on time and within budget, which contributes to management perceptions of successful implementation (Gill, 1999). Moreover, because the ERP being installed is based upon and supports business processes with which they are already familiar and which they accept, systems users are also more likely to characterize vanilla implementations as successful.

Unfortunately, the underlying business processes of many successful organizations deviate significantly from the acknowledged best practices of their respective industries. This occurs for a variety reasons: tradition; idiosyncrasies of organizational culture, structure, and strategy; the need or desire to cater to the needs of valued clients; etc. (Daft, 2001). Since research indicates that successful ERP implementation depends upon a careful alignment of business processes and system requirements, either the ERP or the organization must be modified (Al-Mudinigh, Zairi, & Al-Mashari, 2001; Bingi, Sharma, & Godla, 1999; Holland & Light, 1999; Hong & Kim, 2002).

Both options, of course, have their advantages and disadvantages. Adapting a vanilla ERP to an organization's current business processes can help ensure user acceptance because the new system mimics the old system with which users are already familiar. However, successfully modifying an ERP's capabilities to meet the distinctive needs and desires of a given organization is a daunting technical challenge requiring significant investments in time, money, and expertise (Gill, 1999; Hong & Kim, 2002).
Furthermore, given the integrated nature of ERP software, code modifications made to one module can and often do “ripple” through the remaining modules with disastrous consequences despite the best efforts of IS professionals (Scheer & Habermann, 2000). For example, changes to the ERP software that supports order taking could result in orders from valued customers being filled incorrectly or lost entirely. Given the potential for disaster, it is frequently easier in terms of time, money, and effort to mold the organization to the ERP than to mold the ERP to the organization (Holland & Light, 1999).

Yet, this too is problematic. Effectively adapting a given firm’s processes to meet the demands of a chosen ERP often requires senior management to make significant modifications to the organization’s division of labor, reporting relationships, procedures, structures, and culture (Hong & Kim, 2002). Doing this, of course, places a double burden on system users who must now adapt to both a new system and a new set of processes. The strain of this effort can significantly affect users’ willingness to accept the challenge and opportunities the ERP offers. Still, Hong and Kim (2002) have observed that the more organizations modify their business processes to meet the demands of a proposed ERP, the more likely it is that the ERP implementation will be judged successful by system users. This may occur because the business processes upon which the ERP is based are typically a given industry’s acknowledged “best” practices and their adoption may in and of itself lead to improvements in productivity and profitability that help win over system users, which, in turn, paves the way for a successful ERP implementation.
This line of reasoning leads to the following operational definition of organizational alterations: changes made to users' procedures, assumptions, knowledge or relationships (Hong & Kim, 2002) in order to align organizational processes with those used by the ERP software being implemented. Based on this notion and the model described earlier, the following hypotheses are proposed:

**H01**

*Organizational alterations made to fit the ERP software product will not correlate, either positively or negatively, with successful ERP implementation.*

**H11**

*Organizational alterations made to fit the ERP software product will positively correlate with successful ERP implementation.*

C. **Technical alterations**

Alterations to the ERP software selected for implementation by a given organization, however, may be unavoidable. According to Gill (1999), one or both of the following factors can force technical alteration of the ERP software:

- Client inability or unwillingness for whatever reason to make the organizational alterations needed to align its business processes with the “best” practices the ERP is designed to support.

- To correct flawed advice given to clients by vendors or consultants concerning the ERP product being purchased.
Hong and Kim (2002) note that technical alterations to ERP typically occur at one or more of the following three levels:

- Configuration changes within the ERP software,
- Modifications made to the ERP software, and
- Extensions that allow for local code and third-party "bolt-on" software to be used

Note: Configuration changes do not require code changes while extensions and modifications do (Hong & Kim, 2002).

Modifications to the ERP software itself typically fall into three categories: data, function, and output. Gill (1999) warns that data modifications are among the riskiest to attempt because of the degree of coordination necessary between old and new systems during any future upgrade. Data conversion involves the identification, labeling, sorting, and communication of data field information between current systems and their successors (Burnell, 1999). Both upgrades and modifications can result in inaccurate data, which can frustrate an ERP implementation.

Two issues typically confront functional modification to ERP software: missing validation routines and missing operational steps—both of which are imbedded in the existing business model (Soh, Kien, & Tay-Yap, 2000). Remedying these problems requires further client negotiations with the ERP vendor for licensing privileges, which, if purchased, can drive up implementation costs.

Output modification addresses the reporting piece of the ERP. Modifications to this part of the package can affect the content and/or the presentation of the information being reported and may be necessary if the information content desired is either
unavailable or incomplete in the initial ERP package. Again, modifying this aspect of the ERP requires considerable programming expertise, which can drive up the installation’s personnel costs. Furthermore, the time needed to affect these modifications can play havoc with ERP implementation timelines and even create backlogs in the client’s in-house IS department (Bellomo, 1999).

Again, modification of the ERP software, problematic as it may be, cannot always be avoided. Satisfying the needs of valued customers and/or supporting unique business structures, strategies, processes, and cultures may require alteration of the original ERP software, as these may be critical components of a client’s competitive advantage (Soh, Kien, & Tay-Yap, 2000). Any decision to modify the ERP package must be made with the company’s needs in mind (Gurin, 1999). Ultimately, the decision to customize an ERP package must take into account the following questions:

- Will the modification duplicate an aspect of functionality that is critical to maintaining or enhancing the organization’s competitive advantage or does the request simply reflect system users’ fear of change or desire for convenience?
- To what extent will the modification being considered impact the time and budget constraints within which the ERP installation team must operate?
- Will the modification being considered produce a reasonable return on investment for the client organization?

Research indicates that selective modification with the goal of serving valued customers or maintaining a client’s unique competitive advantage seems to be a growing trend in ERP installation (Gill, 1999). These considerations then prompt the following
operational definition of technical alterations: modifications made by professional programmers to the data, function, or output of a purchased software product in order to make it easier for users to effectively do their jobs.

As stated earlier, technical alterations, while necessary, are nevertheless risky and costly exercises. Scheer and Habermann (2000) point out that thousands of parameters can be set within a given ERP software package and a single error can ripple through the remainder of the system with unforeseen and disastrous consequences. It is therefore to the installation team's advantage to discourage unnecessary modifications and, instead, encourage users to explore the new system's full potential for increasing their productivity and effectiveness. Encouraging users in this manner should increase user acceptance of the new system and decrease user demands for risky modifications, which should smooth the way for an error-free implementation. This, finally, in turn, should positively impact system user perceptions and lead to a successful ERP implementation. This line of reasoning informs the study's second null and alternative hypotheses.

$H_02$

Technical alterations to the ERP software resulting from user demand will not correlate, either positively or negatively, with successful ERP implementation.

$H_{A2}$

Technical alterations to the ERP software resulting from user demand will negatively correlate with successful ERP implementation.
D. System user training

For the purposes of this study, ERP training will be defined as the exchange of knowledge through instructional materials, repositories, shared experiences, and practices that enhance users’ understanding of how to employ the ERP to accomplish their job functions, and encourage users to be more comfortable with and feel more positive about the new system.

Bingi, Sharma, and Godla (1999) argue that “training employees on ERP is not as simple as Excel training in which you give them a few weeks of training, put them on a job and they blunder their way through. ERP systems are extremely complex and demand rigorous training” (p. 10). Yet, important as training arguably is to effective ERP implementation, it is frequently the first budget item to be cut (Witby, 1999). In all fairness, however, it must be noted that, given the time and cost overruns to which ERP installations are vulnerable and given that training costs can consume up to 20% of an installation’s budget, it is understandable that training expenditures would be the first to be axed when an installation goes over budget (Al-Mudinigh, Zairi, & Al-Mashari, 2000; Eline, 1999). Still the importance of thoroughly training system users in any new system cannot be overestimated. According to a review of ERP failures by Bingi, Sharma, and Godla (2000), inadequate ERP training can result in up to 30 to 40% of front line workers being unable to effectively use the new system to perform their daily functions.

Effective ERP training needs to help systems users master not only the intricacies of the new system but the business model it supports (Eline, 1999). ERP training integrated in this manner offers system users four potential advantages:
- It helps system users better understand the daily tasks for which they are responsible (Eline, 1999).
- It gives system users a familiarity with the ERP and its goals that eases their fear of change.
- It gives systems users the knowledge needed to find innovative ways to use the new system to better perform their current functions; these innovations can form the basis for future system enhancements and optimizations.
- It gives systems users the knowledge to adapt the ERP software to better serve the evolving needs of customers and combine traditional approaches with the new possibilities the ERP offers (Cahn, 1999).

The aforementioned observations and potential training benefits prompt the study's third null and alternative hypotheses.

**$H_{03}$**

*System users' perception of the quality of training on the ERP system will not correlate, either, positively or negatively, with successful ERP implementation.*

**$H_{A3}$**

*System users' perception of the quality of training on the ERP system will correlate positively with successful ERP implementation.*

E. **Key system users**

For the purpose of this study, *key system users* will be defined as *those individuals, within the company, who are (a) knowledgeable of the business, (b) able to work with the new software, (c) understand the software's functionality, (d) appreciate*
the new software's potential for meeting the company's needs, and (e) valued for their knowledge and worth ethic by fellow system users.

Identifying existing resources at the start of an ERP project helps set the stage for the successful introduction and ultimate acceptance of the new system (Larsson, Lowstedt, & Sharri, 2001). Two particularly useful resources in the context are the informal organization that develops within any firm and the key members that are its touchstones (Daft, 2001). If other system users value these individuals for their work ethic and knowledge, then they can be recruited by top management to act as “agents of influence”—“key” system users who can inspire, support, and educate others within the organization (Larsson, Lowstedt, & Sharri, 2001). Effectively identified and employed, key system users can be extremely useful in helping organizations achieve buy-in of the ERP by rank and file users, encouraging them to embrace the new system as a natural tool for accomplishing their work and develop positive expectations of its long-term value and utility (Holland & Light, 1999; Willcocks & Sykes, 2000). This, Hill (1998) asserts, helps combat the biggest obstacle to any new system: system users’ resistance to change. Furthermore, using key systems to help diffuse knowledge of and experience with the new system can help augment the impact of what are too often truncated ERP training efforts (Willcocks & Sykes, 2000). Empirical validation of these assertions comes in part from a study by Baroudi, Olson, and Ives (1986) that used path analysis to analyze the relationship among user involvement in the development of information, system usage, and user satisfaction. Based on information gathered from a survey of 200
production managers, Baroudi, et al concluded that user involvement enhanced both system usage and user satisfaction.

Cahn (1999) characterizes key system users as organizational members who communicate well with other system users, work well with managers, accept the accountability expected of them, and willingly commit to the ERP installation, refusing to abandon it even when their regular duties become demanding. Typically, they are selected from among rank and file system users, come from a variety of business units within the firm, and are tasked with addressing business rather than technology concerns (Hill, 1998). Given the demands placed upon them by the installation process, key systems users need to be energetic, enthusiastic high-performers with strong interpersonal skills (Willcocks & Sykes, 2000).

According to IS researchers, effective use of key system users in an ERP installation demands that:

- Key system users have adequate formal education, augmented by comprehensive system-specific training by knowledgeable vendors (Holland & Light, 1999; Soh, Kien, & Tay-Yap, 2000).
- Key system users’ input should be an integral part of both the development and implementation phases of a proposed ERP (Holland & Light, 1999).
- Key system users should play an central role in system user training efforts (Burnell, 1999)

These considerations motivate the inclusion of the study’s fourth null and alternative hypotheses.
Key system users' involvement with the ERP system will not correlate, either positively or negatively, with successful ERP implementation

Key system users' involvement with the ERP system will correlate positively with successful ERP implementation

F. Project management

While key system users are acknowledged as having an enormous effect on the implementation and acceptance of an ERP, the "face" of the new system, the individual with whom the project and its ultimate success or failure is most closely identified is the project manager (Mousseau, 1998). This is because the project manager, among other things, has formal power and authority over the ERP project; interprets senior management's goals and objectives for the project; controls the project's human and financial resources; and manages key relationships among senior managers, users, and vendors before, during, and after the project (Mousseau, 1998).

Al-Mudinigh, Zairi, and Al-Mashari (2001) maintain that the complexity of ERP projects demands that projects managers have business, technical, and change management skills in equal measure. According to Mousseau (1998), they must be able to:

- Manage the expectations of sponsors, future users, and those on the project team.
• Maintain credibility in the areas of business and technical knowledge with senior management and everyone else connected with the ERP development and installation effort.
• Stay calm under stress.
• Be flexible and imaginative.
• Control change without impeding it.
• Motivate team members.
• Bring the project in on time and within budget.

It is difficult to overstate the importance of project managers and the project management processes they inaugurate and direct to the success of ERP development and installation. Project manager inability to effectively plan and monitor objectives, budgets, and deadlines is second only to system user resistance as the leading cause of ERP installation failure (Al-Mudinigh, Zairi, & Al-Mashari, 2001).

Given the power and visibility of project managers, system users’ interactions with them must logically and significantly affect system user perceptions regarding the quality and utility of any ERP, which leads to this study’s last operational definition and associated hypotheses. The project manager is the person who communicates to the system user what they can expect regarding the new system. This is done through project manager control of the project plan, interpretation of its goals and directives, obtainment of necessary monetary and human resources, management of relationships, and communication with management.

Hos
Effective interaction with the project manager, as perceived by the system user, will not correlate, either positively or negatively, with successful ERP implementation.

H₅

Effective interaction with the project manager, as perceived by the system user, will correlate positively with successful ERP implementation.
IV. Method

A. Cooperating Organization

This study scrutinized system user perceptions of an ERP implementation initiated in 1999 by Corporate Express Document and Print Management (CEDPM). CEDPM is a business line of Corporate Express, Inc., which, in turn, is a wholly owned subsidiary of Buhrmann NV, one of the world’s largest, direct suppliers of office products and essential business services (2002 sales: $10 billion). With annual sales of $300 million, CEDPM is considered one of the printing industry’s smaller players. Nevertheless, it is a national leader in the design and production of both paper and electronic business forms. It numbers among its competitors such behemoths as Moore ($4 billion in annual sales), Relizon ($3 billion in annual sales), and Standard Registry ($3 billion in annual sales). CEDPM serves an extensive customer base that includes 90% of the Fortune 500. It specializes in customized business forms and pressure-sensitive labels. CEDPM also supplies related products and services including dedicated direct mail services. CEDPM operates 10 form and label manufacturing plants and 50 sales offices across the United States that combined employ 1,110 people.

CEDPM began operation in 1958 as Mid-Continent Tab Company, a small firm specializing in the production of computer punch cards. Dictaphone Corporation acquired Mid-Continent in 1975 before being purchased in turn by Pitney Bowes in 1979. Using a leveraged buy-out, Data Documents seized the company in 1988 and managed it until 1997 when Corporate Express bought it. Two years later, Corporate Express
merged with Buhrmann, NV. As of this writing, CEDPM is the only forms manufacturer to have successfully implemented an ERP.

CEDPM began vendor selection for its proposed ERP in the summer of 1999. Its legacy system was an in-house, mainframe system purchased from Bull. Senior management awarded the contract to Baan, a firm specializing in ERP systems for manufacturing concerns. Software configuration started in late September of 1999. The implementation team consisted of consultants from Vannenburg Business Systems as well as employees representing CEDPM’s sundry divisions. CEDPM ensconced the team in Vannenburg Business System’s Chicago, Illinois, office, allowing its members to focus on the project free from the distractions of their normal responsibilities. The team set a May 2000 deadline for a full implementation of the new system at the Omaha, Nebraska, facility, but false starts and last-minute changes to critical design configurations delayed execution for a full three months. The finance module finally went online in September 2000 with sales, purchasing, distribution, and manufacturing following suit two months later.

Once Omaha’s ERP was operational, the implementation team began successive installation efforts at the firm’s remaining 11 sites. The firm’s information strategy involved integrating a given production facility and the sale division(s) supporting it. Those sales divisions not linked to a particular manufacturing site were brought online by geographic region. As of July 2002, CEDPM’s implementation team had finished work at 11 facilities. Only one site, located in Tulsa, Oklahoma, scheduled to be completed by the end of 2004 remains. The general pattern has been to send in a training team one
month before implementation at a given facility begins, complete the implementation, and then leave a trouble-shooting team behind for a month.

B. Participants and Sample

The survey analyzed ERP implementations at three CEDPM sites: Omaha, the first division integrated; Atlantic, the sixth division incorporated; and Fresno, the tenth division brought online. The study sampled system user perceptions at three stages in the implementation process: at the beginning (Omaha), the middle (Atlantic), and near the end of the procedure (Fresno). Both the Omaha and Fresno divisions accommodate a manufacturing facility, a sales organization, and a distribution center. The Atlantic division focuses solely on sales and distribution. The Omaha division is the largest of the three with 108 employees; Atlantic and Fresno have 54 and 37 employees respectively.

CEDPM's Human Resources department provided a list of current employees. The investigator mailed surveys to each of the 199 workers employed at the three sites. A letter attached to the survey packet (see Appendix B) asked individuals to return the survey unanswered if they did not employ the new Baan ERP in the course of their day-to-day activities. Participation in the study was voluntary and not restricted by age, race, or gender. Fifty-six individuals, ranging in age for 19 to 70, completed and returned the surveys.

C. Instrument

The investigator developed a 28-item questionnaire (see Appendix A) using the assumption underlying the tentative research model depicted in Figure 1: user perceptions of the success of an ERP implementation will be related to their assessment of the quality
and utility of organization alterations, technical alterations, ERP user training, key users' involvement in the implementation effort, and the project management process. The survey offered participants a set of 5 possible responses to each question (see Table 1), organized into a Likert-type scale that ranged from 1 (complete agreement) to 5 (complete disagreement). Two open-ended questions followed the initial 28.

Table 1: **Constructs and Items on Survey Instrument breakdown by variable**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Operational Definition</th>
<th>Question No.</th>
<th>Scoring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful Implementation</td>
<td>system user perception that the ERP is a useful tool for performing necessary job functions and has the potential to help the user make even more efficient and productive use of the system in the future.</td>
<td>1 thru 6</td>
<td>Average</td>
</tr>
<tr>
<td>Organizational Alterations</td>
<td>changes made to users' procedures, assumptions, knowledge or relationships (Hong &amp; Kim, 2002) in order to align organizational processes with those used by the ERP software being implemented</td>
<td>7 thru 11</td>
<td>Average</td>
</tr>
<tr>
<td>Technical Alterations</td>
<td>modifications made by professional programmers to the data, function, or output of a purchased software product in order to make it easier for users to effectively do their jobs.</td>
<td>12 thru 17</td>
<td>Average</td>
</tr>
<tr>
<td>Training</td>
<td>the exchange of knowledge through instructional materials, repositories, shared experiences, and practices that enhance users' understanding of how to employ the ERP to accomplish their job functions, and encourage users to be more comfortable with and feel more positive about the new system.</td>
<td>18 thru 20</td>
<td>Average</td>
</tr>
<tr>
<td>Key System Users</td>
<td>those individuals, within the company, who are (a) knowledgeable of the business, (b) able to work with the new software, (c) understand the software's functionality, (d) appreciate the new software's potential for meeting the company's needs, and (e) valued for their knowledge and worth ethic by fellow system users.</td>
<td>21 thru 24</td>
<td>Average</td>
</tr>
<tr>
<td>Project Management</td>
<td>The project manager is the person who communicates to the system user what they can expect regarding the new system. This is done through project manager control of the project plan, interpretation of its goals and directives, obtainment of necessary monetary and human resources, management of relationships, and communication with management.</td>
<td>25 thru 28</td>
<td>Average</td>
</tr>
</tbody>
</table>

1. **Validity**

The author's thesis committee and four CEDPM employees exempted from the study evaluated the questionnaire's content and construct validity. A pilot study
involving 20 CEDPM employees provided additional substantiation. The author offered the pilot study questions to ten of the participants in an interview format; and presented the same questions using a paper and pencil form to the remaining ten. The author revised the questionnaire based upon information culled from the pilot study before administering it to the remainder of the sample.

2. Reliability

The author used Cronbach’s Alpha to test the questionnaire’s reliability (see Table 2 for results). Values ranged from .56 for organizational alterations to .85 for successful implementation. The low alpha value for organizational alterations was puzzling given the tentative model’s assumption and could have justified eliminating this variable from further consideration. It was decided, however, to retain it and hope that further data collection and statistical analysis would help clarify the variable’s low reliability score. The remaining scales—Project Management (.75), Technical Alterations (.77), Key System Users (.80), and Training (.82)—proved sufficiently reliable given the exploratory nature of this study. According to Nunnally and Bernstein (1994),

A satisfactory level of reliability depends on how a measure is being used. ... It can be argued that increasing reliabilities much beyond .80 in basic research is often wasteful of time and money. Measurement error attenuates correlations very little at that level. (p. 265)
Table 2: Cronbach’s Alpha Scores on Reliability within each Study Variable

<table>
<thead>
<tr>
<th>Study Variable</th>
<th>Cronbach’s Alpha Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful Implementation</td>
<td>.85</td>
</tr>
<tr>
<td>Organizational Alterations</td>
<td>.56</td>
</tr>
<tr>
<td>Technical Alterations</td>
<td>.77</td>
</tr>
<tr>
<td>Training</td>
<td>.82</td>
</tr>
<tr>
<td>Key System Users</td>
<td>.80</td>
</tr>
<tr>
<td>Project Management</td>
<td>.75</td>
</tr>
</tbody>
</table>

D. Procedure

CEDPM’s Vice President of Information Services of CEDPM approved administration of the survey. This research project was exempted by the University of Nebraska Institutional Review Board under 45 CFR 46:101b, category 2, on April 10, 2003. The IRB# is 151-03-EX. Questionnaires were distributed and returned through intra-company mail in sealed envelopes marked “Confidential: To be opened only by addressee.” A cover letter explaining the purpose of the survey and the voluntary nature of participation accompanied the survey (see Appendix B). The letter also informed participants of their prerogative to contact the University of Nebraska Institutional Review Board concerning their rights as research participants.
Given that the correlations associated with this analysis are purely conjectural and that a firm theoretical framework upon which to "hang" them has yet to be established, the investigator elected to employ a step-wise regression for Model Building. Relevant statistics—descriptives, $r$, $R$-Squared, $F$ values, regression coefficients, etc.—were calculated and analyzed using SAS software. The level of significance for all tests was set at the .05 level.

V. **Analysis of Results**

Fifty-six of the 199 surveys mailed were returned, resulting in an overall response rate of 31%. Response rates for the Atlantic region varied dramatically from those for Omaha and Fresno (see Table 3). Atlantic region participants returned 51% of the surveys while Omaha and Fresno respondents returned just 20% and 29% respectively.

Table 3: *Numbers of Responses by Division*

<table>
<thead>
<tr>
<th>Division</th>
<th>Number of Surveys Mailed:</th>
<th>Number of Surveys Returned:</th>
<th>Percentage of Final Sample:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omaha</td>
<td>54</td>
<td>21</td>
<td>38</td>
</tr>
<tr>
<td>Atlantic</td>
<td>19</td>
<td>54</td>
<td>33</td>
</tr>
<tr>
<td>Fresno</td>
<td>27</td>
<td>31</td>
<td>29</td>
</tr>
</tbody>
</table>
Several factors may have contributed to Omaha's low response rate. Despite the project team's best efforts, Omaha's implementation was problematic; both initial planning and training ultimately proved inadequate. CEDPM began system user training in June 2002, but major changes to the ERP software involving buy-out processing and inventory valuation (e.g., low cost, First In/First Out [FIFO], Lot Costing etc) delayed ERP implementation until September. System user retention of initial training undoubtedly declined during the postponement, a situation that might have been ameliorated by remedial instruction had time constraints not limited such efforts to the distribution of written instructions and updates. Users consequently found themselves having to relearn the new system while maintaining normal levels of productivity and efficiency. Frustration with the new system may have deepened as additional problems with the new system forced users to spend valuable time reentering back-logged sales orders, correcting unit of measure issues, etc. This aggravation conceivably motivated the Omaha division's low response rate and colored the few responses that were received—particularly those to the two open-ended questions—which were almost uniformly negative. Fortunately, the project team profited from these painful lessons. The open-ended responses from Atlantic and Fresno respondents indicate that the remaining implementations went much more smoothly.

Another factor that may have contributed to the relatively low overall response rate for both the Omaha and Fresno sites was the distribution seven months earlier of another company-wide survey that covered many of these same issues. Perhaps potential participants viewed the later survey, the one conducted for this study, as redundant.
Nevertheless, the majority of participants perceived the ERP installation to be successful (see Table 4). Overall, 33% of all respondents completely agreed that the ERP implementation had been successful, 35% agreed, 16% neither agreed nor disagreed (i.e., were neutral on the issue), 8% slightly disagreed, and another 8% completely disagreed.

Table 4: Overall average response rates broken down by variable and response option

<table>
<thead>
<tr>
<th>Variable</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful Implementation</td>
<td>33%</td>
<td>35%</td>
<td>16%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Organizational Alterations</td>
<td>42%</td>
<td>25%</td>
<td>21%</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Technical Alterations</td>
<td>8%</td>
<td>23%</td>
<td>21%</td>
<td>26%</td>
<td>22%</td>
</tr>
<tr>
<td>Training</td>
<td>8%</td>
<td>21%</td>
<td>23%</td>
<td>27%</td>
<td>21%</td>
</tr>
<tr>
<td>Key System Users</td>
<td>10%</td>
<td>29%</td>
<td>27%</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>Project Management</td>
<td>17%</td>
<td>24%</td>
<td>25%</td>
<td>18%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Response breakdowns by variable, also depicted in Table 3, hint at the source of the ERP’s overall success. Seventy percent of participants either completely or slightly agreed that the alterations CEDPM made to its organizational processes before or during the implementation had been useful and of a high quality. On the other hand, just 31% of
participants completely or slightly agreed that technical alterations made to the system’s software had been both useful and of a high quality. The training supporting the implementation fared little better with just 29% of respondents either completely or slightly agreeing that it had been useful and of a high quality. Respondents were split on the issue of whether key system users’ input had contributed significantly to the ERP’s successful implementation with 29% either completely or slightly agreeing that it had and 33% either completely or slightly disagreeing. Still, 41% of respondents completely or slightly agreed that the implementation’s project management process had been both useful and of a high quality during the ERP implementation. As will be seen, however, these breakdowns do not truly reflect the underlying relationships between successful ERP implementation and its postulated correlates.

As this study’s purpose is to verify and quantify relationships between successful ERP implementation and the aforementioned potential correlates rather than to analyze differences in system users’ perceptions of the implementation process itself, this report will now move on to discuss the statistical tests used and the resulting findings. For a detailed itemization of responses by variable, survey items and location, refer to Appendix C.

The goal on the data analysis conducted was to test the hypotheses presented. The investigator used regression analysis to assess the significance of the hypothesized relationship between the dependent variable (successful ERP implementation) and the independent variables (organization alterations, technical alterations, training, key users, and project management). At least one or more of the variables emerged from the F test
for overall significance with a significant relationship with the dependent variable \( F = 0.0007 \).

Table 5: Results of ANOVA Test

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>Df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Significance F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>5</td>
<td>16.6218</td>
<td>3.3244</td>
<td>6.7071</td>
<td>0.0007</td>
</tr>
<tr>
<td>Residual</td>
<td>50</td>
<td>24.7824</td>
<td>0.4956</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>41.4043</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To quantify the relative significance of each of the individual independent variables, the individual test was performed. Surprisingly, this procedure revealed that only one of the five variables, technical alterations, had a significant effect on successful implementation \( p=0.0087 \). The other four variables failed to achieve significance (see Table 6).

Table 6: Results of Multiple Regression Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.0930</td>
<td>0.4161</td>
<td>0.2234</td>
<td>0.8241</td>
</tr>
<tr>
<td>Organizational Alt</td>
<td>0.0783</td>
<td>0.1601</td>
<td>0.4887</td>
<td>0.6272</td>
</tr>
<tr>
<td>Technical Alt</td>
<td>0.3966</td>
<td>0.1451</td>
<td>2.7324</td>
<td>0.0087</td>
</tr>
<tr>
<td>Training</td>
<td>-0.0215</td>
<td>0.1021</td>
<td>-0.2103</td>
<td>0.8343</td>
</tr>
<tr>
<td>Key Users</td>
<td>0.0291</td>
<td>0.1320</td>
<td>0.2204</td>
<td>0.8265</td>
</tr>
<tr>
<td>Project Management</td>
<td>0.2394</td>
<td>0.1489</td>
<td>1.6077</td>
<td>0.1142</td>
</tr>
</tbody>
</table>

Note: N = 56.
Due to multicollinearity, the investigator performed a stepwise regression analysis (Model Building) to determine if any of the other variables achieved significance. Once again, technical alterations achieved significance \((p=0.0001)\). One other variable, project management, also proved statistically significant \((p=0.0468)\) (see Table 7).

Table 7: *Summary of Step-wise Regression Analysis*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model R-Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Alterations</td>
<td>.3499</td>
<td>29.06</td>
<td>0.0001</td>
</tr>
<tr>
<td>Project Management</td>
<td>.3970</td>
<td>4.15</td>
<td>0.0468</td>
</tr>
</tbody>
</table>

**VI. Hypotheses and Discussion**

Both the variables and hypotheses generated for this study were based upon IS research to date. Surprisingly, this study found only two out of the five variables, i.e., technical alterations and project management, to have any significant relationship to successful implementation from the user’s perspective. The following discussion will reexamine each variable in light of the results.
A. Organizational Alterations

The analysis of survey data indicates that the proposition (H$_{a1}$), "Organizational alterations made to fit the ERP software product will positively correlate with successful ERP implementation" was not supported.

ERPs systems typically combine a given industry's best practices into one system. If these best practices are already in place, then there should be little need to fit the organization to the software before or during the implementation. If these practices are not in place, then ERP implementation will inevitably involve reconfiguration of the system to the organization's current practices, adaptation of its current practices to the new software, or some combination of both. As discussed in the introduction, none of these alternatives is painless and it is the new system's users who typically pay the price in the form of increased stress, reduced productivity, and missed opportunities. To its detriment, CEDPM failed to make any significant organizational alterations before or during the implementation. Upper management's goal was to implement the software as quickly as possible; optimization of business processes would be undertaken later as time permitted. Consequently, survey questions related to changes in business practices might have seem irrelevant or nonsensical to most participants, hence, the lack of significance in the perceived relationship between organizational changes and user perceptions of successful ERP implementation.

Of course, it is possible that CEDPM's business practices are already closely aligned with the best practices of the printing industry. If this is case, then system users may have experienced a smooth transition from the old system to the new because the
latter supported processes with which they were already familiar. According to the consultants employed by CEDPM through Baan and the Baan expert now on staff, however, the opposite was true. ERP software configurations that would allow several industry best practices to function have yet to be activated. Furthermore, users have implemented new and additional manual processes designed to circumvent the ERP so that day-to-day operations more closely resemble those employed by the old system. Consequently, it is possible that the complete agreement responses to the organizational alteration questions came from users who perceived that organizational processes had changed when, in reality, changes were limited to task-specific procedures (e.g., order entry, cost estimation, etc)

Given the lack of significant organizational alteration on the part of CEDPM before and during the implementation and the confusion this lack of alteration may have generated in participants—confusion hinted at earlier in the survey's low reliability scores in this area—it would have been better, in retrospect, to have dropped this variable from the study.

This realization is bolstered by the fact that users typically resist organizational alterations because they fundamentally fear change (Daft, 2001; Kreitner & Kimicki, 2001). If significant organizational changes had been made by CEDPM before or during the ERP implementation, then users would have perceived the process to be much more painful and their responses to these particular questions would have been much more negative than they were.
B. Technical Alterations

The analysis of survey data indicates that the proposition (H₂) "technical alterations to the ERP software resulting from user demand will negatively correlate with successful ERP implementation" was not supported. Rather than correlating significantly and negatively with user perceptions of successful ERP implementation, technical alterations to ERP software, in fact, correlated significantly and positively. What could account for this odd turn of events?

Hong and Kim (2002) discovered that users tend to favor technical alterations if the changes in question cause the new system to mimic the old. CEDPM failed to either institute significant organizational alterations. This, of course, necessitated significant technical alterations to the ERP software in order to adapt it to the firm's existing processes and procedures. Since these adaptations forced the new system to imitate one with which they were already comfortable, system users naturally associated these alterations with their idea of successful implementation (i.e., one did not arouse their fear of change or challenge them to adapt). The cost in time and money needed to implement these alterations and deal with their unintended consequences did not seem to enter into system users' evaluation of the new system or its implementation. Neither did users seem aware of nor did they take into account either the new system's lost potential or the damage these alterations may do in the end to business and system efficiencies. Time may alter these perceptions.
C. Training

The analysis of survey data indicates that the proposition \((H_{A3})\) "system users' perception of the quality of training on the ERP system will correlate positively with successful ERP implementation" was not supported. Comments pulled from the open-ended questions, as well as the percentage breakdown of responses to relevant survey questions (see Appendix C), indicate that the users perceived the training to be inadequate and, consequently, useless to them in their attempts to use the new system to better perform their jobs now or in the future. Participants from all three divisions responded consistently that they disagreed that training helped them to perform their jobs using the ERP system. Only Atlantic users slightly agreed with the statement.

Training, as developed by the implementation team, combined classroom instruction with hands-on learning. Time considerations, unfortunately, forced the implementation team to adopt a highly accelerated regimen. Classroom instruction in this new and very complicated system was limited to one week, with one additional week scheduled for hands-on practice. No provisions were made for follow-up training. Manuals containing instructions tailored to individual job tasks, however, were given to each participant. Management highly encouraged attendance. Classroom sessions were repeated to allow departments to split attendance, thus, permitting current business processes to continue unimpeded.

Negative reactions to the training provided were aggravated by several additional factors. The time gap between system user training and system implementation in the Omaha division, a gap that might have been bridged by follow-up training, undoubtedly
fueled frustration with both the new system and the training meant to support it. By the
time Atlantic’s implementation commenced, however, technical alterations to the new
system had been perfected for the most part and trainers had refined their presentations of
the material. These facts may account for the more positive response to the training
questions offered by Atlantic participants. Fresno’s implementation, on the other hand,
suffered from a lack of training staff. Implementation efforts at a prior division had
fallen seriously behind schedule and staff normally assigned to training duties had to
remain behind to work with users at the previous site. Users indicated they effectively
performed their jobs using the new ERP system because of their own resourcefulness.
Another possibility, observed by some who have interacted with users at this site since
the implementation, is Fresno’s users can perform their tasks, but not as efficiently as
they could have with better training.

D. Key Users

The analysis of survey data indicates that the proposition (H₄) “key system users’
involvement with the ERP system will correlate positively with successful ERP
implementation” was not supported. Respondents made few comments concerning this
factor. Key users were involved, but they may not have been involved enough or for a
long enough period of time to make an impact or are not continuing to be involved.
Several key users, who were involved in the implementation, are no longer with the
company. Of the sites sampled, this shortage of trainers and implementation staff in
general was most keenly felt by the Fresno division, as demonstrated by the consistently
negative tenor of its responses to the system user items on the questionnaire (see
Appendix C). Key users may not have been trained well enough to assist others adequately. In addition, key users may not have had the respect of the systems users necessary for them to encourage and support rank and file users’ needs.

E. Project Management

The analysis of survey data indicates that the proposition (H₃) “effective interaction with the project manager, as perceived by the system user, will correlate positively with successful ERP implementation” was supported. This implies that system users’ perception of how the implementation project was controlled, how its directives and goals were communicated, how its resources were made available, and how crucial relationships were handled all contributed significantly to the success of the ERP implementation. Responses to the open-ended question on perceived goals of the ERP system indicate that the majority of respondents had similar perceptions of the new system’s goals. The perceived goals could be divided into three categories: improvement (either in business processes, specific functions, reporting capabilities, data access, etc.), integration (of functional areas, data, or the company as a whole), and cost reductions (specifically labor costs). That the results of the statistical tests applied to this variable bordered on significance (see Table 5) might indicate that the variable was related to successful ERP implementation, but that the relationship is not as strong as that between successful ERP implementation and technical alterations.
VII. Study Limitations and Implications

A. Limitations

Small sample size and the difficulties inherent in isolating the effects of the independent variables inherent in an exploratory, observational (i.e., "quasi-experimental") study greatly limited the ability of this study's results to be generalized. Future studies will need to incorporate significantly greater numbers of respondents and incorporate randomized assignment of those respondents to either treatment or experimental control subgroups.

Circumstances outside the author's control may have also compromised the study's internal validity. First, results gleaned from a prior survey conducted by Corporate Express that touched upon many of the issues examined in this study were released shortly before the distribution of this researcher's questionnaire. The second study's respondents may have been influenced—consciously or unconsciously—by the results of the first. This unforeseen circumstance may have reduced the response rate.

Secondly, considerable lengths of time (i.e., weeks if not months) often transpired between "treatments" (i.e., technical alterations, training courses, etc.) and the measurement of the possible effects on user perceptions of successful ERP implementation. This may have distorted respondents' memories of events and perceptions. Future studies will need to more carefully coordinate treatment and measurement.

Thirdly, the fact Corporate Express failed to incorporate any discernable organizational alterations rendered measures of this theoretically important construct
unreliable. Future studies should identify and include organizations for which organizational alterations are a key component of an ERP implementation.

Fourthly, this study based its definition of ERP implementation success on user rather than management priorities. However, it is likely than user perceptions of ERP implementation success have been influenced to a significant degree by managers given that management invariably instigates ERP conversions. Researchers can increase the internal validity of future studies by first acquiring a more systematic understanding of the differences between managers’ and rank and file users’ definitions of ERP implementation success.

Finally, the survey’s items were based on a set of operational definitions gleaned from previous research that was by no means exhaustive. Other variables can and should be identified and considered in order to provide a solid theoretical basis for future research.

B. Implications

It is possible to glean from the study results that system users felt the ERP system was implemented successfully and that the new system helped improve their overall job performance as well as the firm’s business processes and overall performance. As future optimizations are made to the ERP, it is important to reiterate the need for good project management. The project management process should communicate the purpose of the project, as well as communicate to individuals what is expected of them. The other area that was significantly correlated with implementation success was technical alterations. Alterations made to the ERP software apparently helped users perform better, but further
technical improvements in the system—particularly those associated with its report
generation functions—were needed.

One of the study's most surprising findings related to system users' perceptions of
the implementation's training component. IS research indicates that training is important
when implementing any new information system, particularly ERP systems.
Interestingly, the study revealed that system users' beliefs that the training offered in
conjunction with the installation was inadequate did not affect their perceptions of the
implementation's overall success. This begs a number of questions 'In general, do users
perceive training to be a waste of time?' 'Are new tasks and/or systems best learned by
trial and error?' 'Should training include material on an industry's best practices?'
'How do system user apathy and/or motivation affect ERP training efforts?' 'If
employees felt valued enough to be included in ERP training efforts, would that improve
morale and subsequent performance. IS research asserts that system user training is
crucial. These results challenge current assumptions regarding training and suggest new
avenues for future research.

This study also suggests the need for additional research into the process of
achieving user buy-in for organization alterations, so that technical and organization
alterations can be initiated that allow ERP systems to exercise their full potential. Results
relating to organizational alterations indicate that users expect changes to processes and
procedures during implementation of a new system and might be more accepting of true
business process reform than previously imagined. Furthermore, if key user input is not
perceived as being related to successful ERP implementation, then does their role in the process need to be redefined in order for them to be effective?

ERP implementation strategies and techniques will continue to evolve as more companies choose this technology. This study is a modest step forward in the discipline's efforts to understand the variables that affect successful implementation.

**VIII. Conclusion**

Implementing an ERP system offers business many benefits. Yet, the hours of work and dollars invested have a high percentage of failing to meet budgets and timelines or of the system not even being completed. The theory has been proposed that a relationship exists between the user's perceptions of the factors involved in an ERP implementation process and their perception of the implementation success. This study found that technical alterations and project management have a relation to the implementation success of an ERP system. Organization alterations, training and the use of key users in the implementation process do not have a correlation to implementation success. Even though, these were the results of the statistical evaluation, there were several questions raised for future research. The angle of this study was from the users' perception, which is an area that has had very little research done and has many possibilities to be explored. The previous research of the importance of training was challenged and left questions as to how the user perceives training and its importance to implementing a new system. Business reorganization has also been researched as an important consideration for an ERP system implementation. Yet, this case study implemented an ERP without any business reorganization. How extensive and how to
best achieve business reorganization will be an interesting challenge for this company as well as an area for further research for other businesses implementing ERP systems. Key users involvement in the implementation process is another area of speculation and needed research. What other variables may have impacts to an ERP implementation from the user perception that have not even been raised? The implication that if the users have a positive perception of the ERP system, then a solid base has been successfully implemented resulting in a functioning information system that can make a favorable return on investment and add value to the company as it continues maturing. This study has touched a small surface of many possibilities surrounding a technology that is here to stay for many years to come.
References


<http://www.dmreview.com>


Appendix A: Survey Instrument

Please respond to the items below. This information will be used to categorize the responses received.

1. The division where I work is _______________________________.

2. The department I work in is
   - Customer Service
   - Financial
   - Technical
   - Manufacturing
   - Office/Administrative
   - Purchasing
   - Sales/Marketing
   - Warehousing/Distribution
   - Other – Describe: ____________________

3. The estimated time I spend each day using the Baan ERP software.
   - 100% - 75%
   - 74% - 50%
   - 49% - 25%
   - 24% - 1%
   - 0% (If 0%, please return this form and do not proceed further.)

The items below question different aspects of the ERP project implemented at Corporate Express Document and Print Management. Please read each statement carefully and respond by circling the number that most closely reflects your opinion.

<table>
<thead>
<tr>
<th></th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am capable of doing my job using the new ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>The new ERP system has become a tool to help me accomplish my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>The more I know about the new ERP system the easier it is to use.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>The new ERP system provides new opportunities for our business.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>I have positive expectations for the ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>I am eager to learn more about the new</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Complete</td>
<td>Slightly</td>
<td>Neutral</td>
<td>Slightly</td>
<td>Completely</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>---</td>
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<td>---------</td>
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<td>------------</td>
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</tr>
<tr>
<td></td>
<td>Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>As a result of the ERP implementation, the procedures I follow to do my job have changed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>As a result of the ERP implementation, the policies I follow to do my job have changed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Since the ERP system has been implemented I have had to learn other aspects of our business.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Since the ERP system has been implemented it has been necessary for me to interact with other departments that I didn’t have to interact with before.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>Organization changes that have occurred with the new ERP system have been positive.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>The new ERP system checks if I enter information in the wrong format.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Extra functionality has been added (at my request or another user’s request) that allows me to more accurately perform my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>Extra functionality has been clearly documented to avoid confusion.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Standard reports available within the ERP system provide me with the information I require to adequately perform my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>The reports available within the ERP system are specific enough to send to customers without any modifications.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Exploring the ERP system has let me discover helpful methods for accomplishing my job.</td>
<td>Complete Agree</td>
<td>Slightly Agree</td>
<td>Neutral</td>
<td>Slightly Disagree</td>
<td>Completely Disagree</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------------</td>
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<td>----------------</td>
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<tr>
<td>17</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>The training I received taught me enough to perform my job with the ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>As a result of my training, I have a general understanding of how the tasks I perform affect the other parts of the business.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>With the training I received, I feel comfortable using the ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Key Users are CEDPM employees who are knowledgeable of the business. They understand, work with, and envision the possibilities the new ERP system has for meeting the company’s needs.**

<table>
<thead>
<tr>
<th></th>
<th>Key users were involved in the training I received.</th>
<th>Complete Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>22</td>
<td>Key users have helped to make me enthusiastic about the ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>23</td>
<td>Key users continue to be involved in shaping the business needs that relate to the ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>24</td>
<td>I understand the ERP system better due to working with a key user.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>25</td>
<td>I am clear about the goals of the new ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>26</td>
<td>I felt informed about what was expected of me to implement the ERP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Completely Agree</td>
<td>Slightly Agree</td>
<td>Neutral</td>
<td>Slightly Disagree</td>
<td>Completely Disagree</td>
<td>Not Applicable</td>
<td></td>
</tr>
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<td>---</td>
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<td>-------------------</td>
<td>---------------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>I felt the implementation of the ERP system was well managed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
<tr>
<td>28</td>
<td>I understand the importance of changing applicable processes and procedures due to the implementation of the new system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>N/A</td>
</tr>
</tbody>
</table>

What do you perceive to be the goal(s) of the new ERP system?

Please make any additional comments in regards to the new ERP system.
Appendix B: Survey Cover Letter

Dear CEDPM Employee,

I would appreciate a few minutes of your time. I am conducting a research study to satisfy the requirements of a Master’s Degree in Management Information Systems at the University of Nebraska at Omaha. The purpose of the study is to analyze the relationship between the user perceptions of the Enterprise Resource Planning (ERP) implementation process at a manufacturing business, Corporate Express Document and Print Management, and the success of that implementation.

Since this study involves user perceptions regarding ERP implementation, it is critical that I obtain responses from individuals who have been involved with the ERP system at CEDPM.

Only 5-10 minutes of your time will be needed to complete the attached survey and return it to me in the envelope provided. Your participation is entirely voluntary. You may decline to answer specific questions or terminate participation at any time. Please be assured that individual responses will be kept anonymous, in strict confidence, and used only to obtain information about perceptions of an ERP implementation process and the perception of success of that implementation. Your responses will be tabulated and reported as part of the group statistics. Open-ended responses may be reported verbatim in the final results of this paper.

Please complete the survey and return it by April 30, 2003.

The accuracy of the study depends upon your responses, which will play a major part in understanding the factors influencing ERP implementation success.

Please take a few minutes to complete the attached survey and return it to me in the envelope provided through the inner company mail system. If you have any questions regarding this study, please feel free to contact either one of us by email or phone. Alternately, you may contact the Institutional Review Board at the University of Nebraska Medical Center (402-559-6463) for questions concerning your rights as research participants.

Thank you for your time and cooperation in this research effort.

Shirley R. Shouse, Graduate Student
CEDPM Headquarters Office
4205 S. 96th St.
Omaha, NE 68127
Phone: (402) 898-6353
E-mail: shirley.shouse@cexp.com

Peter Wolcott, Associate Professor
Department of Information Systems and Quantitative Analysis (ISQA)
College of Information Science and Technology
University of Nebraska at Omaha
Omaha, NE 68182-0392
Phone: (402) 554-3158
E-mail: pwolcott@mail.unomaha.edu
### Appendix C: Analysis of Responses by Variable and Site

#### Successful ERP Implementation

<table>
<thead>
<tr>
<th>Item</th>
<th>Site</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am capable of doing my job using the new ERP system.</td>
<td>Omaha</td>
<td>30%</td>
<td>60%</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>57%</td>
<td>33%</td>
<td>0%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>57%</td>
<td>14%</td>
<td>21%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>2. The new ERP system has become a tool to help me accomplish my job.</td>
<td>Omaha</td>
<td>16%</td>
<td>37%</td>
<td>21%</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>24%</td>
<td>43%</td>
<td>5%</td>
<td>9%</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>33%</td>
<td>27%</td>
<td>14%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>3. The more I know about the new ERP system the easier it is to use</td>
<td>Omaha</td>
<td>25%</td>
<td>55%</td>
<td>10%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>48%</td>
<td>38%</td>
<td>9%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>53%</td>
<td>33%</td>
<td>7%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>4. The new ERP system provides new opportunities for our business</td>
<td>Omaha</td>
<td>5%</td>
<td>35%</td>
<td>30%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>10%</td>
<td>25%</td>
<td>35%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>33%</td>
<td>20%</td>
<td>33%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>5. I have positive expectations for the ERP system.</td>
<td>Omaha</td>
<td>10%</td>
<td>35%</td>
<td>25%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>10%</td>
<td>48%</td>
<td>9%</td>
<td>19%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>27%</td>
<td>40%</td>
<td>20%</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>6. I am eager to learn more about the new ERP system.</td>
<td>Omaha</td>
<td>35%</td>
<td>40%</td>
<td>25%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>67%</td>
<td>24%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>53%</td>
<td>27%</td>
<td>13%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>Overall Averages:</td>
<td>33%</td>
<td>35%</td>
<td>16%</td>
<td>8%</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>
### Organizational Alterations

<table>
<thead>
<tr>
<th>Item</th>
<th>Site</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. As a result of the ERP implementation, the procedures I follow to do my job have changed.</td>
<td>Omaha</td>
<td>89%</td>
<td>11%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>71%</td>
<td>14%</td>
<td>10%</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>73%</td>
<td>13%</td>
<td>13%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>8. As a result of the ERP implementation, the policies I follow to do my job have changed.</td>
<td>Omaha</td>
<td>50%</td>
<td>28%</td>
<td>17%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>62%</td>
<td>24%</td>
<td>14%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>64%</td>
<td>14%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>9. Since the ERP system has been implemented I have had to learn other aspects of our business.</td>
<td>Omaha</td>
<td>29%</td>
<td>29%</td>
<td>30%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>33%</td>
<td>33%</td>
<td>24%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>47%</td>
<td>33%</td>
<td>13%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>10. Since the ERP system has been implemented it has been necessary for me to interact with other departments that I didn’t have to interact with before.</td>
<td>Omaha</td>
<td>21%</td>
<td>42%</td>
<td>26%</td>
<td>0%</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>29%</td>
<td>33%</td>
<td>14%</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>33%</td>
<td>13%</td>
<td>33%</td>
<td>13%</td>
<td>7%</td>
</tr>
<tr>
<td>11. Organization changes that have occurred with the new ERP system have been positive.</td>
<td>Omaha</td>
<td>0%</td>
<td>6%</td>
<td>21%</td>
<td>47%</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>0%</td>
<td>25%</td>
<td>45%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>21%</td>
<td>29%</td>
<td>29%</td>
<td>14%</td>
<td>7%</td>
</tr>
</tbody>
</table>
Overall Averages: 45% 25% 21% 9% 7%

<table>
<thead>
<tr>
<th>Technical Alterations</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Site</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Omaha</td>
<td>5%</td>
<td>37%</td>
<td>5%</td>
<td>37%</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>14%</td>
<td>33%</td>
<td>10%</td>
<td>29%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>27%</td>
<td>20%</td>
<td>27%</td>
<td>13%</td>
<td>13%</td>
</tr>
</tbody>
</table>

12. The new ERP system checks if I enter information in the wrong format.

13. Extra functionality has been added (at my request or another user's request) that allows me to more accurately perform my job.

14. Extra functionality has been clearly documented to avoid confusion.

15. Standard reports available within the ERP system provide me with the information I require to adequately perform my job.

16. The reports available within the ERP system are specific enough to send to customers without any modifications.
<table>
<thead>
<tr>
<th>Item</th>
<th>Site</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Exploring the ERP system has let me discover helpful methods for accomplishing my job.</td>
<td>Omaha</td>
<td>5%</td>
<td>20%</td>
<td>50%</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>0%</td>
<td>47%</td>
<td>26%</td>
<td>16%</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>13%</td>
<td>33%</td>
<td>20%</td>
<td>13%</td>
<td>20%</td>
</tr>
<tr>
<td>Overall Averages:</td>
<td></td>
<td>8%</td>
<td>23%</td>
<td>22%</td>
<td>26%</td>
<td>22%</td>
</tr>
</tbody>
</table>
## Training

<table>
<thead>
<tr>
<th></th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The training I received taught me enough to perform my job with the ERP system.</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>Omaha</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td>Atlantic</td>
<td>10%</td>
<td>25%</td>
<td>20%</td>
<td>15%</td>
<td>30%</td>
</tr>
<tr>
<td>Fresno</td>
<td>0%</td>
<td>13%</td>
<td>20%</td>
<td>40%</td>
<td>27%</td>
</tr>
</tbody>
</table>

| | | | | | |
|---|---|---|---|---|
| 19. As a result of my training, I have a general understanding of how the tasks I perform affect the other parts of the business. | 0% | 10% | 25% | 40% | 25% |
| Omaha | 0% | 10% | 25% | 40% | 25% |
| Atlantic | 20% | 35% | 15% | 25% | 5% |
| Fresno | 7% | 27% | 33% | 13% | 20% |

| | | | | | |
|---|---|---|---|---|
| 20. With the training I received, I feel comfortable using the ERP system. | 10% | 10% | 35% | 30% | 15% |
| Omaha | 10% | 10% | 35% | 30% | 15% |
| Atlantic | 10% | 35% | 20% | 25% | 10% |
| Fresno | 7% | 21% | 21% | 29% | 21% |

Overall Averages: 8% 21% 23% 27% 21%
### Key System Users

<table>
<thead>
<tr>
<th>Item</th>
<th>Site</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Key users were involved in the training I received.</td>
<td>Omaha</td>
<td>0%</td>
<td>35%</td>
<td>10%</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>15%</td>
<td>30%</td>
<td>25%</td>
<td>25%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>20%</td>
<td>7%</td>
<td>20%</td>
<td>20%</td>
<td>33%</td>
</tr>
<tr>
<td>22. Key users have helped to make me enthusiastic about the ERP system.</td>
<td>Omaha</td>
<td>5%</td>
<td>15%</td>
<td>40%</td>
<td>10%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>10%</td>
<td>25%</td>
<td>30%</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>0%</td>
<td>13%</td>
<td>47%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>23. Key users continue to be involved in shaping the business needs that relate to the ERP system.</td>
<td>Omaha</td>
<td>5%</td>
<td>42%</td>
<td>16%</td>
<td>21%</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>5%</td>
<td>50%</td>
<td>35%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>20%</td>
<td>20%</td>
<td>40%</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>24. I understand the ERP system better due to working with a key user.</td>
<td>Omaha</td>
<td>15%</td>
<td>45%</td>
<td>20%</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>10%</td>
<td>55%</td>
<td>10%</td>
<td>25%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>20%</td>
<td>13%</td>
<td>33%</td>
<td>7%</td>
<td>27%</td>
</tr>
<tr>
<td>Overall Averages:</td>
<td></td>
<td>10%</td>
<td>29%</td>
<td>27%</td>
<td>16%</td>
<td>17%</td>
</tr>
</tbody>
</table>
## Project Management

<table>
<thead>
<tr>
<th>Item</th>
<th>Site</th>
<th>Completely Agree</th>
<th>Slightly Agree</th>
<th>Neutral</th>
<th>Slightly Disagree</th>
<th>Completely Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. I am clear about the goals of the new ERP system.</td>
<td>Omaha</td>
<td>10%</td>
<td>35%</td>
<td>25%</td>
<td>25%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>10%</td>
<td>40%</td>
<td>25%</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>27%</td>
<td>13%</td>
<td>47%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>26. I felt informed about what was expected of me to implement the ERP system.</td>
<td>Omaha</td>
<td>0%</td>
<td>10%</td>
<td>35%</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>25%</td>
<td>30%</td>
<td>30%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>7%</td>
<td>20%</td>
<td>40%</td>
<td>7%</td>
<td>27%</td>
</tr>
<tr>
<td>27. I felt the implementation of the ERP system was well managed.</td>
<td>Omaha</td>
<td>0%</td>
<td>5%</td>
<td>11%</td>
<td>32%</td>
<td>53%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>10%</td>
<td>15%</td>
<td>25%</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>7%</td>
<td>7%</td>
<td>20%</td>
<td>40%</td>
<td>27%</td>
</tr>
<tr>
<td>28. I understand the importance of changing applicable processes and procedures due to the implementation of the new system.</td>
<td>Omaha</td>
<td>26%</td>
<td>37%</td>
<td>26%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Atlantic</td>
<td>40%</td>
<td>40%</td>
<td>15%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fresno</td>
<td>40%</td>
<td>40%</td>
<td>7%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>Overall Averages:</td>
<td></td>
<td>17%</td>
<td>24%</td>
<td>25%</td>
<td>18%</td>
<td>15%</td>
</tr>
</tbody>
</table>