

MOTIVATIONS FOR ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM
IMPLEMENTATION IN PUBLIC VERSUS PRIVATE SECTOR ORGANIZATIONS

by

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ABSTRACT

The goal of this research was to increase the knowledge base regarding Enterprise Resource Planning (ERP) Software implementation, particularly in the public sector. To this end, factors regarding benefits sought through ERP system implementation and critical factors surrounding successful ERP implementation were identified. In addition, the perception of project team members' satisfaction with modules implemented and their concerns about implementing ERP software were identified in this study. The results of this study provided recommendations for public- and private-sector organizations in order to increase their opportunity for successful ERP system implementation.

The literature review and results of this study suggested that the benefits sought during ERP system implementation were consistent among public- and private-sector organizations. Benefits such as increased standardization, better reporting, and reduced operational costs were recognized as goals of ERP software implementation. Factors that attributed to successful ERP system implementations were top management support, and knowledgeable project managers and team members. The t-test analyses found differences among the two groups, public and private sector organizations, regarding some benefits sought and the level of satisfaction with some modules.

The study included recommendations for organizations to fully research ERP functionality prior to implementation, implement strong change management, use other

means of measuring return on investment, ensure employee buy-in and top management involvement, and avoid scope creep.

In loving memory of my grandmother, Bernice H. Britt, whom I adored; and in dedication to my son, Bryan J. Harrison-Henson, whom I consider my best blessing.

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CHAPTER 1

THE PROBLEM AND ITS DESIGN COMPONENTS

Introduction

Since the 1990s, Enterprise Resource Planning (ERP) software has been one of the most popular business software packages on the market, reaching its height in popularity in 1998. ERP software integrates and centrally manages the business functions of an organization (Buxbaum, 2001). Companies of all sizes and types have implemented ERP software packages to manage their organization, including public-sector organizations (Miranda, 1999).

Public-sector organizations are unique because of additional government regulation and public accountability. Because ERP software is standardized for universal best business practices, it is sometimes difficult for public-sector organizations, such as school systems, to implement. The rise in popularity of ERP software and the evidence of continued ERP implementation in the public sector make it important for school district leaders to understand the concerns and advantages for implementing ERP software.

Statement of the Problem

The purpose of this study was to determine the following: (a) the benefits sought from implementing ERP, (b) the extent to which critical factors were present during the ERP software implementation, (c) the level of satisfaction with the performance of implemented

modules among the project managers and team members, (d) the perceptions of project managers and team members as to the benefits and concerns of implementing ERP, (e) the extent to which selected decision-making processes were used in the organization's decision to implement ERP, and (f) the number of modules purchased with the intent to implement versus those actually implemented. This knowledge will allow organization leaders to make more informed decisions when implementing ERP.

Clarification of the Problem Statement

Definition of Terms

The following definitions are included to clarify terminology usage in the present study.

End-user – An end-user is a person who enters data into the system to initiate a business transaction, such as a requisition or budget transfer.

Enterprise Resource Planning (ERP) – ERP is computer software that provides organizations with the knowledge to manage their core business processes (Miranda, 1999).

Go Live – The Go Live date of an ERP system implementation is the date that the software is made available for use to the end-users.

Implementation team member -- An implementation team member is a person who configures the system for the organization's specific needs.

Project manager – A project manager is an individual who leads the implementation team members into full implementation of the ERP software.

Private corporations – A private corporation is one in which the company is not part of a local, state, or federal government.

Public-sector organization – A public-sector organization is one which is part of a local, state, or federal government.

System Application Products in Data Processing (SAP) – SAP is a type of enterprise resource planning software.

Delimitations

This study was delimited by the self-reported data and subjective opinions obtained from the ERP implementation project managers and team members at public and private-sector organizations in North America. Organizations outside of the North America were not included in this study.

Assumptions

It was assumed that the survey instrument developed by the researcher would permit the assessment of the project managers and team members' perceptions regarding the advantages, and concerns of implementing ERP systems and that all respondents conveyed their honest opinions.

Significance of the Study

The implementation of ERP software has been continuing to grow in the public and private sectors. Thus, it is important that organizational leaders have information to make intelligent decisions. It is also important that organizational leaders understand the issues with which they could be faced when implementing ERP. This study extended Al-Sehali's (2000) dissertation by exploring the differences in the factors affecting ERP implementation

in organizations in the public sector versus those in the private sector. It was intended to provide data that would assist organizational leaders in making informed decisions when implementing ERP by supplying information as to the concerns and satisfaction with ERP implementation. Information from this study may be useful in determining how well the needs and expectations of other organizations have been met when implementing ERP.

Conceptual Framework

Literature Review

The resources selected for review consisted of books, journal articles, white papers, dissertations, and dissertation abstracts. In the information technology community, a white paper is an informational document offering an overview of a technology, product or issue, including its importance and business benefits.

Al-Sehali (2000), in his dissertation, explored ERP software implementation in the Arab Gulf states and United States companies with respect to: (a) the benefits/motivations for implementing ERP software, and (b) the critical factors necessary for successful implementation of ERP software. Further careful investigation and analysis of these two considerations in the United States provided for the development of a conceptual framework for evaluating the differences in implementing an ERP system between public and private organizations (Al-Sehali, 2000).

Enterprise Resource Planning Software

Enterprise Resource Planning software had its beginning in manufacturing resource planning software. This software later evolved into MRPII. In the early 1990s, MRPII was further extended from production planning to cover other business areas such as human resources. MRPII evolved into two systems and directions: Customer Oriented Manufacturing Management Systems (COMMS), and Enterprise Resource Planning (ERP) (Kilian, 2001).

The primary goal of ERP is to improve and increase information flow within an organization (Norris, Hurley, Hartley, Dunleavy, & Balls, 2000). Ideally, ERP software improves cooperation and interaction between all the business units in an organization -- payroll, personnel, purchasing, and inventory management. Integration allows the various departments to more easily share information and communicate with each other.

Also, ERP software standardizes information within the organization. This streamlines the data flow between different parts of a business (Lieber, 1995). In an ERP system, data are entered by one department and staff in other departments immediately have access to the information without having to reenter the information into the system. Minahan (1998) stated “ERP gives all users a single, real-time view of their company’s available resources and commitments” (p. 113).

Public-sector organizations, such as school systems, may have specific requirements not applicable to private organizations. In addition, the cost of implementing an ERP system also may make it prohibitive for public-sector organizations to implement. According to Miranda (1998), if an ERP vendor only designs software for the public sector then he may not be following universal best business practices. However, “transporting business practices

to the public sector may not be desirable or even possible. Some also may point out that the greater burden of accountability in the public sector is entwined in processes that appear cumbersome or redundant to those from the private sector” (p. 7).

Despite the barriers to implement, at the time of this study, several public-sector organizations, had implemented an ERP system. Several large school districts have implemented an ERP system, including Houston Independent School District (Houston, Texas), Orange County Public Schools (Orlando, Florida), and Duval County Public Schools (Jacksonville, Florida).

At the time of this study, there were at least six major ERP vendors: Systems, Applications, and Products in Data Processing (SAP), Lawson, Oracle, Baan, J.D. Edwards, and People-Soft (Al-Sehali, 2000). Of the six major ERP vendors, SAP had the largest market share. Founded in 1972 by five former IBM systems engineers and headquartered in Walldorf, Germany, SAP was the world's largest inter-enterprise software company, and the world's third-largest independent software supplier overall. SAP employs over 28,900 people in more than 50 countries (SAP, 2003).

Benefits of Implementing ERP

This study sought to determine if there were differences in motivations to implement ERP in private-sector organizations versus public-sector organizations. Thus, the study evaluated if there were differences in the benefits sought through ERP implementation in the public sector versus the private sector. The study further sought to evaluate what factors have contributed to successful implementations within these two types of organizations. As an extension of Al-Sehali’s study, this study included a review of literature based on the benefits identified by Al-Sehali.

Al-Sehali (2000) identified seven benefits of an ERP system: (a) easier access to reliable information, (b) elimination of redundant data and operations, (c) reduction of cycle times, (d) cost reduction, (e) adaptability in a changing business environment, (f) Year-2000 enabled, and (g) Euro-enabled. Organizations usually implement ERP software to accomplish one or all of the benefits listed above, hence the motivations for implementing an ERP system.

ERP systems allow information to be communicated more quickly and consistently, via the shared database, than a non-integrated system. A shorter communication time between departments can decrease the time required to complete business transactions (cycle time), provide easier access to information by all departments within an organization, and reduce redundancy (Bingi et al., 1999 and Al-Sehali, 2000). Eliminating redundancy, improving controls, and increasing inventory turnover increases efficiency within an organization are benefits of an ERP system implementation.

Ideally, an ERP system is easily adaptable to new processes and requirements. ERP systems are designed to respond quickly to new business demands and can be changed to respond to the changing environment. Most ERP software vendors purport flexibility as one of the advantages of the software (Miranda, 1998). ERP vendors are constantly evolving to meet the changing business demands.

In 1999, many companies implemented new software because their present software could not process the year 2000. ERP software was one of the software packages that could recognize the year 2000 and thus was implemented by many companies to address the year 2000 problem. Although the year 2000 problem could have been fixed by adding lines of

software code to companies' existing software, many companies found it easier and more cost-effective to implement a year 2000-compliant ERP solution (Minahan, 1998).

In addition, by 2001 companies doing business in Europe had to be able to accommodate the Euro currency. This is a major issue for companies that do business globally. Because most ERP systems can accommodate the Euro, many companies have implemented the software to meet their needs to use the new currency (Al-Sehali, 2000).

Successful ERP Implementation

The success of an ERP solution depends on how quickly benefits can be reaped from the software (Al-Sehali, 2000). Thus, the shorter the implementation the sooner an organization can realize a return on investment. The return on investment for the acquisition of an asset is defined as the overall profit (or loss) on an investment expressed as a percentage of the total invested. It is a ratio between the income generated by the asset and the cost of the asset. Return on investment is a measurement of management's efficiency and effectiveness.

If not properly managed, implementation of ERP software can be difficult. Al-Sehali found that the major critical success factor for ERP implementation was top management support and involvement (Al-Sehali, 2000). Al-Sehali found other factors relevant to a successful implementation are managing change, having a clear understanding of the objectives ERP is to serve in the company, providing adequate training, and reassuring employees of job security. These findings are consistent with the critical factors identified by Bingi, Sharma, and Godla (1999).

According to Bingi, Sharma, and Godla (1999), there are 10 critical issues that contribute to the success of an ERP implementation: top management commitment,

reengineering, integration, ERP consultants, implementation time, implementation costs, the ERP vendor, selecting the right employees, training employees, and employee morale.

Organizations which have these factors present during their implementation are most likely to experience a successful implementation. They are more likely to achieve a return on their investment in a short period of time.

Bingi et al. (1999) stated, “The success of a major project like an ERP implementation completely hinges on the strong, sustained commitment of top management. This commitment, when percolated down through the organizational levels, results in an overall organizational commitment. An overall organizational commitment that is very visible, well defined and felt is a sure way to ensure a successful implementation” (p. 9). Thus, for successful ERP implementation, top management must be involved in every step.

In addition, in order for successful implementation to occur, organizations had to change the way they do business in order to align with the industry best practice as defined by the ERP vendor (Bingi et al. 1999). Companies must carefully research current business processes and how the processes will change after the ERP implementation.

In order to have a successful implementation, organizations must recognize how the integration affects the entire business. Bingi et al. (1999) stated, “Prior to integration, the functional departments used to work in silos and were slow to experience the mistakes other departments committed” (p. 11). After ERP implementation, departments are forced to work together because of system integration.

Another critical factor affecting a successful implementation is the ability to hire trained consultants. Because information regarding ERP implementation is limited and skilled professionals are not easily found, organizations must seek the necessary skills from

consultants. There is a shortage of competent ERP consultants. In addition, finding consultants with industry specific knowledge, such as public sector experience is even more difficult.

Implementation time is crucial in companies recognizing a return on their investment. Most companies want to keep implementation time at a minimum. Implementation time is affected by the number of modules being implemented, the scope of the implementation, the extent of customization, and the number of interfaces with other applications (Bingi et al., 1999).

Implementation costs also need to be kept at a minimum in order to recognize a greater return on investment. In addition to the cost of the software, companies must also consider the other costs, such as consultants. Because these consultants are in high demand they can be expensive. Many companies also have to increase the salary of members of their implementation team in order to keep them from leaving the company for higher wages. There are also costs associated with upgrading hardware to support the system.

According to Bingi et al. (1999), selecting a suitable ERP vendor is extremely important in a successful implementation. Many small ERP vendors are being acquired and merged with larger vendors. Finding a company with financial stability is essential when implementing an ERP. In addition, organizations must consider the vendor's market focus, track record with customers, vision of the future, and with whom the vendor is strategically aligned.

In addition to finding the right ERP vendor, companies must also have realistic expectations of the capability of the ERP system. According to Loizos (as cited in Al-Sehali, 2000), a fully integrated system requires not only an effective information system, but also

the corporate philosophy to support it. A company must know what to realistically expect from the vendor when implementing ERP software.

Another critical success factor in implementing an ERP system is selecting the right project team and project manager. Companies usually have to dedicate some of their top employees to the implementation team for at least one year. This causes backfilling and gaps in the departments that they leave behind. These internal resources on the project should exhibit the ability to understand the overall needs of the company and also be aware of the best business practices in the industry (Bingi et al., 1999). In addition, they must learn the intricacies of the ERP software.

Training employees is another significant issue in successfully implementing ERP software. ERP systems are extremely complex and demand rigorous training. It is difficult for trainers or consultants to pass on the knowledge to the employees in a short period of time (Bingi et al., 1999). Without proper training, end-users are likely to become frustrated with the new ERP and are likely to make costly errors because of a lack of understanding of the ERP.

Bingi et al. (1999) also found that employee morale can be affected by implementing ERP if change is not appropriately managed. Employees may become frustrated by the increased demand for accuracy and computer proficiency demanded by the ERP. Also, because of the long hours required by the implementation team, it can be easy for their morale to be affected. Management must remain cognizant of the stress of implementing ERP.

Al-Sehali (2000) identified the following factors that contribute to the failure of an ERP: speed and difficulty of implementation, selection of the wrong ERP software,

commitment to a single vendor, too many features, cost of an ERP system, unrealistic expectations, lack of attention to the infrastructure planning, centralized decision-making, lack of a strategy, insufficient ERP experience, and undue haste. If too many of the above variables are present, the implementation of the ERP software could be a failure.

Because of the many benefits that can be achieved with ERP software, many organizations have implemented the system. An ERP implementation can be considered successful if the organization achieves the expected return on investment within the expected timeframe. As the market for ERP has become saturated, the only opportunity for new business is within the public sector (Richardson, 2002).

Research Questions

The following research questions guided this study.

1. What were the benefits sought in the implementation of ERP software in public and private organizations?
2. To what extent were critical factors present during the ERP implementation? How do these factors differ between organizations in the public sector versus the private sector?
3. To what extent were the respondents satisfied with performance of the implemented ERP modules? How did satisfaction differ between organizations in the public and private sectors?
4. What were the concerns regarding the ERP implementation project as perceived by the implementation team members?
5. To what extent were selected decision-making processes used in the organization's decision to implement ERP?
6. Which modules did the organization intend to implement versus those actually implemented and why?

Methodology

Population

The population for this study consisted of those individuals who were a part of an implementation project team at a public or private sector organization in North America, which had implemented or will implement ERP software. Participants for this study were randomly selected from a known list of SAP project managers. A sample of 100 private sector and 100 public sector organizations was used for the study.

Data Collection and Instrumentation

Data were collected via a survey designed by the researcher. The researcher created a survey instrument based on the benefits of implementing ERP and the critical factors affecting an ERP implementation as defined in the review of literature. As the instrument was developed, it was periodically reviewed by ERP professionals and modified based on their suggestions.

The survey was separated into four parts. Part 1 of the survey instrument addressed Research Question 1 by asking questions regarding the benefits sought and realized by implementing the ERP software. Part 2 of the survey asked questions regarding critical factors present during the implementation, and addressed Research Question 2. Part 3 of the survey addressed Research Question 3 by asking questions regarding the modules purchased and implemented as well as the level of satisfaction with each module. Part 4 (Questions 4.1 – 4.9) of the instrument addressed Research Question 4 by asking questions regarding implementation concerns. Questions 4.10 and 4.11 of Part 4 of the survey instrument asked questions about the decision-making process used for implementing the ERP software and addresses Research Question 5. Questions 4.12, 4.13, and 4.14 addressed Research Question

6 by asking questions regarding modules implemented versus those intended to implement and the reason(s) why.

Data Analysis

There were two groups for comparison in the study, public sector organizations and private sector organizations. The Statistical Package for the Social Sciences for Windows (SPSS) was used to analyze the data.

In order to analyze the first research question, that sought to find information regarding the benefits sought in the implementation of ERP software, Part 1 of the survey instrument was analyzed for frequencies of yes and no responses to both Parts A (Expected) and B (Realized) of the questions . Descriptive statistics were also used to analyze Parts A and B of the questions regarding the level of satisfaction for each benefit. Responses were coded using a 3-point Likert scale, disregarding Not Applicable responses. In addition, in order to determine if there is a difference between the public sector and private sector organizations regarding benefits expected and realized, an analysis of the responses was done using t-tests, at the .05 significance level.

In order to analyze the second research question that sought to find information regarding the critical factors present during the ERP implementation and how these factors differ between organizations in the public sector versus the private sector, Part 2 of the survey instrument was analyzed for frequencies of yes, no and somewhat responses. A t-test was also done to determine if there was a difference between the responses of the two groups, public sector and private-sector organizations, at the .05 significance level.

In order to answer the third research question that sought to find information regarding the modules purchased and implemented, as well as the satisfaction with those

modules, responses to Part 3 of the survey instrument were analyzed for frequencies of yes and no responses. In addition, descriptive statistics were used to describe respondent's level of satisfaction with the modules implemented and purchased for each group. The responses to the level of satisfaction were coded using a 4-point Likert scale, disregarding the Not Applicable response. Lastly, the responses of the two groups were compared to determine if there were differences between the two groups regarding purchased and implemented modules and their level of satisfaction.

In order to answer the fourth research question that regarding the benefits and concerns of the implementation project, the responses to items in question 4.1 of Part 4 were analyzed for frequencies of yes, no, and somewhat responses. These responses were coded using a 3-point Likert scale. In addition, responses to each question were analyzed to see if there were differences in responses between the two groups, using t-tests at the .05 significance level. The responses to Items 4.2 – 4.9 were journalized.

In order to answer the fifth research question that sought to answer the question as to what extent selected decision-making processes were used in the organization's decision to implement ERP, Questions 4.10 and 4.11 of the survey instrument were analyzed for frequency of responses. T-tests were also performed to see if there was a difference in responses between the two groups at the .05 significance level.

In order to answer the sixth research question that sought to answer the question as to which modules the organization intended to implement versus those that were actually implemented and the reason why, Questions 4.12, 4.13, and 4.14 of the survey instrument were analyzed for frequency of responses.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

ERP systems have been adopted by many businesses since 1990. ERP has transformed organizational computing by integrating business processes, sharing common data across the entire enterprise, and producing and accessing information in a real-time environment (Bradford, 2001).

The primary goal of ERP has been to improve and increase information flow within an organization (Norris et al., 2000). This is achieved by integrating departments and functions across a company onto a single computer system that serves the needs of all of the different departments. Integration and the sharing of a common database eliminates departments having to duplicate effort by keying the same information into different computer systems. Single entry of information also minimizes the risk of errors (Koch et al., 2001).

Despite proposed benefits, many companies have had significant problems implementing ERP systems. ERP systems are notoriously complex, and installing the software often forces organizations to change their internal processes. These problems have caused many companies to abandon their ERP initiative or implement the system in limited capacity (Bradford, 2001). Prior to ERP software implementation, processes may not have

been efficient but they were simple. ERP forces departments to integrate and communicate across departments. This can be exceedingly difficult (Koch et al., 2001).

The rise in popularity of ERP software and the evidence of continued ERP implementation in both the public and private sectors makes it important for school district leaders to understand the concerns and advantages of implementing ERP software.

History of ERP

According to Gumaer (1996), accounting was one of the first business applications to be computerized. The first manufacturing software applications were limited generally to inventory control and purchasing and were the by-product of accounting software and the desire by accountants to know the value of inventory. The need for software specifically designed for manufacturing operations led to the development of material requirements planning (MRP), and subsequently, manufacturing resource planning (MRPII) packages.

Material requirements planning software converted the master schedule for products into time-phased requirements for raw materials. The master schedule was used for planning and procurement. This software later evolved into manufacturing resource planning. In the early 1990s, manufacturing resource planning was further extended from production planning to cover other areas such as finance, human resources, and project management. Many manufacturing resource planning applications have evolved into ERP software (Kilian, 2001).

Although ERP vendors still use the same basic model as manufacturing resource planning for the manufacturing portions of their systems, ERP represents the application of newer information technology to the manufacturing resource planning model. These technology changes include the move to relational database management systems, the use of

a graphical user interface, and client/server architecture (Gumaer, 1996). ERP software also expanded the scope of manufacturing resource planning to include other business areas, such as accounting and human resource management.

Prior to ERP, businesses traditionally compiled, stored, and shared information on mainframe-based computing systems. These systems could handle huge amounts of data, but were usually expensive, rigid, and offered limited integration with other systems. As a result companies began moving to a client-server computing architecture. Using a server linked to a network of personal computers disburses computing power across a company and provides users with access to companywide information (Minahan, 1998). At the time of the present study, many school systems were still using mainframe systems for both their business and student functions.

Most ERP systems have been supported by a client/server architecture. Miranda (1999) stated that the benefits of client/server architecture were (a) the elimination of a legion of manual logs and computerized databases, (b) process improvement opportunities permitted by single point of data entry, and (c) the ability for electronic workflow and web-based technologies.

Definitions of ERP

Many different definitions of ERP software were found in the literature. Minahan (1998) stated that on the most basic level, ERP is a complex software system that ties together and automates the basic processes of a business. ERP is an automated spreadsheet that can calculate a company's resources such as inventory, cash and commitments, regardless of whether the data is inputted through an accounting or materials management system.

Koch et al. (2001) stated that ERP systems are nothing more than generic representations of the ways a typical company does business. ERP attempts to integrate departments and functions across a company onto a single computer system that serves all of the different departments' particular needs. ERP software is a set of applications that automate finance and human resources departments and helps manufacturers handle jobs such as order processing and production scheduling (Hoffman, 1998). Komiega (2001) defined ERP as the combination of software, hardware, and business processes, optimized to define a common solution for all aspects of a company's business from order entry to invoice and everything in between.

In the present study, the definitions by David Caruso at Advanced Manufacturing Research, Incorporated and LaMonica were accepted as appropriate. Caruso as cited in Minahan (1998) described ERP as "a transactional backbone" that gives companies access to the information they need to make more knowledgeable decisions or to fuel more task-specific applications, such as electronic commerce. Similarly, LaMonica (1999) defined ERP as the sharing of information among disparate systems to enable better decision making and increase operational speed.

According to Miranda (1999), the following features are present in an ERP system:

1. Modular integration, which refers to different operational functions being tied together in an overall system.
2. Common and relational databases, which organize records into a series of tables linked by common fields.
3. Client/server technology, which is computer architecture wherein a server is networked to end-user desktop computers (clients).
4. Best business practices and process reengineering, which means that the software is modeled after best business practices and is also flexible enough to permit redesign of core operational processes.

5. Workflow capabilities, which refers to the ability to push the flow of information through a business to the right people at the right point.
6. Powerful development toolsets, which allow technical people to redefine menus and panels without changing the underlying programming codes. Toolsets also permit developers to build from scratch additional functionality that may not be available in their ERP system today.
7. Drill down/audit trail capabilities, which refers to audit trails that provide the ability to review all of the history of changes to a record in the database (such as a requisition). ERP audit capabilities record activity by user name, date, time, and transaction. Drill-down permits the ability to reach the source document of a prior step in the process, such as detail for a journal entry.
8. Flexible Chart-of-Accounts, which incorporates detailed information, while maintaining the overall reporting and budgeting structure.
9. Advanced reporting and analysis, which equips decision makers with the tools to detect patterns and trends in order to make better decisions.
10. Web enabling and internet capabilities, which facilitate transactions with the external world. (pp. 2 – 6)

Modules of ERP

Modules of an ERP system refer to the business function (e.g., human resources) for which a group of applications (e.g., payroll) are created to support. Each ERP system offers different modules. Hoffman (1998) provided a description of ERP modules:

1. Manufacturing and Logistics Module – A group of applications for planning production, taking orders, and delivering products to the customer. Examples are production planning, materials management, order entry and processing, warehouse management, transportation management, project management, plant maintenance, and customer service management.
 2. Finance Module – A group of applications for managing the bookkeeping functions of the organization. This module includes general ledger, accounts payable and receivable, fixed assets, treasury management, and cost control.
 3. Human Resources Module – A group of applications for handling personnel-related tasks for corporate managers and individual employees. This module includes payroll, personnel management processes (such as recruitment and vacation allotments), and self-service human resources.
- (p. 2)

Industry Specific Applications

Most ERP systems are designed for manufacturing companies which produce physical products. Companies that do not produce physical items may find it difficult to implement and use ERP systems. To minimize this difficulty, most ERP vendors now offer industry-specific solutions for non-manufacturing companies such as public sector and utility organizations (Al-Sehali, 2000).

Benefits of an ERP System

Software is the enabling technology that allows an organization to automate a particular aspect of its business. The goal for any enabling technology is to allow an organization to more readily achieve its business mission (Reed, 2002). According to Weston (1998), ERP users can achieve their business mission and gain competitive advantage from the way they implement the ERP system and exploit the resulting data. “ERP is a set of building blocks, and it is how those building blocks are put together that gives an organization an advantage” (Towner as cited in Weston, p.2).

Al-Sehali (2000) identified seven benefits of an ERP system: (a) easier access to reliable information, (b) elimination of redundant data and operations, (c) reduction of cycle times, (d) cost reduction, (e) adaptability in a changing business environment, (f) Year 2000 enabled, and (g) Euro enabled. Organizations usually implement ERP software to accomplish one or all of the benefits listed above, hence the motivations for implementing an ERP system.

An ERP system provides access to consistent data throughout the organization. Because ERP software uses a shared database management system, there is easier access to

information by all departments within an organization. All departments enter information into the same database and thus all departments have access to the same information. This allows decisions to be made from an enterprise point of view, accessing information from all departments, rather than separate departments making a decision and then coordinating the information manually (Bingi et al., 1999). Komiega (2001) also stated that one of the primary benefits of an ERP system is that it allows for global visibility of information across the company.

Using a single database also reduces redundancy within an organization. Because the modules are integrated, there is no need for repetitious data entry between departments. Once data are entered by one department they can be accessed through the system by other departments. This eliminates redundant tasks within the organization (Al-Sehali, 2000). This also allows for standardization throughout the organization. Koch et al. (2001) stated that two of the three major reasons why companies undertake ERP are to standardize manufacturing processes and to standardize human resource information.

For many organizations, ERP also reduces cycle times. Cycle time refers to the amount of time necessary to complete a business transaction from inception to completion. For example, the cycle time of a school's supply order can be calculated as the time from when the order is entered into the system as a requisition to the time that the transaction is completed by the order payment. According to Al-Sehali (2000), time reductions are achieved by minimizing delays in flow of information between business units. ERP systems allow information to be communicated more quickly, via the shared database, than a non-integrated system. A shorter communication time between departments can decrease the time required to complete business transactions such as an order.

Cost savings is another benefit that can be achieved by implementing ERP software. For example, Komiega (2001) stated that an ERP system can reduce or eliminate general administration costs associated with the support and maintenance of multiple business systems. Running interfaces between different business systems in order to share information can be expensive because of the programming and data storage issues involved.

One of the biggest gains from ERP packages is that they force a company to institute a proven set of business processes. In addition, ERP systems also allow companies to turn on and off functionality as needed to adapt quickly to changes in their business, whereas a customized application has to be rebuilt (Weston, 1998). ERP systems are designed to respond quickly to new business demands and can be changed to respond to the changing environment. Most ERP software vendors purport flexibility as one the advantages of the software (Miranda, 1999).

New processes can be caused by technology, such as the move from client-server architecture to Internet architecture, or by changes in the business environment, such as the current emphasis on supply chain management and customer relationship management. ERP vendors are constantly evolving to meet the changing business demands and to allow the organization to move nimbly and adapt quickly to changes in the business environment (Weston, 1998).

In 1999, many companies implemented new software because their present software could not process the year 2000. ERP software was one of the software packages that could recognize the year 2000 and thus was implemented by many companies to address the year-2000 problem. Although the year-2000 problem could have been fixed by adding lines of

software code to companies' existing software, many companies found it easier and more cost-effective to implement a year-2000 compliant ERP solution (Minahan, 1998).

In addition, by 2001 companies conducting business in Europe had to be able to accommodate the Euro currency. This is a major issue for companies transacting business globally. Because most ERP systems can accommodate the Euro, many companies have implemented the software to meet their needs to use the new currency (Al-Sehali, 2000).

Costs of an ERP System

Although there have been many benefits to implementing an ERP system, there have also been associated costs. There have been inherent difficulties of implementing software as complex as an ERP system. ERP packages have been built from thousands of database tables. Each table has decision switches which lead the software down one decision path or another. Figuring out precisely how to set all the switches in the table requires a deep understanding of the existing processes being used to operate the business. As the table settings are decided, these business processes are reengineered the ERP's way (Koch et al., 2001).

There are clearly financial costs associated with implementing ERP. Reed (2002) stated that the cost components of an IT project are software, software support, support infrastructure, customization, implementation, training, and change management. Koch et al. (2001) stated that the overlooked costs are training, integration and testing, data conversion, data analysis, consultants ad infinitum, replacing the best and brightest employees, implementation teams who never cease to exist, waiting for the return on investment, and post-ERP depression. In companies with more than \$500 million in revenues that had

implemented ERP, the average cost overrun was 178% and the average schedule overrun was 230% (Miranda, 1999).

In addition, Komiega (2001) stated that the consulting costs can equate to 50% of the total project costs. Training the entire organization could account for 10 to 20% of the total project cost. There has also been a significant cost associated with design and testing from operations, as well as the cost to an internally supported ERP with a dedicated staff.

Umble and Umble (2002) stated that the price of securing the benefits of ERP may be high. The cost of a modest ERP implementation can range from \$2 million to \$4 million depending on the size of the organization and the specific products and services purchased. The cost of a full-blown implementation in a large organization can easily exceed \$100 million. "A recent survey of 63 companies with annual revenues ranging from \$12 million to \$63 billion indicated that the average implementation cost \$10.6 million and took 23 months to complete." (p. 1).

ERP implementation can also cause a company to experience a decline in productivity. A report on ERP Trends which appeared in IIE Solutions (2001) stated that while 24% of survey participants reported no decrease in productivity following implementation, 75% experienced a moderate to severe productivity dip, and 25% had dips lasting up to one year. On average, 25% of the implementations were over budget. Companies also underestimated support costs for the year following initial implementation by an average of 20%. More companies saw their support costs increase rather than decrease in their pre- versus post-ERP environments. The most difficult support tasks were the incorporation of work process changes, software upgrades, support of gap solutions, and the addition of functionality (*Enterprise resource implementation still tough*, 2001).

According to Umble and Umble (2002), not only do ERP systems require considerable time and money to implement, the implementation can also disrupt a company's culture, create extensive training requirements, and lead to productivity dips and mishandled customer orders. Experience indicates that about 50% to 75% of firms in the United States experience some degree of failure when implementing advanced manufacturing or information technology.

ERP Implementation

Implementation Strategies

ERP systems come in modular fashion and do not have to be implemented entirely at once. Several companies follow a phase-in approach in which one module is implemented at a time (Bingi et al., 1999). SAP, a leading ERP vendor, recommends this approach, by suggesting that ERP software package should be implemented "inside-out" installing inventory and financials first, followed by sales and distribution, material management and lastly enhanced financials, production planning, and other modules (Cissna, 1998).

Best of breed is an ERP implementation strategy which involves implementing different software packages, for different functions. The packages are linked to one another through programming interfaces but may not share a common database. According to Miranda (1999), this decreases the risk of overall failure (i.e., sub-par performance of one software system does not lead to all of the systems' failure), and the overall functionality is greater (i.e., the "best" individual applications are being molded into one system). The disadvantage is that the strategy at most produces simulated ERP because there is not one shared database and there could be repetitive data entry. Koch et al. (2001) referred to this

implementation strategy as franchising -- independent ERP systems are installed in each unit, linking common processes. Sherman (2000) defined the best of breed approach as using ERP as a “transaction engine” and integrating additional packages.

With true ERP strategy, a single vendor provides a solution that is viewed as the overall best for the organization as a whole. This strategy seeks to reduce the total cost of ownership of enterprise applications (Miranda, 1999). Koch et al. (2001) referred to this as the Big Bang strategy, in which companies cast off all their legacy systems at once and implement a single ERP system across the entire company.

Implementation Project Management

Managers are often surprised by the scope, size, and complexity of an ERP implementation. As a result, management sometimes does not initiate the necessary level of detailed project management planning and control (Umble & Umble, 2002).

Bingi et al. (1999) stated that implementing any integrated ERP solution is not as much a technological exercise but an “organizational revolution.” Extensive preparation before implementation is the key to success. Implementations must be carried out with patience and careful planning in order to achieve competitive advantage. The longer the implementation process takes to complete, the greater the risk to the success of the project (Reed, 2002).

There are many suggestions as to how an organization should prepare for ERP implementation. Umble and Umble (2002) identified six prerequisites for ERP implementation project success:

1. Organizational commitment
2. Clear communication of strategic goals
3. View ERP as an enterprise-wide venture

4. Select a compatible ERP system
5. Insure data accuracy
6. Resolve multi-site issues (pp. 3 – 7)

According to Donovan (2001) there are also some basic tenets of ERP that should guide management's actions and decisions prior to the implementation project:

1. Make time for effective preparation, implementation, and appropriate use.
2. Have a clearly defined business strategy and business processes.
3. Select ERP software to support strategic and process objectives better.
4. Acquire flexible ERP information technology that can accommodate rapidly changing business conditions.
5. Have the implementation led by a senior executive who has the authority to make changes happen and happen quickly (p. 1).

In addition, Bradford (2001), stated that top management must ask itself the following questions: Does the ERP system strengthen the company's competitive position? How might it erode the company's competitive advantage? How does ERP affect the organization structure and culture? What is the scope of the ERP implementation – only a few functional units or the entire organization? Are there any alternatives that meet the company's needs better than an ERP system?

Jacob and Wagner (1999), identified the five phases of an implementation project plan: (a) initiation, introduction of the software, (b) orientation, configuration for business processes, (c) development, such as developing interfaces, (d) pre-production, preparing for rollout, and (e) post-production, focus on ancillary functionality and features of the system to be rolled out in the future. In addition, Komiega (2001) warns that project managers must also remain mindful of scope creep, budget constraints, and immature consulting.

Implementation Critical Success Factors

Successfully implementing ERP the first time requires a structured methodology that is strategy-, people-, and process-focused (Umble & Umble, 2002). Al-Sehali (2000) found that the major critical success factor for ERP implementation was top management support and involvement. If an implementation does not have top management support, the implementation can fail to meet desired expectations. Al-Sehali found other factors relevant to a successful implementation are managing change, having a clear understanding of the objectives ERP is to serve in the company, providing adequate training, and reassuring employees of job security. These findings are consistent with the critical factors identified by Bingi, Sharma, and Godla (1999).

According to Bingi, et al. (1999), there are 10 critical issues that contribute to the success of an ERP implementation: top management commitment, reengineering, integration, ERP consultants, implementation time, implementation costs, the ERP vendor, selecting the right employees, training employees, and employee morale. Organizations which have these factors present during their implementation are most likely to experience a successful implementation. They are more likely to achieve a return on their investment in a short period of time.

Top Management

In his dissertation, Bradford (2001) stated that one organization characteristic, top management support, was instrumental in explaining ERP implementation success. Top management must take an active role in leading the ERP implementation. The success of a major project like an ERP implementation completely depends on the strong, sustained

commitment of top management. This commitment when transferred down through the organizational levels results in an overall organizational commitment (Bingi et al. 1999).

Management must be involved in every step of the ERP implementation. Some companies make the grave mistake of handing over the responsibility of ERP implementations to the technology department. This risks the entire company's survival because of the ERP system's profound business implications. An overall organizational commitment that is very visible, well-defined, and felt is a sure way to ensure a successful implementation (Umble & Umble, 2002).

Similarly, Glaser (1999) stated that there must be a demonstrated strong commitment to successfully implementing the new system by showing strong leadership from senior management, limiting the initial scope of the project, and working towards achieving an early success. Leadership support is essential to obtain buy-in from all levels of the organization, especially since ERP systems, by their nature, generate such widespread organizational change.

If top management is not strongly committed to the system, and does not actively participate, the implementation has a high likelihood of failure. The implementation of ERP must be viewed by top management as a transformation in the way the company conducts business. Without clear leadership and commitment from top management, individuals throughout the organization will discover creative ways to maintain the status quo, and the power inherent in the new information technology will be wasted (Umble & Umble, 2002).

Reengineering

Bingi et al. (1999) stated that implementing an ERP system involves reengineering the existing business process to the best business process standard. ERP systems are built on best practices that are followed in the industry. The cost and benefits of aligning with an ERP model could be very high. “Research shows that even the best ERP application package can meet only 70 percent of the organizational needs” (p. 5). In order to accomplish the remaining 30%, an organization has to change its processes to conform to the ERP package, customize the software to suit its needs, or not be concerned about meeting the balance. When an organization customizes the software to suit its needs, the total cost of implementation rises.

According to Umble and Umble (2002) automating existing redundant or non-value-added processes in the new system can cause an implementation to fail. The integrated environment of the new ERP system will require the organization to conduct business in a different way. The proper implementation of an ERP system should force key business processes to be reengineered and cause a corresponding realignment in organizational control to sustain the effectiveness of the reengineering efforts.

An ERP system will clearly change the normal mode of operation within and between functions, but it will also change many social systems throughout the organization. If people are not properly prepared for the significant changes that need to take place, the natural reaction will be resistance to change which may sabotage the entire implementation (Umble & Umble, 2002).

Integration

True integration, moving away from departmental independence and creating dependent, effective, cross-functional processes should be a primary goal for successful ERP implementation. Functional silos (departmental independence) defines the organizational boundaries where information flows, and often cooperation stops. ERP must be fully integrated into daily business operations in order for an organization to realize the full benefits. If enterprise integration is to have any chance of complete success, it will be due, to a large extent, to the removal of traditional cross-functional barriers (Donovan, 2001).

According to Bingi et al. (1999), with tight integration, companies must also be aware of the potential risks of the errors. Organizations should have mandatory training classes to educate employees about how transactions flow through the system and how errors affect the activities and departments within the organization. If inaccurate data is entered into the common database, the erroneous data may have a negative domino effect throughout the enterprise. Inaccurate data can lead to errors in payroll and materials management. If a company with inaccurate data just forges ahead under the assumption that data errors will be corrected when they are spotted, the ERP will lose credibility (Umble & Umble, 2002).

ERP Consultants

Because of rapid growth within the ERP software market, there has been a shortage of competent consultants. Finding the right people and keeping them through the implementation can be a major challenge. ERP implementation demands multiple skills – functional, technical, and interpersonal. Consultants with specific industry knowledge, such as public sector, are fewer in number. The success or failure of the project depends on how

well the organization can manage consultants and the necessary knowledge transfer between consultants and internal employees (Bingi et al., 1999).

Implementation Time

The extent of customization required to meet the needs of a specific type of business contributes to the implementation time. This customization takes a long time, depending on the specific requirements of the business. The average length of time for a typical implementation is about 23 months and can take as many as 150 consultants. The length of implementation is affected to a great extent by the number of modules being implemented, the scope of the implementation, the extent of customization, and the number of interfaces with other applications (Bingi et al., 1999).

Implementation Costs

Umble and Umble (2002) stated that for companies with revenues between \$12 million and \$63 billion, the average implementation cost was \$10.6 million. According to Bingi et al. (1999), the total cost of implementation could be 3 to 5 times the purchase price of the software and can equate to 50% of the total implementation project costs. The implementation costs increase as the degree of customization increases. The cost of hiring consultants can consume a large portion of the overall budget for the implementation. Retaining skilled employees can be expensive as well. Employees could double or triple their salaries by accepting other positions; thus, an organization may have to be prepared to increase the salaries of project team members. Project managers must remain cognizant of the implementation costs and seek to minimize these costs. In a recent survey conducted by The Conference Board, a market and management research organization, it was found that

cost continues to be a concern for many companies implementing ERP. Implementation costs were found to be, on average, 25 percent over budget (*Enterprise Resource Implementation Still Tough*, 2001).

ERP Vendors

According to Bingi et al. (1999), selecting a suitable ERP vendor is extremely important in a successful implementation. Many small ERP vendors are being acquired and merged with larger vendors. Finding a company with financial stability is essential when implementing an ERP. In addition, organizations must consider the vendor's market focus, track record with customers, vision of the future, and with whom the vendor is strategically aligned.

In addition to finding the right ERP vendor, companies must also have realistic expectations of the capability of the ERP system. According to Loizos (as cited in Al-Sehali, 2000), a fully integrated system requires not only an effective information system, but also the corporate philosophy to support it. A company must know what to realistically expect from the vendor when implementing ERP software.

Since ERP systems force customers to re-engineer their current business practices to fit the ERP model, selecting the wrong ERP vendor could result in an unwilling commitment to architecture and applications that do not fit the organization's strategic goals (Hecht, 1997). Selecting the wrong vendor causes the organization to either completely overhaul all business processes or to add modifications to their system which are difficult to manage and strongly discouraged by ERP vendors. Excessive organizational change and system modifications have a negative effect on achieving a return on investment.

Management must make sure the ERP vendor selected can meet the expectations for the ERP project. Some of the biggest ERP system implementation failures have occurred because the new software's capabilities and needs are mismatched with the organization's existing business processes and procedures. An ERP system that is not designed to meet the specific business needs of the company can cause tremendous problems. A significant mismatch between the technological imperatives of the system and the existing structure, processes, or business needs of the organization will generate widespread chaos (Umble & Umble, 2002).

Selecting the Right Employees

Companies implementing an ERP system must be willing to dedicate some of their best employees to the project for a successful implementation. Often companies do not realize the impact of choosing the internal employees with the right skill set. Internal resources of a company should not only be experts in the company's processes but also be aware of the best business practices in the industry. Internal resources on the project should exhibit the ability to understand the overall needs of the company and should play an important role in guiding the project efforts in the right direction. Lack of proper understanding of the project needs and the inability to provide leadership and guidance to the project by the company's internal resources is a major reason for failure of ERP projects (Bingi et al., 1999).

Training Employees

Training and updating employees on ERP is a major challenge. People are one of the hidden costs of ERP implementation. Without proper training, about 30 to 40% of front-line

workers will not be able to handle the demands of the new system. The people at the keyboard are making important decisions about commitments of the company. They need to understand how their data affects the rest of the company. Some of the decisions front-line people make with an ERP system were the responsibility of a manager in former systems. It is important for managers to understand this change in their jobs and encourage their front-line people to be able to make those decisions themselves (Bingi et al., 1999).

Top managers and all system users must be fully educated so they understand how the ERP system should be integrated into the overall company operation. All users must be trained to take full advantage of the system's capabilities. A failure to educate and train all relevant personnel will guarantee implementation problems (Umble & Umble, 2002).

Employee Morale

Employees working on an ERP implementation project work long hours. The stress of implementation coupled with regular job duties could decrease their morale. Leadership from upper management and support of project leaders should seek to boost the morale of these team members (Bingi et al., 1999).

People may be fearful of changes brought about by any new system, especially one as pervasive as an ERP system. They may fear that the new system will make their jobs more difficult, reduce their importance, or even cost them their jobs. Subsequently, ERP systems may create a great deal of uncertainty in some people as to whether or not they will be able to perform their jobs as well as they did under the old system. Some staff may also be uncomfortable with the realization that with better information, upper management can keep better track of what they are doing and the money they are spending (Umble & Umble 2002).

The negative effect of morale can even cause fear in veteran employees. Because people must create new work relationships, share information that once was closely guarded, and make business decisions they were never required to make, employees can become intimidated by the new ERP software. These kinds of changes are marked by resistance, confusion, redundancies, and errors, unless managed properly (Appleton, 1997).

Implementation Failure Factors

“While systematic knowledge about ERP success factors continues to grow, so too does the overall level of confusion about the practicality of ERP because success stories are matched or exceeded by incidents of failure” (Buckhout as cited in Miranda, 1999, p.1). In a recent survey cited in Umble and Umble (2002), information technology managers identified three primary reasons for the failure of all information technology projects: poor planning or poor management (cited by 77%), change in business goals during the project (75%), and lack of business management support (73%).

According to Donovan (1999), the idea that ERP implementation is strictly a technology project because software is involved is wrong; and, in fact, is one of the leading causes of ERP failure. Systems driven implementations are more likely to fail. If the implementation is treated as simply an information technology project, the ERP system will never realize its full capabilities. In such cases, it is likely that the technology will be deployed in a vacuum; business processes will not be properly reengineered and aligned with the software requirements; and staff will resist using it. To realize the full potential of an ERP system, the technological aspects of the implementation must be managed as part of a broad program of transformation. Umble and Umble (2002) have stated that “successful implementations are typically headed by an individual outside the IT department” (p. 4).

In a study by The Conference Board, survey results indicated that 40% of study participants failed to achieve their business case a year after having implemented ERP. The study also showed that it took six months longer than expected to achieve the company's business case because of pressure to go live and that substantial post-implementation efforts were exerted to identify and measure shortcomings and deficiencies (*Enterprise resource implementation still tough*, 2001).

Donovan (2001) found that five consistent reasons for poor results in ERP implementations:

1. Operating strategy did not drive business process design and deployment.
2. The implementation took much longer than expected.
3. Pre-implementation preparation activities were done poorly if at all.
4. People were not well-prepared to accept and operate the new system.
5. The cost to implement was much greater than anticipated. (p. 1)

Measure of ERP Implementation Success

A properly implemented ERP system has been projected to see "payback" in 12 to 18 months. Effective project management can reduce this timeline. The success of an ERP solution depends on how quickly benefits can be reaped from the software (Al-Sehali, 2000). Thus, the shorter the implementation the sooner an organization can realize a return on investment.

The return on investment for the acquisition of an asset has been defined as the overall profit (or loss) on an investment expressed as a percentage of the total invested. It is a ratio between the income generated by the asset and the cost of the asset. Return on investment is a measurement of management's efficiency and effectiveness.

Traditional return on investment calculations account for only two types of quantifiable benefits – dollars saved and new revenue generated. It ignores non-dollar based metrics such as improvements in the level of customer satisfaction or faster time to market of new products and services. Traditional models have not measured competitively critical benefits such as better and faster decision-making, enhanced sales effectiveness, greater productivity, and organizational flexibility to respond to rapidly changing markets (*Informatica*, 2001).

Return on investment does not quantify intangible costs and benefits. Some suggestions for quantifying the business value of IT investments are: (a) subjectivity gap, which is a subjective evaluation of intangible benefits, (b) revenue distance, which is the gap between the investment itself and the revenue mechanism it supports, (c) business value index, which assigns values between one and four to intangible benefits on a scorecard, and (d) scenario planning, which lays out a variety of paths that can occur if the investment is made or if it is not made and pushes decision-makers to define the likelihood for each scenario and make decisions accordingly (Knowledge@Wharton, 2001). Which measure of return on investment an organization should use depends on the organization. The organization must have a clear process for decision making and a clear articulation of how to account for certain costs and benefits (Harker as cited in Knowledge@Wharton, 2001).

Post Implementation

According to the Government Finance Officers Association (2002), post implementation is the time to reenergize people, refocus their effort, replot their course, and

reschedule timelines for reaching the destination. The Government Finance Officers

Association suggested the following 12 post-implementation best practices:

1. Focus on capabilities and benefits, after going live – there are still benefits to be realized after go live.
2. Continue to establish milestones and priorities toward reaching the initial goals, such as improved efficiency.
3. Keep change in play.
4. Continue to maintain and create milestone plans, and detailed work plans, key dates and deliverables with benefits score boards tracked with vigilance.
5. Improve the return on the core ERP by extending capabilities beyond the ERP platform, such as web-enabled technologies, customer relationship management, and supply chain management.
6. Teach the organization to use new capabilities.
7. Use business case management as a tool to prioritize post implementation change initiatives.
8. Transition project roles from team member to steward, focused on achieving full benefit.
9. Build and leverage process expertise.
10. Promote post-implementation commonality -- do not let departments decide to make their own changes after the implementation. Promote and ensure commonality and integration benefits that come with it.
11. Assign clear ownership of benefits – there should be a person whose fortune rides on realizing benefits.
12. Define metrics to manage change. (pp. 1 – 4)

ERP Implementation in the Public Sector

According to Parkinson (as cited in Songini, 2000), a public-sector ERP system implementation is often more complex than a private-sector one, “because there is often a Gordian knot of regulations, boards, commissions, and agencies that must be disentangled to complete the project” (p.1). In addition, there tend to be lots of turf wars.

One of the barriers to implementation of ERP technology in small and mid-size governments is the cost of system implementation. Many ERP vendors provide special software licensing programs for this market. Some government organizations have been unable to take advantage of ERP software because of the expense (Jacob & Wagner, 1999).

Consistent with the suggestions for private corporations, Glaser (1999) suggested that in selecting ERP software, public sector organizations compare their existing processes to best practices, minimize software modifications, create a request for proposals by modifying another government's proposal, have functional requirements submitted by functional managers, partner with an agency that has public sector implementation experience such as the Government Finance Officers Association, and most importantly map business processes.

According to Glaser (1999), there are 10 steps in the ERP system selection process defined by the Government Finance Officers Association: (a) proposal evaluation plan, (b) analysis of functional requirements, (c) analysis of software/implementation references, (d) comparative cost analysis, (e) software demonstrations, (f) site visits, (g) discovery – short listing, (h) contract negotiations, (i) elevation of final vendor, and (j) establishing the contract.

Glaser (1999) suggested that the project manager should clearly identify the goals to be accomplished in order to frame the project scope and focus and motivate the project team. Recommendations from an ERP implementation project in Des Moines suggested that project managers should avoid scope creep, have clear project objectives, have executive sponsorship, have a strong steering committee, have a strong project manager, assign strong and best people to functional and technical project teams, break the project into discrete phases, use detailed planning and tracking of project tasks, anticipate and admit problems.

Miranda (1999) stated that few governments are capable of large doses of change within a short implementation window. He identifies the following major obstacles:

1. Few “Live” ERP public sector sites to visit
2. Turf battles over system ownership
3. Difficulty establishing project management capabilities

4. Identifying full-time staff resources
5. Finding experienced implementation partners
6. Bottlenecks in the issue resolution process
7. Recognizing limitations of ERP systems
8. Investing in change management
9. Sub-optimization of system capabilities (pp. 7 – 10)

There are public-sector organizations that have implemented ERP systems. These include federal, state, and local governments. Several large school districts and institutions of higher learning have also implemented ERP software packages. Below are several examples of public sector organizations that have implemented ERP systems.

Houston Independent School District

The Houston Independent School District is the largest public school system in Texas and the seventh largest in the United States, at the time of this study. Operating with a \$1.65 billion budget, the district has 30,000 full- and part-time employees and provides pre-kindergarten through twelfth grade education to 207,000 students. Based on the recommendation from an external review committee and an operational audit conducted by the State of Texas comptroller's office, the district chose to implement an ERP system because their current system was not year-2000 compliant, no longer met the needs of its customers, and needed to be replaced. Houston Independent School District chose to implement SAP R/3 as their ERP software. The total investment made by the district to implement was \$10.1 million. The district projected to realize savings and benefits from reduced transaction costs, more productive use of invested capital in inventory, a one-time reimbursement for warranty claims, and a reduction in purchased materials costs. Their expected return on investment was 42% (Gerbetz & Plazonja, 2000).

Georgia Department of Administrative Services

Georgia's Department of Administrative Services, which has a budget of \$24 billion, implemented PeopleSoft software. The implementation cost \$52 million and took 18 months. There were approximately 5000 end users. Georgia's Department of Administrative Services provided financial and human resources services such as accounting and payroll to 80 state agencies at the time of implementation. The department needed to come into compliance with the Generally Accepted Accounting Principles and more importantly brace itself for year 2000, and thus decided to buy a standardized ERP system. The success of their implementation was attributed to constant communication via a Web page, email, instant messaging and other means, as well as face-to-face meetings and extensive planning. The project also had support from the governor's office, giving managers the confidence to make rapid decisions (Songini, 2000).

Cook County, Illinois Government

Cook County Government had 26,000 employees and a budget in excess of 2.4 million at the time it implemented a Financial Management Information System as its enterprise solution. The project was undertaken because there was consensus across the county that its legacy systems and existing processes were inadequate to support a government of its size and complexity. The need to address year-2000 problems in both payroll and hospital inventory systems provided an opportunity for the county to procure a new system and to undertake the necessary business process reengineering steps to improve productivity. The legacy system did not support the basic needs of either the users for consistent, reliable, and timely enterprise information (Glaser, 1999).

After a successful implementation with Cook County government, Glaser (1999) shared the lessons learned, which were consistent with factors found in the literature. He stated that leadership commitment is crucial to the success of an ERP project. Communication of the leadership's support is essential to obtain buy-in from all levels of the organization, especially since ERP systems, by their nature, generate such widespread organizational change. In addition, he noted the importance of communication, which builds consensus, support, and motivation. Although some government organizations find it difficult, Glaser also stated the importance of a full-time staff dedicated to the ERP system. In addition, Glaser noted the importance of having focused project management and steering committee to focus and manage the project and audit the implementation plan.

The City of Des Moines, Iowa

The City of Des Moines implemented an ERP solution in 1998 with a primary rationale being to address its year-2000 problem. Prior to implementing an ERP system, Des Moines had manually-intensive processes and many different business systems. The City chose to run parallel systems. One factor that contributed to the implementation success was that the project was endorsed publicly by the City Manager. Cost overruns were a problem. The project exceeded cost primarily due to the number of consultant hours required for implementation. The projected cost for consultant hours was exceeded by 50% during phases one and two of the implementation project.

In describing the Des Moines Implementation, Riper (2000) stated that five factors contributed to their implementation success. They were: scope discipline, people resources (such as a team that included one functional specialist for each module), physical resources, and communications (such as formal weekly meetings), and attitudinal resources. The

implementation team was also committed to adherence to project objectives – changing the city’s business practices to fit the software rather than the other way around. This imposed a rigor on the project that prevented virtually all software modifications that might have been requested. Thus, software upgrades should be easier.

The city found expectations to be a key influence on the project team’s cohesiveness and productivity. Establishing and conveying specific expectations to top management, the project team itself, and the operating departments helped both to keep the scope narrowly defined and unchanging and to celebrate milestones as they were reached during phase one (Riper, 2000).

These public sector organizations represented school systems, county and state organizations. In most of these implementations, becoming year-2000 compliant and replacing their legacy system were primary motivations to implement an ERP system. In addition, most of the organizations cited support from top leadership as a primary factor in their implementation success.

Future of ERP

In 1998, AMR Research, an industry and market analysis firm specializing in enterprise applications and enabling technologies, predicted that the enterprise resource planning software market would grow at a compound annual rate of 37% by 2003. AMR Research anticipated that revenues for all ERP software companies would top \$52 billion by 2002. At the time of the present study, the top five ERP vendors by total projected company revenue, were SAP, Oracle, PeopleSoft, Baan, and JD Edwards. SAP has been projected to remain the market leader in enterprise applications and substantially increase its share in the

supply chain management, customer relationship management, and e-business markets (Gaboury, 1998).

According to Richardson (2002), the three leading software companies – SAP, PeopleSoft, and Oracle – have stopped referring to themselves as Enterprise Resource Planning (ERP) vendors. Interviews with other ERP vendors show that the only new market for ERP sales is public sector. However, ERP remains the largest investment in information technology infrastructure for most organizations. It is the backbone of current and future investments in enterprise commerce management. SAP and PeopleSoft have new opportunities to sell complementary web-based applications based on the tight integration with their ERP backbone.

Shepherd (2000) stated that there is a widespread perception that companies are no longer buying and implementing ERP systems and that ERP vendors like SAP are in trouble. Although it is true that other application categories, such as supply chain management, and electronic-procurement, have received most of the attention from the press and investment community, they are still much smaller than the ERP segment. SAP remains the dominant enterprise application vendor in both revenue and market share, and it is beginning to gain momentum in many non-ERP product areas.

Businesses worldwide purchased far more ERP licenses in 2000 than any other application. AMR Research predicts that ERP's share of all application spending will diminish as the investment grows in customer relationship management, supply chain, electronic-commerce, and many other areas. Most ERP vendors are moving away from a monolithic architecture to a tightly-integrated, decoupled environment (Sherman, 2000).

Sherman (2000) also stated that there are still opportunities in ERP. But they require a different approach than becoming an expert in a particular application. Those who succeed will know how to connect ERP with supply-chain and e-commerce systems – or how to integrate different ERP modules – both on a program level and at the business process architecture level. In addition, the cost for consultants is a little less expensive because of market pressures.

According to Miranda (1999), future trends for ERP include the following:

1. Expanded product offering
2. Entry into the government middle market
3. Decline in software and implementation costs
4. Blueprint implementation methodologies
5. Multi-site software license are introduced
6. ERP outsourcing
7. Scientific knowledge on ERP grows (pp. 10 – 11)

Summary

It may be concluded from this review of literature that many factors contribute to a successful ERP implementation. Most of the researchers agreed on the benefits of ERP systems and the critical factors necessary for a successful implementation. In addition, researchers agreed that the absence of the critical factors and the failure to properly prepare for the ERP implementation, can contribute to the failure of an ERP software implementation.

In regard to the benefits sought through implementation, researchers agreed that ERP software allows for increased communication within an organization. Many organizations seek to implement ERP systems in order to achieve easier access to reliable information,

elimination of redundant data and operations, reduction of cycle times, and cost reductions. ERP also allowed some organizations to become year-2000 compliant and Euro-enabled.

In regard to critical factors for a successful implementation, researchers consistently cited top management support as the most critical factor for successful implementation (Al-Sehali, 2000 and Bingi et al. 1999). The research indicated that project managers must carefully monitor implementation activities to ensure that the critical factors are present during the ERP implementation. Monitoring and remaining cognizant of these factors can enable organizations to have a successful implementation.

ERP implementation in the public sector has been limited due to the high cost to implement. However, some public sector organizations such as school districts, have successfully implemented ERP software. Many of the factors that are required for successful implementation in the private sector are also required in the public sector. Also, many of the public sector organizations implement ERP software seeking the same benefits as private sector companies. However, managing the critical factors during the implementation in the public sector may be more difficult because of the increased government regulation and public accountability.

CHAPTER 3

METHODOLOGY

Introduction

In this chapter, the methodology and procedures used to conduct this study are described. The collection and analysis of survey data will serve to capture pertinent information as provided by ERP implementation project managers and team members in both public and private organizations in North America.

This chapter is divided into six sections. The first section is the statement of the problem. The second section contains a description of the population and sample used for the study. The third section is comprised of the research questions. Instrumentation and survey development are described in the fourth section. The fifth section describes the method of data collection. The sixth section explains how the data will be analyzed to answer the research questions.

Statement of the Problem

The purpose of this study was to determine the following: (a) the benefits sought from implementing ERP, (b) the extent to which critical factors were present during the ERP software implementation, (c) the level of satisfaction with the performance of implemented modules among the project managers and team members, (d) the perceptions of project

managers and team members as to the benefits and concerns of implementing ERP, (e) the extent to which selected decision-making processes were used in the organization's decision to implement ERP, and (f) the number of modules purchased with the intent to implement versus those actually implemented.

Population

The population for this study consisted of those individuals who were a part of an implementation project team at a public or private sector organization in North America which has implemented or will implement ERP software. A sample of 100 private-sector and 100 public-sector organizations that have implemented SAP software was used for the study.

Research Questions

The following research questions will serve to guide this study.

1. What were the benefits sought in the implementation of ERP software in public and private organizations?
2. To what extent were critical factors present during the ERP implementation? How do these factors differ between organizations in the public sector versus the private sector?
3. To what extent were the respondents satisfied with performance of the implemented ERP modules? How did satisfaction differ between organizations in the public and private sectors?

4. What are the concerns regarding the ERP implementation project as perceived by the implementation team members?
5. To what extent were selected decision-making processes used in the organization's decision to implement ERP?
6. Which modules did the organization intend to implement versus those actually implemented and why?

Instrumentation

Data was collected via a survey designed by the researcher. This instrument was partially based on the instrument used by Al-Sehali (2000) in his dissertation study. Additional questions were added based on the review of literature on ERP system implementation. As the instrument was developed, it was periodically reviewed by ERP professionals and modified based on their suggestions. Suggestions on the content, clarity, and appearance of the instrument were made based on feedback from these professionals.

The four-section instrument was composed of four parts which included: expected results and benefits, implementation critical factors for success, modules implemented, and implementation concerns.

Part 1 of the survey instrument addressed Research Question 1 by asking questions regarding the benefits sought and realized by implementing the ERP software. Respondents were asked (a) expected and realized (b) expected but not realized, (c) not expected but realized, or (d) not expected and not realized the stated benefits.

Part 2 of the instrument addressed Research Question 2. This section asked the respondents to indicate if the stated factors were present during their implementation (Yes, Somewhat, No).

Part 3 of the survey addressed Research Question 3 by asking questions regarding the modules purchased and implemented, as well as the level of satisfaction with each module. Respondents were asked to indicate (a) if they had not implemented the stated application or (b) if they had implemented the application, and were very satisfied (c) satisfied, (d) unsatisfied, or (e) very unsatisfied, with the stated application.

Part 4 of the instrument addressed Research Questions 4, 5 and 6 with questions regarding implementation concerns, the decision making process, and modules implemented. Items a – 1 of this section asked questions regarding the extent to which stated concerns were present during their implementation project (Yes, Somewhat, or No) and addressed Research Question 4. Items 4.2 – 4.7 also addressed Research Question 4 and were additional questions about their specific implementation, allowing the respondent to give additional information regarding their organization's implementation experience.

Questions 4.10 and 4.11 of Part 4 of the survey instrument asked questions about the decision-making process used for implementing the ERP software and addressed Research Question 5. Respondents were asked to indicate which of the stated processes their organizations used in its decision making process.

Finally, questions 4.12 – 4.14 of the survey instrument asked questions about the modules implemented and the modules intended to implement and addressed Research Question 6. Respondents were asked were there modules that their organization intended to

implement and did not, and if so, which modules. They were also asked to indicate why they did not implement the stated modules.

Data Collection

The survey instrument and cover letter were sent via email to project managers in the sample of public and private sector organizations on September 10, 2003. The cover letter explained the purpose of the survey and the importance of participating in the research project. The cover letter also requested that the project manager complete the survey by September 19, 2003. On September 18, 2003 a follow-up letter and another copy of the survey instrument was sent from the researcher to non-respondents to further encourage participation and to maximize the response rate. On September 22, 2003, a third and final follow-up letter was sent to non-respondents.

Data Analysis

There were two groups for comparison in the study, public-sector organizations and private-sector organizations. The Statistical Package for the Social Sciences for Windows (SPSS) was used to analyze the data.

Data Analysis for Research Question 1

In order to analyze the first research question, that sought to find information regarding the benefits sought in the implementation of ERP software, Part 1 of the survey instrument was analyzed for frequencies of responses. In addition, in order to determine if there was, a difference between the public sector and private sector organizations regarding

benefits expected and realized, an analysis of the responses was done using t-tests, at the .05 significance level.

Data Analysis for Research Question 2

In order to analyze the second research question that sought to find information regarding the critical factors present during the ERP implementation and how these factors differ between organizations in the public sector versus the private sector, Part 2 of the survey instrument was analyzed for frequencies of yes, somewhat and no responses. In order to compare the means between the two groups, the responses were recoded using a Likert scale of Yes = 2, Somewhat = 1, and No = 0. The mean value was calculated by sector and overall and a t-test was also conducted to determine if there was a difference between the responses of the two groups, public sector and private sector organizations, at the .05 significance level.

Data Analysis for Research Question 3

In order to answer the third research question that sought to find information regarding the modules implemented and the level of satisfaction with those modules, responses to Part 3 of the survey instrument were analyzed for frequencies of yes responses. In addition, descriptive statistics were used to describe respondent's level of satisfaction with the modules implemented and purchased for each group. In addition, descriptive statistics were used to describe the respondent's level of satisfaction with the modules implemented and purchased for each group. The responses to the level of satisfaction were coded using 4-point scale (Very Unsatisfied = 0, Unsatisfied = 1, Satisfied = 2, and Very Satisfied = 3),

disregarding the Not Implemented response. Lastly, the mean values of the two groups were compared to determine if there were differences between the two groups regarding their level of satisfaction.

Data Analysis for Research Question 4

In order to answer the fourth research question that sought to answer the question as to the benefits and concerns of the implementation project, the responses to items in question 4.1 (a – l) of Part 4 were analyzed for frequencies of yes, somewhat, and no responses. The responses to Items 4.4 – 4.7 were journalized.

Data Analysis for Research Question 5

In order to answer the fifth research question that sought to answer the question as to what extent selected decision-making processes were used in the organization's decision to implement ERP, Questions 4.10 and 4.11 of the survey instrument were analyzed for frequency of responses.

Data Analysis for Research Question 6

In order to answer the sixth research question that sought to answer the question as to which modules the organization intended to implement versus those that were actually implemented and the reason why, Questions 4.12, 4.13, and 4.14 of the survey instrument were analyzed for frequency of responses.

Summary

This chapter presented the methods and procedures used in collecting and analyzing the data. The analysis of data will be presented in Chapter 4 and a summary and conclusions drawn from the data analysis, as well as resulting implications and recommendations for practice and future research, will be presented in Chapter 5.

CHAPTER 4

ANALYSIS OF DATA

Introduction

This chapter provides an analysis of the data gathered in this research study. The chapter is divided into eight major sections: Introduction, Research Question 1, Research Question 2, Research Question 3, Research Question 4, Research Question 5, Research Question 6, and Summary.

The purpose of this study was to determine the following: (a) the benefits sought from implementing ERP, (b) the extent to which critical factors were present during the ERP software implementation, (c) the level of satisfaction with the performance of implemented modules among the project managers and team members, (d) the perceptions of project managers and team members as to the benefits and concerns of implementing ERP, (e) the extent to which selected decision-making processes were used in the organization's decision to implement ERP, and (f) the number of modules purchased with the intent to implement versus those actually implemented.

Description of the Population

The data for this study were collected from September to November 2003. ERP project team members at 200 organizations (100 randomly-selected private-sector

organizations and 100 public-sector organizations) located in North America were asked to respond to a survey sent to them via electronic mail from the researcher. A total of 81 (40.5%) usable surveys were returned.

Table 1 presents the breakdown of public versus private-sector respondents of the responding population.

Table 1: Population and Respondents by Sector

Sector	Population (N=200)		Respondents (N=81)	
	N	%	n	%
Public	100	50.0	48	59.3
Private	100	50.0	33	40.7
Total	200	100.0	81	100.0

The majority of the respondents in the sample population were from public-sector organizations (48, 59.3%). In addition, 49.4% (40) of the respondents indicated that they were a project team member during ERP system implementation, 28.4% (23) indicated that they were the project manager during implementation, and 22.2% (18) indicated that they held some other position. The range of Go Live dates indicated by the respondents were from 1995 to 2003, with the majority of respondents (48, 60.5%) going live in 2000 or earlier. The year 2000 had the highest number of responses for Go Live date (15, 19%), followed by the year 2001 (14, 17%). Table 2 displays the frequency of responses for Go Live dates.

Table 2: Year of Go Live for ERP Implementation (N=81)

Go Live Year	Number of Responses
1995	2
1996	2
1997	6
1998	12
1999	11
2000	15
2001	14
2002	5
2003	9
Several/Varied	4

Note. Not all respondents completed every survey item.

Research Question 1

What were the benefits sought in the implementation of ERP software in public and private organizations?

In order to provide an answer to Research Question 1, respondents were asked to indicate in Question 1 of the survey instrument if they had expected and/or realized the stated benefits. Respondents were requested to indicate whether they had expected and realized, expected but not realized, not expected but realized, or not expected and not realized the stated benefit. The results, displayed in Table 3, provides the frequencies of responses for each of the stated benefits, sorted in descending order by the benefit which received the highest Expected and Realized responses.

Table 3: Expected and Realized Benefits of ERP System Implementation (N=81)

Benefit	Expected and Realized		Expected but Not Realized		Not Expected but Realized		Not Expected and Not Realized	
	n	%	n	%	n	%	n	%
Easier access to reliable information.	63	77.8	15	18.5	0	0.0	2	2.5
Increased standardization of processes.	62	76.5	14	17.3	1	1.2	3	3.7
Redesigned business processes.	59	72.8	11	13.6	6	7.4	5	6.2
The ability to produce better reports with the information I need.	54	66.7	23	28.4	1	1.2	3	3.7
Eliminated redundant tasks.	50	61.7	23	28.4	3	3.7	5	6.2
Improved internal communication.	42	51.9	22	27.2	5	6.2	11	13.6
Improved customer relationship or supply chain management.	40	49.4	14	17.3	1	1.2	19	23.5
Overall reduced operational costs.	38	46.9	29	35.8	0	0.0	12	14.8
Software that is easily adaptable to business changes.	34	42.0	31	38.3	1	1.2	15	18.5
Realized a return on investment.	32	39.5	35	43.2	2	2.5	8	9.9

Note. Not all respondents completed every survey item.

The results indicate that easier access to reliable information (63, 77.8%) and increased standardization of processes (62, 76.5%) had the highest number of positive responses (expected and realized). The benefits of realized a return on investment (35, 43.2%) and software that is easily adaptable to business changes (34, 42%) received the highest number of expected but not realized responses. In addition, 7.4% (6) of the respondents indicated that they did not expect, but realized, redesigned business processes

and 23.5% (19) of the respondents indicated that they did not expect or realize, improved customer relationship or supply chain management.

The responses were used to determine if the benefits were expected and realized at different rates between the public and private sector. Appendix E displays the results, sorted in descending order by the benefit which received the highest number of expected and realized responses among the public-sector respondents.

Among the public-sector organizations, the benefits of easier access to reliable information and increased standardization of processes received the highest number of expected and realized responses (37, 77.1%). Among private-sector organizations, the benefit with the highest number of expected and realized responses was redesigned business processes (30, 90.9%). Consistent with the overall results, 26 (78.8%) respondents indicated that they expected and realized the benefit of easier access to reliable information.

The benefit of realized a return on investment received the highest number of responses as being expected but not realized among the public-sector organizations (26, 54.2%). The benefit of software that is easily adaptable to business processes received the highest number of expected but not realized responses among the private-sector organizations (12, 36.4%).

Among public-sector organizations, the benefit of redesigned business processes received the highest number of not expected but realized responses, 12.5% (6). Among private-sector organizations, 9.1% (3) respondents indicated that they did not expect to achieve the benefit of improved internal communication but had realized that benefit.

Among groups, the benefit of improved customer relationship, or supply chain management received the highest number of not expected and not realized responses – public sector (11, 22.9%) and private sector (8, 24.2%).

The results were then analyzed for expected and not expected benefits by combining the number of responses for expected and realized and expected but not realized. The responses for not expected but realized and not expected and not realized were also added together. The results appear in Table 4, sorted by the benefit which received the highest number of expected responses.

Table 4: Expected versus Not Expected Benefits (N=81)

Benefit	Expected		Not Expected	
	n	%	n	%
Easier access to reliable information.	78	96.3	2	2.5
The ability to produce better reports with the information I need.	77	95.1	4	4.9
Increased standardization of processes.	76	93.8	4	4.9
Eliminated redundant tasks.	73	90.1	8	9.9
Redesigned business processes.	70	86.4	11	13.6
Realized a return on investment.	67	82.7	10	12.3
Overall reduced operational costs.	67	82.7	12	14.8
Improved internal communication.	64	79.0	16	19.8
Software that is easily adaptable to business changes.	65	80.2	16	19.8
Improved customer relationship or supply chain management.	54	66.7	20	24.7

Note. Not all respondents completed every survey item.

At least 66.7% (51) of the respondents indicated that they expected to realize each of the stated benefits. The benefits of easier access to reliable information and the ability to produce better reports with the information I need, received the highest number of expected responses, (78, 96.3%) and (77, 95.1%) respectively. The benefit which received the most not expected responses was improved customer relationship or supply chain management (20, 24.7%). The benefits of improved internal communication and software that is easily adaptable to business changes, both received 16 Not Expected responses (19.8%).

Table 5: Expected Benefits – by Sector

Benefit	Expected				Not Expected			
	Public N = 48		Private N = 33		Public N = 48		Private N = 33	
	n	%	n	%	n	%	n	%
Easier access to reliable information.	45	93.8	33	100.0	2	4.2	0	0.0
The ability to produce better reports with the information I need.	46	95.8	31	93.9	2	4.2	2	6.1
Increased standardization of processes.	44	91.7	32	97.0	4	8.3	0	0.0
Eliminated redundant tasks.	40	83.3	33	100.0	8	16.7	0	0.0
Redesigned business processes.	38	79.2	32	97.0	10	20.8	1	3.0
Realized a return on investment.	39	81.3	28	84.8	11	22.9	4	12.1
Overall reduced operational costs.	40	83.3	27	81.8	6	12.5	6	18.2
Improved internal communication.	38	79.2	26	78.8	9	18.8	7	21.2
Software that is easily adaptable to business changes.	37	77.1	28	84.8	11	22.9	5	15.2
Improved customer relationship or supply chain management.	30	62.5	24	72.7	12	25.0	8	24.2

Note. Not all respondents completed every survey item.

Table 5 displays expected benefits by sector, sorted by the benefit which received the highest number of expected responses among public-sector organizations. The benefits of the ability to produce better reports with the information I need (46, 95.8%) and easier access to reliable information (45, 93.8%) received the highest number of responses for expected benefits among the public-sector respondents. Consistent with the overall responses, the

benefits of software that was easily adaptable to changes, and improved customer relationship or supply chain management, received the highest number of responses for not expected benefits (28, 84.8%) and (12, 25.0%).

Among private-sector organizations, the benefits of easier access to reliable information and eliminated redundant tasks were both expected to be realized by 100.0% of the private-sector respondents. Improved customer relationship or supply chain management (8, 24.2%) and improved internal communication (7, 21.2%) received the highest number of responses as benefits that were not expected.

The results were also analyzed for realized versus not realized responses. The responses of expected and realized and not expected but realized were combined. The responses to expected but not realized and not expected and not realized were also combined. Table 6 displays the results, sorted in descending order by the benefit which received the highest number of realized responses.

Table 6: Realized versus Not Realized Benefits (N=81)

Benefit	Realized		Not Realized	
	n	%	n	%
Redesigned business processes.	65	80.2	16	19.8
Increased standardization of processes.	63	77.8	17	21.0
Easier access to reliable information.	63	77.8	17	21.0
The ability to produce better reports with the information I need.	55	67.9	26	32.1
Eliminated redundant tasks.	53	65.4	28	34.6
Improved internal communication.	47	58.0	33	40.7
Improved customer relationship or supply chain management.	39	48.1	31	38.3
Overall reduced operational costs.	38	46.9	41	50.6
Software that is easily adaptable to business changes.	35	43.2	46	56.8
Realized a return on investment.	34	42.0	43	53.1

Note. Not all respondents completed every survey item.

Overall, the benefit which received the highest number of realized responses was redesigned business processes (65, 80.2%). The benefits of easier access to reliable information and increased standardization of processes both received 77.8% (63) of the responses as having been realized through the ERP system implementation.

Benefits which received the highest number of not realized responses were software that is easily adaptable to business changes (46, 56.8%) and realized a return on investment (43, 53.1%).

The data were then analyzed by sector to determine the benefits realized in the public and private sectors. The results are displayed in Table 7, which is sorted by the benefit that received the highest number of realized responses in the public sector.

Table 7: Realized Benefits – by Sector

Benefit	Realized				Not Realized			
	Public N = 48		Private N = 33		Public N = 48		Private N = 33	
	n	%	n	%	n	%	n	%
Increased standardization of processes.	38	79.2	25	75.8	10	20.8	7	21.2
Easier access to reliable information.	37	77.1	26	78.8	10	20.8	7	21.2
Redesigned business processes.	35	72.9	30	90.9	13	27.1	3	9.1
The ability to produce better reports with the information I need.	29	60.4	26	78.8	19	39.6	7	21.2
Eliminated redundant tasks.	29	60.4	24	72.7	19	39.6	9	27.3
Improved internal communication.	24	50.0	33	69.7	23	47.9	10	30.3
Improved customer relationship or supply chain management.	22	45.8	19	57.6	20	41.7	13	39.4
Overall reduced operational costs.	19	39.6	19	57.6	27	56.3	14	42.4
Software that is easily adaptable to business changes.	19	39.6	16	48.5	29	60.4	17	51.5
Realized a return on investment.	15	31.3	19	57.6	30	62.5	13	39.4

Note. Not all respondents completed every survey item.

Among public-sector organizations, increased standardization of processes (38, 79.2%) and easier access to reliable information (37, 77.1%), received the highest number of responses for realized benefits. Realized a return on investment (30, 62.5%) and software that is easily adaptable to business changes (29, 60.4%) received the highest number of responses for not realized benefits.

Among private-sector organizations, improved internal communication (33, 69.7) and redesigned business processes (30, 90.9%) received the highest number of responses as benefits which were realized. Consistent with the public sector, software that is easily adaptable to business changes (17, 51.5%) and improved customer relationship or supply chain management and overall reduced operational costs (14, 42.4%) received the highest number of responses for not realized benefits.

Research Question 2

To what extent were critical factors present during the ERP implementation? How do these factors differ between organizations in the public sector versus the private sector?

In order to provide an answer to the second research question, respondents were asked to indicate the extent to which stated critical factors were present during their implementation (Yes, Somewhat, or No). The results, displayed in Table 8, sorted in descending order by the factor which received the most yes responses, show the frequencies and percentages of responses for each of the critical factors.

Table 8: Frequency of Implementation Critical Factors (N=81)

	Yes		Somewhat		No	
	n	%	n	%	n	%
Top management was kept abreast of the project status.	64	79.0	16	19.8	0	0.0
The implementation had top management (executive level) support.	62	76.5	18	22.2	1	1.2
There was a clearly defined scope for the implementation project.	55	67.9	21	25.9	4	4.9
The project manager was influential with upper management.	44	54.3	28	34.6	7	8.6
End-users were involved during the implementation.	43	53.1	30	37.0	8	9.9
The implementation project manager was skillful in project management.	42	51.9	27	33.3	10	12.3
The project had skilled consultants.	41	50.6	29	35.8	10	12.3
The ERP vendor was involved in our project.	37	45.7	22	27.2	20	24.7
There was effective end-user training.	35	43.2	34	42.0	12	14.8
The project team was knowledgeable about ERP and business processes.	35	43.2	37	45.7	9	11.1
The project had the support of business unit managers.	33	40.7	38	46.9	10	12.3
The ERP software was modified to meet our needs.	29	35.8	31	38.3	21	25.9
Our organization mapped and reengineered our business processes to match the ERP processes.	24	29.6	39	48.1	16	19.8
The organization was prepared to manage change.	22	27.2	30	37.0	28	34.6

Note. Not all respondents completed every survey item.

The critical factor, top management was kept abreast of project status (64, 79.0%) and the implementation had top management (executive level) support (62, 76.5%), received the highest number of yes responses. The critical factor, the organization was prepared to manage change (28, 34.6%) and the ERP software was modified to meet our needs (29, 35.8%) received the highest number of no responses.

The results were analyzed for frequency of responses by sector. The results are displayed in Appendix F, which is sorted in descending order by the factor that received the highest number of yes responses among public-sector respondents.

Among public-sector organizations, the factor top management was kept abreast of the project status received the most yes responses (37, 77.1%). Among private-sector organizations, the responses, top management was kept abreast of the project status and the implementation had top management (executive level) support both received the highest number of yes responses, (27, 81.8%).

Among both groups the factor, the organization was prepared to manage change received the highest number of no responses. Nineteen (39.6%) of the public sector organizations indicated that their organization was not prepared to manage change and 9 (27.3%) of the private-sector organizations indicated the same.

In order to determine if there was a difference in mean values between the two groups, the responses were recoded using a Likert scale of Yes = 2, Somewhat = 1, and No = 0. The mean value was calculated by sector and overall, the results of which appear in Table 9. A t-test was also done to determine if there was a difference between the responses of the two groups, at the .05 significance level. The responses to question 02.01(m) was recoded to

reverse the Yes and No responses because a positive response to that question has a negative effect on the success of an implementation.

Table 9: Mean Value of Implementation Critical Factors (N=81)

Critical Factor	Mean		Overall
	Public Sector	Private Sector	
Top management was kept abreast of the project status.	1.77	1.84	1.80
The implementation had top management (executive level) support.	1.69	1.85	1.75
There was a clearly defined scope for the implementation project.	1.65	1.63	1.64
The project manager was influential with upper management.	1.40	1.56	1.47
End-users were involved during the implementation.	1.38	1.52	1.43
The project had skilled consultants.	1.29	1.53	1.39
The implementation project manager was skillful in project management.	1.29	1.56	1.41
The project team was knowledgeable about ERP and business processes.	1.27	1.39	1.32
The project had the support of business unit managers.	1.25	1.33	1.28
There was effective end-user training.	1.10	1.54	1.28
The ERP software was modified to meet our needs.	1.10	1.09	1.10
The ERP vendor was involved in our project.	1.06	1.43	1.21
Our organization mapped and reengineered our business processes to match the ERP processes.	.96	1.30	1.10
The organization was prepared to manage change.	.78	1.12	.93

Note. Not all respondents completed every survey item.

Overall, the factor, top management was kept abreast of the project status had the highest mean value (n = 80, 1.80). The factor, the organization was prepared to manage change received the lowest overall mean value of .93 (n = 80).

Among the public-sector respondents, the factor top management was kept abreast of the project status had the highest mean value (n = 48, 1.77). The factors receiving the lowest mean value were the factors, our organization mapped and reengineered our business processes to match the ERP processes (n = 46, .96) and the organization was prepared to manage change (n = 47, .78).

Among the private-sector respondents, the factor the implementation had top management (executive level) support received a slightly higher mean value (n = 33, 1.85) than the factor top management was kept abreast of the project status (n = 32, 1.84). Consistent with the overall findings, the factor, the organization was prepared to manage change had the lowest mean value (n = 33, 1.12) among the respondents from the private sector.

A t-test indicated that there is a statistically significant mean difference between the two groups regarding the factor, the ERP vendor was involved in our project ($t = -2.04$, $df = 78$, $p = .045$), equal variances assumed. The mean value for the private sector (1.43) was higher than the mean value for the public sector (1.06). This indicates that private sector respondents felt that the vendor was involved during the implementation more so than the respondents from the public sector.

A t-test indicated that there is a statistically significant mean difference between the two groups regarding the factor, our organization mapped and reengineered our business processes to match the ERP processes

($t = -2.20$, $df = 77$, $p = .031$), equal variances assumed. The mean value for the private sector (1.30) was higher than the mean value for the public sector (.96). This indicates that respondents in the private sector felt that their organization mapped business processes more than the respondents from the public sector.

All other t-tests did not reveal a statistically significant difference in mean values between the two groups. Although not statistically significant, the mean value for 12 of the 14 critical factors identified, was higher among private-sector respondents than among public-sector respondents.

Research Question 3

To what extent were the respondents satisfied with performance of the implemented ERP modules? How did satisfaction differ between organizations in the public and private sectors?

In order to answer the third research question, respondents were asked to indicate the extent to which they were satisfied with the performance of the stated ERP modules by indicating if they had Not Implemented the stated module or had implemented and were Satisfied, Very Satisfied, Unsatisfied, or Very Unsatisfied. The results displayed in Table 10 show the frequencies of responses for each of the stated modules. The table is sorted in descending order by the module which received the highest number of Very Satisfied responses.

Table 10: Satisfaction with Modules Implemented (N=81)

Note. Not all respondents completed every survey item.

Module	Not Implemented		Satisfied		Very Satisfied		Unsatisfied		Very Unsatisfied	
	n	%	n	%	n	%	n	%	n	%
General Ledger	2	2.5	32	39.5	35	43.2	2	2.5	3	3.7
Accounts Payable	3	3.7	31	38.3	35	43.2	3	3.7	3	3.7
Finance	3	3.7	36	44.4	31	38.3	1	1.2	4	4.9
Accounts Receivable	7	8.6	36	44.4	28	34.6	1	1.2	3	3.7
Materials Management	4	4.9	38	46.9	24	29.6	3	3.7	3	3.7
Fixed Assets	11	13.6	30	37.0	20	24.7	7	8.6	5	6.2
Inventory management	14	17.3	32	39.5	18	22.2	3	3.7	3	3.7
Human Resources	25	30.9	31	38.3	18	22.2	3	3.7	2	2.5
Budgeting	13	16.0	28	34.6	16	19.8	12	14.8	5	6.2
Payroll	33	40.7	23	28.4	16	19.8	3	3.7	2	2.5
Cost Control	10	12.3	40	49.4	14	17.3	5	6.2	1	1.2
Personnel	33	40.7	26	32.1	14	17.3	1	1.2	2	2.5
Sales and Distribution	28	34.6	28	34.6	12	14.8	2	2.5	3	3.7
Plant Maintenance	28	34.6	28	34.6	10	12.3	3	3.7	3	3.7
Warehouse Management	41	50.6	18	22.2	9	11.1	1	1.2	3	3.7
Manufacturing and Logistics	35	43.2	20	24.7	8	9.9	4	4.9	3	3.7
Industry Solution, such as public sector	40	49.4	17	21.0	7	8.6	5	6.2	3	3.7
Production Planning	43	53.1	17	21.0	7	8.6	1	1.2	3	3.7
Treasury Management	40	49.4	19	23.5	6	7.4	3	3.7	3	3.7
Customer Service Management	49	60.5	10	12.3	6	7.4	3	3.7	3	3.7
Training and Events	43	53.1	19	23.5	5	6.2	4	4.9	2	2.5
Employee Self Service	53	65.4	10	12.3	5	6.2	1	1.2	0	0.0
Project Management	39	48.1	23	28.4	3	3.7	4	4.9	2	2.5
Quality Management	46	56.8	18	22.2	3	3.7	1	1.2	2	2.5
Transportation Management	54	66.7	10	12.3	3	3.7	2	2.5	2	2.5

Most organizations had implemented the General Ledger, Accounts Payable, and Finance modules (72, 88.9%); while 66.7% (54) respondents indicated that they had not

implemented the Transportation Management module, followed by the Employee Self Service module, which 65.4% (53) of the respondents had not implemented.

The modules, General Ledger and Finance received the highest number of Satisfied and Very Satisfied responses, both receiving a total of 67 (82.7%) responses. The Budgeting module received the highest number of Unsatisfied and Very Unsatisfied responses, receiving a total of 17 (21%) unsatisfied responses.

The data were then analyzed by sector. The results appear in Appendix G, sorted in descending order by the module with the highest number of Very Satisfied responses from the public-sector respondents.

Among public-sector respondents, the Finance (40, 83.3%), Accounts Payable (39, 81.3%), and General Ledger (39, 81.3%) modules received the highest number of Satisfied and Very Satisfied responses. Likewise, among the private-sector responses, the modules, Accounts Payable (27, 81.8%) and Finance (27, 81.8%) and General Ledger (28, 84.8%), received the highest number of Satisfied and Very Satisfied responses.

Among both groups of respondents, the Budgeting module received the highest number of Unsatisfied and Very Unsatisfied responses, public sector (13, 27.1%) and private sector (4, 12.1%).

In addition, descriptive statistics were used to describe the respondent's level of satisfaction with the modules implemented and purchased for each group. The responses to the level of satisfaction were coded using 4-point scale (Very Unsatisfied = 0, Unsatisfied = 1, Satisfied = 2, and Very Satisfied = 3), disregarding the Not Implemented response. The results are displayed in Table 11, sorted by the module with the highest mean value among public-sector respondents. Lastly, the mean values of the two groups were compared to

determine if there were differences between the two groups regarding their level of satisfaction.

Table 11: Satisfaction with Modules Implemented – by Sector (N=81)

Module	Public Sector		Private Sector		Overall	
	n = 48	Mean	N = 33	Mean	n = 81	Mean
General Ledger	43	2.35	29	2.41	72	2.38
Accounts Payable	44	2.39	28	2.32	72	2.36
Accounts Receivable	41	2.32	27	2.30	68	2.31
Finance	44	2.27	28	2.36	72	2.31
Employee Self Service	7	2.43	9	2.11	16	2.25
Materials Management	41	2.24	27	2.19	68	2.22
Personnel	27	2.22	16	2.19	43	2.21
Human Resources	34	2.18	20	2.25	54	2.20
Payroll	30	2.17	14	2.29	44	2.20
Inventory management	31	2.23	25	2.08	56	2.16
Cost Control	32	2.13	28	2.11	60	2.12
Sales and Distribution	23	1.87	22	2.32	45	2.09
Warehouse Management	18	2.06	13	2.08	31	2.06
Fixed Assets	36	2.03	26	2.08	62	2.05
Plant Maintenance	25	2.04	19	2.00	44	2.02
Production Planning	10	1.40	18	2.33	28	2.00
Manufacturing and :Logistics	17	1.82	18	2.06	35	1.94
Quality Management	9	1.44	15	2.20	24	1.92
Training and Events	21	1.86	9	2.00	30	1.90
Treasury Management	20	1.80	11	2.09	31	1.90
Budgeting	37	1.76	24	2.13	61	1.90
Industry Solution, such as public sector	25	1.80	7	2.14	32	1.88
Customer Service Management	9	1.22	13	2.31	22	1.86
Project Management	19	1.74	13	2.00	32	1.84
Transportation Management	7	1.43	10	2.10	17	1.82

Note. Not all respondents completed every survey item.

The Accounts Payable module received the highest mean value among both the public sector ($n = 44, 2.39$) and the private sector ($n = 28, 2.32$). Among the public sector respondents, the Customer Service Management and Production Planning modules had the lowest mean values, ($n = 9, 1.22$) and ($n = 10, 1.40$). Among the private sector, Project Management module and the Training and Events module received the lowest mean value, ($n = 13, 2.0$) and ($n = 9, 2.0$).

A t-test was also conducted to determine if there was a statistically significant mean difference between the responses of the two groups, public-sector and private-sector organizations, at the .05 significance level.

A t-test indicated that there was a statistically significant mean difference between public- and private-sector organizations in their level of satisfaction with the Customer Service Management module ($t = -2.57, df=9.8, p=.03$), equal variances not assumed. The mean value for the private sector (2.31) was higher than the mean value for the public sector (1.22). This indicates that private sector respondents were more satisfied with the Customer Service Management module of their ERP system than the respondents from the public sector.

A t-test indicated that there was a statistically significant mean difference between the public and private sector organizations in their level of satisfaction with the Production Planning module ($t = -2.60, df=11.08, p=.02$), equal variances not assumed. The mean value for the private sector (2.33) was higher than the mean value for the public sector (1.40). This indicates that private sector respondents were more satisfied with the Production Planning module of their ERP, than the respondents from the public sector.

A t-test indicated that there was a statistically significant mean difference between the public and private-sector organizations in their level of satisfaction with the Quality Management module ($t = -2.42$, $df = 10.15$, $p = .04$), equal variances not assumed. The mean value for the private sector (2.20) was higher than the mean value for the public sector (1.44). This indicates that private sector respondents were more satisfied with the Quality Management module of their ERP system than the respondents from the public sector.

A t-test indicated that there was a statistically significant mean difference between the two groups in their level of satisfaction with the Sales and Distribution module ($t = -2.04$, $df = 43$, $p = .05$), equal variances assumed. The mean value for the private sector (2.32) was higher than the mean value for the public sector (1.87). This indicates that private sector respondents were more satisfied with the Sales and Distribution module of their ERP, than the respondents from the public sector.

For the modules in which the t-tests were statistically significant, the samples for comparison were small, except for Sales and Distribution. All other t-tests did not reveal a statistically significant difference in mean value between the two groups. However, the mean value was higher among private-sector respondents for 17 (68.0%) of the 25 modules.

Research Question 4

What were the concerns regarding the ERP implementation project as perceived by the implementation team members?

In order to answer the fourth research question responses to Question 4.1 through 4.8 of the survey instrument were analyzed for frequency of responses. The results are displayed in Table 12.

The data were also analyzed by sector. The results are displayed in Appendix H.

Question 4.01(a) asked “Was the Implementation project adequately staffed to meet the project deadline?” Fifty-eight (71.6%) of the respondents indicated that their implementation team was adequately or somewhat adequately staffed to meet the project deadline. However, only 64.6% (31) of the public-sector respondents indicated that their implementation was adequately staffed – 17 (35.4%) public-sector respondents indicated that their implementation was not adequately staffed. Among private-sector organizations, 81.8% of the respondents indicated that their implementation was or was somewhat adequately staffed.

Question 4.01(b) asked “Was the implementation adequately funded?” Seventy (86.4%) of the respondents indicated that their implementation was adequately or somewhat adequately funded. Among public-sector organizations, 79.2 % (38) indicated that their implementation was at least somewhat adequately funded, while 97% (32) of the private-sector respondents indicated that their implementation was at least somewhat adequately funded.

Question 4.01(c) asked “Did you realize the expected return on your ERP investment?” Fifty-five (67.9%) of the respondents indicated that their organization at least somewhat realized their expected return on their investment. Among public-sector organizations, 60.4% (29) indicated that their organization at least somewhat realized the expected return on their ERP investment. Among private-sector organizations, 78.8% (26) indicated that their organization at least somewhat realized the expected return on their ERP investment.

Question 4.01(d) asked “Did you use some other measure of success (other than return on investment) for the implementation?” Fifty-nine (72.8%) of the respondents indicated that their organization used some other measure of success for their implementation. Among public-sector organizations, 70.9% (34) indicated that their organization used some other measure of success for their implementation. Among private-sector organizations, 75.7% (25) indicated that their organization used some other measure of success for their ERP implementation.

Question 4.01(e) asked “Was your organization prepared for the internal/employees' reactions to the implementation?” Sixty (75.1%) of the respondents indicated that their organization was at least somewhat prepared for the internal/employees' reactions to the implementation. Among public-sector organizations, 66.7% (32) indicated that their organization was at least somewhat prepared for the internal/employees' reactions to the implementation. Among private-sector organizations, 84.9% (28) of the respondents indicated that their organization was at least somewhat prepared for the internal/employees' reactions to the implementation.

Question 4.01(f) asked “Was your organization prepared for the external/public's reaction to the implementation?” Thirty-six (77.8%) of the respondents indicated that their organization was at least somewhat prepared for the external/public's reaction to the implementation. Among public-sector organizations, 75.0% (36) indicated that their organization was at least somewhat prepared for the external/public's reaction to the ERP system implementation. Among private-sector organizations, 81.8% (27) of the respondents indicated that their organization was at least somewhat prepared for the internal/employees' reactions to the implementation.

Question 4.01(g) asked “Was your organization technologically prepared to implement?” Seventy-one (87.7%) of the respondents indicated that their organization was at least somewhat technologically prepared for the implementation. Among public-sector organizations, 83.4% (40) indicated that their organization was at least somewhat technologically prepared for the implementation. Among private-sector organizations, 93.9% (31) of the respondents indicated that their organization was at least somewhat technologically prepared for the implementation.

Question 4.01(h) asked “Would you consider the ERP implementation in your organization to be a success?” Seventy-three (90.1%) of the respondents indicated that they considered their implementation to be at least somewhat a success. Among public-sector organizations, 87.5% (42) indicated that they considered their implementation to be at least somewhat a success. Among private-sector organizations, 93.9% (31) of the respondents indicated that they considered their implementation to be at least somewhat a success.

Question 4.01(i) asked “Has ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency?” Seventy-eight (96.2%) of the respondents indicated that their ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency. Among public-sector organizations, 95.8% (46) indicated that their ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency. Among private-sector organizations, 97.0% (32) of the respondents indicated that their ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency.

Question 4.01(j) asked “Do you have the same organization leader (i.e., CEO) as when the ERP software was implemented?” Thirty-six (44.4%) of the respondents indicated that their organization has the same leader as when the ERP software was implemented. Among public-sector organizations, 41.7% (20) indicated that their organization has the same leader as when the ERP software was implemented. Among private-sector organizations, 48.5% (16) of the respondents indicated that their organization has the same leader as when the ERP software was implemented.

Question 4.01(k) asked “Was employee morale positively changed by ERP implementation?” The majority of the respondents indicated that morale was somewhat positively changed by ERP implementation (42, 51.9%), although 38.3% (31) indicated that morale was not positively changed by ERP implementation. Among public-sector organizations, 54.2% (26) indicated that employee morale was at least somewhat positively changed by ERP implementation. Among private-sector organizations, 69.7% (23) of the respondents indicated that employee morale was at least somewhat positively changed by ERP implementation.

Question 4.01(l) asked “Was your implementation timetable reasonable?” Fifty-eight (71.6%) of the respondents indicated that their implementation timetable was reasonable. Among public-sector organizations, 64.6% (31) indicated that their implementation timetable was reasonable. Among private-sector organizations, 81.9% (27) of the respondents indicated that their implementation timetable was reasonable.

Table 12: Implementation Concerns (N=81)

Concern	Yes		Somewhat		No	
	n	%	n	%	n	%
Was the implementation project adequately staffed to meet the project deadlines?	38	46.9	20	24.7	23	28.4
Was the implementation project adequately funded?	56	69.1	14	17.3	11	13.6
Did you realize the expected return on your ERP investment?	23	28.4	32	39.5	22	27.2
Did you use some other measure of success (other than return on investment) for the implementation?	44	54.3	15	18.5	19	23.5
Was your organization prepared for the internal/employees' reactions to the implementation?	21	25.9	39	48.2	21	25.9
Was your organization prepared for the external/public's reaction to the implementation?	34	42.0	29	35.8	12	14.8
Was your organization technologically prepared to implement?	49	60.5	22	27.2	9	11.1
Would you consider the ERP implementation in your organization to be a success?	54	66.7	19	23.5	8	9.9
Has ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency?	65	80.3	13	16.1	2	2.5
Do you have the same organization leader (i.e., CEO) as when the ERP software was implemented?	32	39.5	4	4.9	45	55.6
Was employee morale positively changed by ERP implementation?	7	8.6	42	51.9	31	38.3
Was your implementation timetable reasonable?	32	39.5	26	32.1	22	27.2

Note. Not all respondents completed every survey item.

In general, the percent of respondents in the private sector which indicated a Yes or Somewhat response was higher than the percent of respondents in the public sector who indicated a Yes or Somewhat response for each of the concerns.

In response to the Question 4.03, “What was /is the size of your implementation team - including programmers and business/functional representatives?”, the majority of the respondents (64.2%) indicated that their implementation team had more than 20 people.

Only 4 (4.9%) respondents indicated that their implementation had less than 10 people.

Table 13 displays the responses to this question.

Table 13: Number of Project Team Members

Number of People on Project Team	Respondents					
	Public		Private		Total	
	n	%	n	%	n	%
Less than 10	3	6.3	1	3.0	4	4.9
10 to 20	16	33.3	7	21.2	23	28.4
More than 20	27	56.3	25	75.8	52	64.2

Note. Not all respondents completed every survey item.

Question 4.05 asked “What problems did you encounter, if any?” The responses fell into major categories, change management, consultants, costs, project management, system/software, training, vendor, and general issues. The results are displayed in Appendix I.

Question 4.06 asked “What would you do differently?” The responses fell into major categories, consultants, costs, project management, training, and vendor issues. The results are displayed in Appendix J.

Question 4.07 asked “What advice do you have for others who are considering an ERP system implementation?” The responses fell into major categories, change management, communication, consultants, costs, project management, system/software, training, vendor, and general issues. The results are displayed in Appendix K.

In response to the question, “Did you consider other ERP systems? Which ones?” the respondents indicated that they had considered many of the major ERP vendors. Along with SAP, Oracle (32, 39.5%) and PeopleSoft (28, 34.6%) received the most responses as being considered by the organizations; followed by JD Edwards (15, 18.5%) and BAAN (6, 7.4%).

Five (6.2%) of the respondents indicated that they only considered SAP as their ERP solution.

Research Question 5

To what extent were selected decision-making processes used in the organization's decision to implement ERP?

In order to answer the fifth research question respondents were asked to respond to Questions 4.10 and 4.11, related to their decision to implement an ERP system. Question 4.10 asked the question, "Regarding the decision to implement the ERP system, which best describes the decision making process." The frequencies of responses are displayed in Table 14.

Table 14: Decision Making Process Used to Implement ERP Software

Process	Number/Percent
Strategic Business Planning Process	51/62.9%
Formal Organizational Readiness Process Model	16/19.8%
Business Case Analysis	23/28.4%
Other	16/19.8%

Note. Not all respondents completed every survey item.

Fifty-one of the respondents (62.9%) indicated that they used a Strategic Business Planning Process in their decision to implement their ERP System. Twenty-three of the respondents (28.4%) indicated that they used Business Case Analysis in their decision to implement their ERP System. Lastly, 19.8% (16) of the respondents indicated that they used

a Formal Organizational Readiness Process Model or some other tool in their decision making process.

The majority of respondents indicated that top management proposed the decision to implement (35, 43.2%), followed by the Business Process Leaders/Business Unit Managers (19, 23.5%). The IT department proposed the decision in 14 (17.2%) of the organizations represented by the respondents, and only 4 (4.9%) implementations were proposed by outside consultants.

Research Question 6

Which modules did the organization intend to implement versus those actually implemented and why?

In order to answer the sixth research question, respondents were asked to answer questions 4.12, 4.13, and 4.14 of the survey instrument. The results were analyzed for frequency of responses.

Were there modules that you intended to implement but did not? Thirty-seven (45.7%) of the respondents indicated that there were modules that they intended to implement but did not, of which 28 were from the public sector and 9 were in the private sector. A total of 36 modules were cited as having been intended to implement but were not. Workflow was the module most cited by respondents as being intended to implement but was not (7, 8.6%). A list of all modules cited as intended to be implemented but was not appears in Table 15. The reason most cited for not implementing the modules was not enough time (20, 35.7%). The results to this question are displayed in Table 16.

Table 15: Modules Intended to Implement But Were Not

Module	Number of Respondents who intended to implement but did not
Accounts Receivable	1
Benefits	1
Budgeting	1
Business Warehouse	2
Cash Management	1
Compensation management	2
Controlling	1
Doc Management (3rd party-IXOS),	1
EHS Safety portion	1
Electronic Procurement	1
Employee Self Service	5
Facilities Management	1
Fixed Assets	2
Fleet operation	1
Grants	2
Human Resources	4
Human resources,	1
Inventory	1
MySAP	1
Payroll	1
Personnel	1
Plant Maintenance	2
Production Management	1
Project Management	3
Quality Management	2
Recruitment	1
RWD for training	1
Sales and Distribution	5
Service Management	1
Time Evaluation	1
Travel Management	1
Treasury	1
Utility Billing	1
Warehouse Management	5
Workflow	7

Table 16: Reasons Modules Were Not Implemented

Reason	Number of Respondents
Not enough time.	20
Not enough money.	19
Could not find skilled consultants	3
ERP module could not fit business need	8
Other	6

Note. Not all respondents completed every survey item.

Summary

This chapter presented an analysis of the data that were collected in order to respond to the six research questions that have guided this study. Chapter 5 will present a summary and conclusions drawn from the data analysis as well as resulting implications and recommendations for practice and future research.

CHAPTER 5

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

This final chapter is divided into six sections. The first section is a statement of the problem. The second section contains a description of the methodology used in the study, and a summary and discussion of the findings related to each research question are the focus of the third section. The fourth section contains conclusions of the study. In the fifth section, implications and recommendations for practice are offered. The sixth section addresses recommendations for future research.

Statement of the Problem

The purpose of this study was to determine the following: (a) the benefits sought from implementing ERP, (b) the extent to which critical factors were present during the ERP software implementation, (c) the level of satisfaction with the performance of implemented modules among the project managers and team members, (d) the perceptions of project managers and team members as to the benefits and concerns of implementing ERP, (e) the extent to which selected decision-making processes were used in the organization's decision to implement ERP, and (f) the number of modules purchased with the intent to implement

versus those actually implemented. This knowledge will allow organization leaders to make more informed decisions when implementing ERP.

Methodology

Population

The population for this study consisted of those individuals who were a part of an implementation project team at a public or private sector organization in North America, which had implemented or will implement ERP software. Participants for this study were randomly selected from a known list of SAP project managers and team members. A sample of 100 private-sector organizations and 100 public-sector organizations were used for the study.

The survey instrument (Appendix A) and cover letter (Appendix B) were electronically mailed to the 200 project managers and team members on September 10, 2003. The first mailing yielded a return of 18 usable surveys (9%). On September 18, 2003 a second electronic mail, including a link to the survey instrument and a follow-up message from the researcher, was mailed to non-respondents to further encourage participation and to maximize the response rate. The second mailing yielded a usable return of 37 surveys (18.5%). On September 24, 2003, a third electronic mail, including a link to the survey instrument and a follow-up message was sent from the researcher. The third mailing yielded a usable return of 26 surveys. Thus, of the 200 survey instruments distributed a total of 81 usable responses (40.5%) were returned. Of the 81 surveys returned, 48 (59.3%) were from public-sector organizations and 33 (40.7%) were from private-sector organizations.

Instrumentation

Data were collected via a survey instrument designed by the researcher. The researcher created a survey instrument based on the benefits of implementing ERP and the critical factors affecting an ERP implementation as defined in the review of literature. As the instrument was developed, it was periodically reviewed by ERP professionals and modified based on their suggestions.

The survey was separated into four parts. Part 1 of the survey instrument addressed Research Question 1 by asking questions regarding the benefits sought and realized by implementing the ERP software. Part 2 of the survey asked questions regarding critical factors present during the ERP implementation, and addressed Research Question 2. Part 3 of the survey addressed Research Question 3 by asking questions regarding the modules purchased and implemented as well as the level of satisfaction with each module. Part 4 (Questions 4.1 – 4.9) of the instrument addressed Research Question 4 by asking questions regarding implementation concerns. Questions 4.10 and 4.11 of Part 4 of the survey instrument asked questions about the decision-making process used for implementing the ERP software and addresses Research Question 5. Questions 4.12, 4.13, and 4.14 addressed Research Question 6 by asking questions regarding modules implemented versus those intended to implement and the reason(s) why.

Data Analysis

The Statistical Package for the Social Sciences for Windows (SPSS) was used to analyze the data. Responses to questions in Part 1 - 4 of the survey, were analyzed for descriptive statistics, including frequency of responses. In addition, t-tests were used to

analyze the statistical differences between the responses in private-sector and the public-sector samples, at the .05 significance level, for Research Questions 2 and 3.

Summary of the Findings

A summary of the findings of the study in response to the six research questions follows:

Research Question 1

What were the benefits sought in the implementation of ERP software in public and private organizations?

This study supported and strengthened what was found in related research as to the benefits sought in the implementation of ERP software in public and private organizations. Al-Sehali (2000) identified seven benefits of an ERP system. The data from the present study similarly indicated that at least 66.7% of the respondents expected to achieve the stated benefits. In addition, among the respondents within the public sector, at least 62.5% indicated that they expected to achieve all of the stated benefits; while among private-sector respondents, at least 72.7% indicated that they expected to realize all but 1 of the stated benefits.

The greatest percentage of respondents (96.3%) expected to receive easier access to reliable information. This would imply that organizations are implementing ERP systems with a primary expectation of achieving easier access to accurate and current information.

The lowest percentage of respondents (66.7%) expected to improve their customer relationship and supply chain management. This may be caused by the relative newness of Customer Relationship and Supply Chain Management modules to the market.

The respondents' answers were used to further determine if the benefits were actually realized by organizations who have implemented ERP systems. At least 42.0% of the respondents indicated that they had realized all of the stated benefits. Among public sector respondents, 31.3% of the respondents indicated that they had realized the stated benefits and among private-sector respondents, 48.5% of the respondents indicated that they had realized the stated benefits. This indicates that more people expected to achieve the stated benefits than those who actually realized them.

The greatest percentage of respondents (80.2%) realized the benefit, redesigned business processes. This would imply that the primary benefit gained from implementing an ERP system is redesigned business processes.

The greatest percentage of respondents (56.8%) indicated that they did not realize the benefit of software that is easily adaptable to business changes. This may indicate that this benefit is not realized in many of the ERP system implementations.

Research Question 2

To what extent were critical factors present during the ERP implementation?
How do these factors differ between organizations in the public sector versus the private sector?

The responses implied that respondents felt that most of the critical factors were present during their implementation. The only factor receiving a high number of No responses was the organization was prepared to manage change (34.6%).

The factor that ranked the highest, indicating that the factor was present in most of the implementations, was top management was kept abreast of the project status (79.0%). The implementation had top management (executive level) support (76.5%), received the second highest number of Yes responses. These results were consistent among both the public- and

private- sector respondents. Top management support was listed as one of the most critical factors to the success of an ERP implementation within the literature.

The two factors for which there was a statistically significant mean difference between the two groups (public and private sector) were the ERP vendor was involved in our project and our organization mapped and reengineered our business processes to match the ERP processes. The mean value for the private sector was higher in response to both of these critical factors than the mean value for the public sector. The responses implied that the private sector organizations felt that they had more involvement from the ERP vendor and mapped and reengineered their business processes more so than the public-sector organizations.

Research Question 3

To what extent were the respondents satisfied with performance of the implemented ERP modules? How did satisfaction differ between organizations in the public and private sectors?

The responses implied that respondents were satisfied overall with each of the modules that were implemented. Many respondents indicated that their organization had not implemented the Employee Self Service (66.7%) and Transportation (65.4%) modules.

Modules that ranked the highest, indicating that respondents were most satisfied with those modules, were general ledger, accounts payable, accounts receivable, and finance. The modules that ranked lowest in satisfaction were Industry Solution, such as public sector, healthcare, utility, customer service management, project management, and transportation management. Among public-sector respondents, the employee self service module was also ranked among the top. Among private-sector respondents, production planning, sales and distribution, and customer service management were also ranked among the top. Although

the customer service management module was rated low overall, respondents within the private sector implied that they were satisfied with the module, while respondents within the public sector indicated a lower level of satisfaction with the module.

Also, two modules, production planning and sales and distribution, received a low satisfaction rating among the public-sector respondents but a high satisfaction rating among the private-sector respondents. The modules project management, training and events, and plant maintenance received low satisfaction ratings among the private-sector respondents.

A t-test indicated that there is a statistically significant mean difference between the two groups in their level of satisfaction with the production planning, quality management, and sales and distribution modules. Respondents from the private sector had a higher mean value than respondents from the public sector. This implied that the private sector respondents were more satisfied with these modules than the public sector respondents.

Research Question 4

What were the concerns regarding the ERP implementation project as perceived by the implementation team members?

In addition to the critical factors for success, the literature also indicated that there were factors that could cause an ERP implementation to fail. The questions regarding the implementation team members' concerns addressed both the critical factors for success and factors that contribute to ERP system implementation failure. The majority of the respondents indicated that they felt their implementation was adequately staffed and funded. The respondents also indicated that their timetable for implementation was at least somewhat reasonable.

Regarding their return on investment and whether their implementation was considered a success, the majority of respondents (66.7%) indicated that they considered their implementation a success. However, only 28.4% indicated that they had positively (Yes response) achieved their expected return on their investment. The majority (54.3%) of the respondents indicated that they had also used some other measure of success for their ERP implementation.

Regarding change within the organization, the majority of the respondents indicated that their organization was technologically prepared to implement their ERP system. Although the majority of respondents indicated that they were at least somewhat prepared for the internal/employee and external/public reaction to their implementation, only 25.9% and 43.9% indicated that their organization was positively prepared (yes response) to manage the internal/employee and external/public reaction.

The majority of respondents indicated that the implementation of the ERP system necessitated a new skill set among their employees. Only 39.51% of the respondents indicated that they had the same leader as when they implemented their ERP system. The majority of the respondents indicated that employee morale within their organization was somewhat positively changed by the ERP implementation.

In general, the percent of respondents in the private sector who indicated a Yes or Somewhat response was higher than the percent of respondents in the public sector who indicated a Yes or Somewhat response for each of the concerns.

The majority of the respondents indicated that their implementation team had more than 20 people. The respondents indicated that other ERP systems considered were Baan, JD Edwards, Oracle, and PeopleSoft. The most frequent response was Oracle (39.5%).

When asked about problems encountered, many of the respondents indicated that they had problems with consultants (such as lack of knowledge in private sector), change management, costs (i.e., budget constraints), project management (i.e., staffing of the implementation team, skilled project management), system/software (i.e., bad data) training (lack of) and general issues. The complete list of responses is included in Appendix I.

When asked about what they would do differently, respondents indicated that they would make changes in the areas of consultants, costs, project management, training, and vendor issues. Respondents indicated that they would limit consultants and hire more trained consultants. They would budget more efficiently and provide more training. The complete list of responses is included in Appendix J.

When asked about advice for others implementing ERP, the responses fell into major categories, change management, communication, consultants, costs, project management, system/software, training, vendor, and general issues. Most of the project management suggestions revolved around top management support and employee buy-in. The complete list of responses is included in Appendix K.

Research Question 5

To what extent were selected decision-making processes used in the organization's decision to implement ERP?

The responses indicated that most of the respondents used some type of formal decision making process in their decision to implement. The majority of respondents indicated that they used a Strategic Business Planning Process in their decision to implement their ERP System. About one-fourth of the respondents indicated that they used Business Case Analysis in their decision to implement their ERP System. In addition, one-fifth of the

respondents indicated that they used a Formal Organizational Readiness Process Model or some other tool in their decision making process.

The majority of respondents indicated that top management proposed the decision to implement followed by the Business Process Leaders/Business Unit Managers. The research indicated that implementations proposed and led by the information technology departments most often were unsuccessful. The respondents indicated that the Information Technology department proposed the decision in 14 of the organizations represented by the respondents. The responses indicated that only 4 of the ERP implementations were proposed by outside consultants.

Research Question 6

Which modules did the organization intend to implement versus those actually implemented and why?

Almost half of the respondents indicated that there were modules that their organization intended to implement but did not. The majority of these respondents were from the public sector. The module most cited as intended to implement was Workflow. The majority of the respondents who did not implement a module which they intended said they did not implement the module because there was not enough time. The response receiving the next highest number of responses was not enough money.

Conclusions

Implications and Recommendations for Practice

Based on the finding of this study, several conclusions were formulated and are presented below:

It was concluded that organizations are implementing ERP systems in both public- and private-sector organizations. Organizations from both sectors are seeking the benefits as identified in the literature. The benefit most sought through ERP implementations in both the private and public sector was easier access to reliable information. It was also concluded that the benefit most often realized through ERP implementation was redesigned business processes.

In regard to critical factors present during ERP implementations, it was concluded that top management was kept abreast of the implementation was the factor most often present during the implementation. Top management support was also present during many of the implementations. This was cited in the literature as the most important critical factor during ERP implementation (Al-Sehali, 2000). It was also concluded that private sector organizations mapped and reengineered their business process and that the ERP vendor was involved in their implementation more so than public-sector organizations.

Regarding the project team members' satisfaction with modules implemented, it was concluded that the respondents were most satisfied with the accounts payable, accounts receivable, finance, and general ledger modules. There was an overall dissatisfaction with the budgeting module. It was also concluded that private-sector project team members were more satisfied with the production planning, quality management, and sales and distribution modules than public-sector project team members.

Although many project team members and project managers felt that their implementation was a success, the majority did not achieve their expected return on investment. Many of the project managers and team members felt that their project was

adequately staffed and funded. Many of the leaders within the organizations had changed since the original ERP implementation. It was also concluded that the project team members had a myriad of advice from their implementation experience in the areas of change management, cost management, consultants, project management, vendor issues, and training. A suggestion heard consistently was to make sure that there is top management support, employee buy-in, proper training, and trained consultants.

Many of the organizations used a formal decision making process in their decision to implement ERP systems. These processes included a strategic business process, business case analysis, and formal organization readiness modules. The decision to implement was most often suggested by top management personnel.

Lastly, it was concluded that most organizations, particularly within the public sector had modules which they intended to implement but did not. The module most often cited as being intended to implement was Workflow. The reason most organizations cited for not implementing modules, which they originally intended to implement, was that there was not enough time or not enough money.

Overall, the responses among the private-sector organizations were more positive than the responses among the public-sector organizations. This may be contributed to the private-sector having fewer government regulations than the public-sector and their ability to be somewhat more flexible with adapting to the software.

Recommendations

The purpose of this study was to present the perceptions of ERP implementation project team members, to determine if there were differences in motivations and levels of satisfaction between the project team members from both public- and private- sector organizations. Based on the findings and conclusions, the researcher's suggestions are as follows:

1. It is recommended that organizations considering ERP system implementation continue to research ERP functionality in order to identify and achieve the expected benefits.
2. It is recommended that organizations continue to implement strong change management within their organizations.
3. It is recommended that other measures of investment return also be considered when measuring the return on investment for ERP implementation.
4. It is recommended that organizations work to ensure employee buy-in and top management involvement.
5. It is recommended that organizations hire competent consultants and skilled project team members and try to avoid scope creep (the addition of tasks outside of the original plan) of the project.
6. It is recommended that organizations ensure time to implement all of the modules that they intend to, in order to gain the greatest return on their investment.
7. It is recommended that leaders within organizations, particularly public-sector organizations, ask the ERP vendor to demonstrate the business process that the

organization needs/desires in order to both ensure that the vendor can accomplish the task and decrease the gap between what is expected and what is realized.

This study has only begun to address the important and timely topic of ERP implementation in the public sector. The following recommendations for future research in the area of ERP implementation are made:

1. Conduct a study to determine the technical and business process issues that affect ERP implementation in the public sector.
2. Conduct a study on the specific outcomes of ERP implementation, particularly in the public sector.
3. Conduct a study on specific decision making processes and their relation to the success of the ERP implementation.
4. Conduct a study using a sample of different ERP systems, to compare software systems, and the success of their implementations in the public sector.
5. Conduct a case study on ERP implementations in the public sector, to determine the extent of presence of critical factors during implementations and post-Go Live.
6. Conduct a study on the success of system upgrades, to determine if there is more success when implementing an upgrade versus the initial implementation.

APPENDIX A
SURVEY COVER LETTER

Dear:

Survey Code: PRXXX

I am a doctoral student at the University of Central Florida. As part of my dissertation requirement, I am conducting a research study on the implementation of enterprise resource planning (ERP) software. The purpose of my research is to learn about the differences in ERP implementation between public and private sector organizations in North America. I am asking you to participate in this research because you have experience with an ERP implementation.

I would greatly appreciate it if you would take a few minutes to answer the questions on the survey found at the link below. If you would like to forward this email to another member of your implementation project team please feel free to do so. The survey asks important, useful questions about your ERP implementation, the answers to which may increase the knowledge base for organizations who will implement ERP in the future.

The results of this survey will be included in my dissertation. There are no direct benefits or compensation to participants and given the nature of the Internet, all survey responses can not be considered strictly confidential.

If you have any questions about this research, please contact me at 407-523-9284 or my advisor Dr. Bozeman at 407-384-2189. Questions or concerns about research participants' rights may be directed to the UCFIRB Office, University of Central Florida Office of Research Orlando Tech Center, 12443 Research Parkway, Suite 207, Orlando, FL 32826. The phone number is 407-823-2901.

I realize this survey will take about ten minutes of your valuable time, but the result should be worth the effort. Please find the survey at the link below. Please complete by September 17, 2003. Thank you for your consideration.

http://intercom.virginia.edu/SurveySuite/Surveys/ERP_Implementation

Sincerely,
Joycelyn L. Harrison
UCF Doctoral Student

APPENDIX B
SECOND FOLLOW-UP LETTER

Dear,

Survey Code: PRXXX

About a week ago, I sent an email to you, with a link to a web survey that asked about your experience implementing an ERP system. As of today, I have not received a completed survey from you. I realize that you are very busy. However, I contacted you and others in hopes of obtaining the insights only ERP project managers and team members can provide.

Please take 10 minutes and complete the survey via the link below.

http://intercom.virginia.edu/SurveySuite/Surveys/ERP_Implementation

Your thoughts and opinions regarding your ERP implementation experience will be very useful to other individuals at organizations which will implement an ERP system in the future.

All responses will be combined with others before shared in the dissertation study. However, if confidentiality is a concern to you please feel free to print the survey and send it to me via US Mail at the address below:

Joycelyn L. Harrison
4352 S. Kirkman Road
Apartment 1203
Orlando, Florida 32811

If you have any questions, please feel free to contact me at 407-523-9284.

Sincerely,

APPENDIX C
THIRD FOLLOW-UP LETTER

Dear,

Survey Code: PRXXX

Over the last few weeks, I have sent you a couple of emails about an important research study I am conducting regarding ERP software implementation. The purpose of the study is to help organizations which will implement ERP systems understand the concerns and issues surrounding ERP implementation.

The study is drawing to a close, and this is the last contact that will be made with the random sample of project managers and team members.

Please take 10 minutes and complete the survey via the link below.

http://intercom.virginia.edu/SurveySuite/Surveys/ERP_Implementation

All responses will be combined with others before shared in the dissertation study. However, if confidentiality is a concern to you please feel free to print the survey and send it to me via US Mail at the address below:

Joycelyn L. Harrison
4352 S. Kirkman Road
Apartment 1203
Orlando, Florida 32811

Finally, I appreciate your willingness to consider my request as I conclude this effort to better understand ERP implementation projects. If you have any questions, please feel free to contact me at 407-523-9284. Questions or concerns about research participants' rights may be directed to the UCFIRB Office, University of Central Florida Office of Research Orlando Tech Center, 12443 Research Parkway, Suite 207, Orlando, FL 32826. The phone number is 407-823-2901.

Sincerely,

APPENDIX D
SURVEY INSTRUMENT

Enterprise Resource Planning (ERP) Implementation
Dissertation Study

Contact Information:

Joycelyn L. Harrison
4352 South Kirkman Road
Apartment 1203
Orlando, Florida 32811
JO523688@pegasus.cc.ucf.edu

Part 1: Expected Results and Benefits

- 1.01. Please enter your survey code.
- 1.02. Please complete the stem sentence with the statements below and answer if the benefit was
1. "Expected and Realized" 2. "Expected but Not Realized" 3. "Not Expected, but Realized" 4. "Not Expected and Not Realized"

BECAUSE OF IMPLEMENTING ERP SOFTWARE, MY ORGANIZATION HAS...

	Expected and Realized	Expected but Not Realized	Not Expected but Realized	Not Expected and Not Realized
a. the ability to produce better reports with the information I need.				
b. overall reduced operational costs.				
c. easier access to reliable information.				
d. eliminated redundant tasks.				
e. improved internal communication.				
f. increased standardization of processes.				
g. realized a return on investment.				
h. software that is easily adaptable to business changes.				
i. redesigned business processes.				
j. improved customer relationship or supply chain management.				

Part 2: ERP Implementation Critical Factors for Success

- 2.01. Please indicate the extent to which the statements below are true for your organization's implementation.

	Yes	Somewhat	No
a. The implementation had top management (executive level) support.			
b. The project team was knowledgeable about ERP and business processes.			
c. Top management was kept abreast of the project status.			
d. The implementation project manager was skillful in project management.			
e. End-users were involved during the implementation.			
f. The organization was prepared to manage change.			
g. There was a clearly defined scope for the implementation project.			
h. The project had the support of business unit managers.			
i. The project had skilled consultants.			
j. The project manager was influential with upper management.			

k. The ERP vendor was involved in our project.			
l. Our organization mapped and reengineered our business processes to match the ERP processes.			
m. The ERP software was modified to meet our needs.			
n. There was effective end-user training.			

Part 3: Modules Implemented

3.01. Please indicate your organization's level of satisfaction with the modules below:

	Not Implemented	Very Satisfied	Satisfied	Unsatisfied	Very Unsatisfied
a. Finance					
b. Accounts Payable					
c. Accounts Receivable					
d. Budgeting					
e. Cost Control					
f. Fixed Assets					
g. General Ledger					
h. Treasury Management					
i. Human Resources					
j. Payroll					
k. Personnel					
l. Employee Self Service					
m. Training and Events					
n. Manufacturing and Logistics					
o. Customer Service Management					
p. Inventory management					
q. Materials Management					
r. Plant Maintenance					
s. Production Planning					
t. Project Management					
u. Quality Management					
v. Sales and Distribution					
x. Warehouse Management					
y. Industry Solution, such as public sector, healthcare, utility					

Part 4: Implementation Concerns

4.01. Please answer the questions below regarding your implementation.

	Yes	Somewhat	No
a. Was the implementation project adequately staffed to meet the project deadlines?			
b. Was the implementation project adequately funded?			
c. Did you realize the expected return on your ERP investment?			
d. Did you use some other measure of success (other than return on investment) for the implementation?			
e. Was your organization prepared for the internal/employees' reactions to the implementation?			
f. Was your organization prepared for the external/public's reaction to the			

implementation?			
g. Was your organization technologically prepared to implement?			
h. Would you consider the ERP implementation in your organization to be a success?			
i. Has ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency?			
j. Do you have the same organization leader (i.e., CEO) as when the ERP software was implemented?			
k. Was employee morale positively changed by ERP implementation?			
l. Was your implementation timetable reasonable?			

- 4.02. What was/is the year of your "Go Live" date?
- 4.03. What was/is the size of your implementation team - including programmers and business/functional representatives? Less than 10 10 to 20 More than 20
- 4.04. Did you consider other ERP systems? Which ones?
- 4.05. What problems did you encounter, if any?
- 4.06. What would you do differently?
- 4.07. What advice do you have for others who are considering an ERP system implementation?
- 4.08. What is/was your role on the project team?
Project Manager
Project Team Member
Other, Please Specify:
- 4.09. Please specify if your organization is:
Public Sector, such as education
Private Sector
- 4.10. Regarding the decision to implement the ERP system, which best describes the decision making process, please check all that apply:
Strategic Business Planning Process
Formal Organizational Readiness Process Model
Business Case Analysis
Other, Please Specify:
- 4.11. The decision to implement was proposed by (please check only one):
IT Department
Business Process Leaders/ Business Unit Managers
Top Management
Outside Consultants
- 4.12. Were there modules that you intended to implement, but did not? Yes No
- 4.13. If yes to question 4.12, which modules did you intend to implement but did not?
Not Applicable

- 4.14. If there were modules that you intended to implement, but did not, please indicate why, please select all that apply.
Not enough time.
Not enough money.
Could not find skilled consultants
ERP module could not fit business need
Other, Please Specify:
Not Applicable
- 4.15. May I contact you, if necessary, for clarification of your responses?
Yes
No
If Yes, phone number:

APPENDIX E

EXPECTED AND REALIZED BENEFITS OF AN ERP SYSTEM IMPLEMENTATION –
BY SECTOR

Benefit	Expected and Realized				Expected but Not Realized				Not Expected but Realized				Not Expected and Not Realized			
	Public N = 48		Private N = 33		Public N = 48		Private N = 33		Public N = 48		Private N = 33		Public N = 48		Private N = 33	
	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%
Easier access to reliable information.	37	77.1	26	78.8	8	16.7	7	21.2	0	0.0	0	0.0	2	4.2	0	0.0
Increased standardization of processes.	37	77.1	25	75.8	7	14.6	7	21.2	1	2.1	0	0.0	3	6.3	0	0.0
The ability to produce better reports with the information I need.	29	60.4	25	75.8	17	35.4	6	18.2	0	0.0	1	3.0	2	4.2	1	3.0
Redesigned business processes.	29	60.4	30	90.9	9	18.8	2	6.1	6	12.5	0	0.0	4	8.3	1	3.0
Eliminated redundant tasks.	26	54.2	24	72.7	14	29.2	9	27.3	3	6.3	0	0.0	5	10.4	0	0.0
Improved internal communication.	22	45.8	20	60.6	16	33.3	6	18.2	2	4.2	3	9.1	7	14.6	4	12.1
Improved customer relationship or supply chain management.	21	43.8	19	57.6	9	18.8	5	15.2	1	2.1	0	0.0	11	22.9	8	24.2
Overall reduced operational costs.	19	39.6	19	57.6	21	43.8	8	24.2	0	0.0	0	0.0	6	12.5	6	18.2
Software that is easily adaptable to business changes.	18	37.5	16	48.5	19	39.5	12	36.4	1	2.1	0	0.0	10	20.8	5	15.2
Realized a return on investment.	13	27.1	19	57.6	26	54.2	9	27.3	2	4.2	0	0.0	4	8.3	4	12.1

Note. Not all respondents completed every survey item.

APPENDIX F

ERP IMPLEMENTATION CRITICAL FACTORS – BY SECTOR

Critical Factor	Yes				Somewhat				No			
	Public		Private		Public		Private		Public		Private	
	n	%	n	%	n	%	n	%	N	%	n	%
Top management was kept abreast of the project status.	37	77.1	27	81.8	11	22.9	5	15.2	0	0.0	1	3.0
The implementation had top management (executive level) support.	34	70.8	27	81.8	13	27.1	5	15.2	1	2.1	0	0.0
There was a clearly defined scope for the implementation project.	33	68.8	22	66.7	13	27.1	8	24.2	2	4.2	2	6.1
The project manager was influential with upper management.	25	52.1	19	57.6	16	33.3	12	36.4	6	12.5	1	3.0
End-users were involved during the implementation.	24	50.0	19	57.6	18	37.5	12	36.4	6	12.5	2	6.1
The implementation project manager was skillful in project management.	23	47.9	19	57.6	15	31.3	12	36.4	9	18.8	1	3.0
The project had skilled consultants.	21	43.8	20	60.6	20	41.7	9	27.3	7	14.6	3	9.1
The project had the support of business unit managers.	20	41.7	13	39.4	20	41.7	18	54.5	8	16.7	2	6.1
The project team was knowledgeable about ERP and business processes.	18	37.5	17	51.5	25	52.1	12	36.4	5	10.4	4	12.1
The ERP vendor was involved in our project.	17	35.4	20	60.6	17	35.4	6	18.2	14	29.2	6	18.2
The ERP software was modified to meet our needs.	17	35.4	12	36.4	19	39.6	12	36.4	12	25.0	9	27.3
There was effective end-user training.	14	29.2	20	60.6	20	41.7	9	27.3	8	16.7	2	6.1
Our organization mapped and reengineered our business processes to match the ERP processes.	12	25.0	12	36.4	20	41.7	19	57.6	14	29.2	2	6.1
The organization was prepared to manage change.	9	11.1	13	39.4	19	39.6	11	33.3	19	39.6	9	27.3

Note. Not all respondents completed every survey item.

APPENDIX G

SATISFACTION WITH ERP MODULES IMPLEMENTED – BY SECTOR

Module	Satisfied				Very Satisfied				Unsatisfied				Very Unsatisfied			
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private		
Accounts Payable	15	31.3	16	48.5	24	50.0	11	33.3	3	6.3	0	0.0	2	4.2	1	3.0
General Ledger	18	37.5	14	42.4	21	43.8	14	42.4	2	4.2	0	0.0	2	4.2	1	3.0
Finance	21	43.8	15	45.5	19	39.6	12	36.4	1	2.1	0	0.0	3	6.3	1	3.0
Accounts Receivable	20	41.7	16	48.5	18	37.5	10	30.	1	2.1	0	0.0	2	4.2	1	3.0
Materials Management	21	43.8	17	51.5	16	33.3	8	24.2	2	4.2	1	3.0	2	4.2	1	3.0
Human Resources	16	33.3	15	45.5	13	27.1	5	15.2	3	6.3	0	0.0	2	4.2	0	0.0
Fixed Assets	14	29.2	16	48.5	13	27.1	7	21.2	6	12.5	1	3.0	3	6.3	2	6.1
Inventory management	16	33.3	16	48.5	12	25.0	6	18.2	1	2.1	2	6.1	2	4.2	1	3.0
Payroll	13	27.1	10	30.3	12	25.0	4	12.1	3	6.3	0	0.0	2	4.2	0	0.0
Personnel	13	27.1	13	39.4	11	22.9	3	9.1	1	2.1	0	0.0	2	4.2	0	0.0
Budgeting	15	31.3	13	39.4	9	18.8	7	21.2	8	16.7	4	12.1	5	10.4	0	0.0
Cost Control	22	45.8	18	54.5	7	14.6	7	21.2	3	6.3	2	6.1	0	0.0	1	3.0
Plant Maintenance	14	29.2	14	42.4	7	14.6	3	9.1	2	4.2	1	3.0	2	4.2	1	3.0
Industry Solution, such as public sector	11	22.9	6	18.2	6	12.5	1	3.0	5	10.4	0	0.0	3	6.3	0	0.0
Warehouse Management	11	22.9	7	21.2	5	10.4	4	12.1	0	0.0	1	3.0	2	4.2	1	3.0
Treasury Management	9	18.8	10	30.3	5	10.4	1	3.0	3	6.3	0	0.0	3	6.3	0	0.0
Training and Events	12	25	7	21.2	4	8.3	1	3.0	3	6.3	1	3.0	2	4.2	0	0.0
Employee Self Service	2	4.2	8	24.2	4	8.3	1	3.0	1	2.1	0	0.0	0	0.0	0	0.0
Sales and Distribution	16	33.3	12	36.4	3	6.3	9	27.3	2	4.2	0	0.0	2	4.2	1	3.0
Manufacturing and Logistics	10	20.8	10	30.3	3	6.3	5	15.2	2	4.2	2	6.1	2	4.2	1	3.0
Customer Service Management	1	2.1	9	27.3	2	4.2	4	12.1	3	6.3	0	0.0	3	6.3	0	0.0
Production Planning	5	10.4	12	36.4	1	2.1	6	18.2	1	2.1	0	0.0	3	6.3	0	0.0

Transportation Management	3	6.3	7	21.2	1	2.1	2	6.1	1	2.1	1	3.0	2	4.2	0	0.0
Project Management	13	33	8	31	0	0	2	8	2	5	2	8.0	2	5.0	0	0.0
Quality Management	6	12.5	12	36.4	0	0.0	3	9.1	1	2.1	0	0.0	2	4.2	0	0.0

Note. Not all respondents completed every survey item.

APPENDIX H
IMPLEMENTATION CONCERNS – BY SECTOR

Concern	Yes				Somewhat				No			
	Public n = 48		Private n = 33		Public n = 48		Private n = 33		Public n = 48		Private n = 33	
Was the implementation project adequately staffed to meet the project deadlines?	19	39.6	19	57.6	12	25.0	8	24.2	17	35.4	6	18.2
Was the implementation project adequately funded?	27	56.3	29	87.9	11	22.9	3	9.1	10	20.8	1	3.0
Did you realize the expected return on your ERP investment?	11	22.9	12	36.4	18	37.5	14	42.4	16	33.3	6	18.2
Did you use some other measure of success (other than return on investment) for the implementation?	26	54.2	18	54.5	8	16.7	7	21.2	13	27.1	6	18.2
Was your organization prepared for the internal/employees' reactions to the implementation?	9	18.8	12	36.4	23	47.9	16	48.5	16	33.3	5	15.2
Was your organization prepared for the external/public's reaction to the implementation?	18	37.5	16	48.5	18	37.5	11	33.3	9	18.8	3	9.1
Was your organization technologically prepared to implement?	25	52.1	24	72.7	15	31.3	7	21.2	7	14.6	2	6.1
Would you consider the ERP implementation in your organization to be a success?	28	58.3	26	78.8	14	29.2	5	15.2	6	12.5	2	6.1
Has ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency?	40	83.3	25	75.8	6	12.5	7	21.2	1	2.1	1	3.0
Do you have the same organization leader (i.e., CEO) as when the ERP software was implemented?	17	35.4	15	45.5	3	6.3	1	3.0	28	58.3	17	51.5
Was employee morale positively changed by ERP implementation?	5	10.4	2	6.1	21	43.8	21	63.6	21	43.8	10	30.3
Was your implementation timetable reasonable?	17	35.4	15	45.5	14	29.2	12	36.4	16	33.3	6	18.2

Note. Not all respondents completed every survey item.

APPENDIX I

PROBLEMS ENCOUNTERED DURING ERP SYSTEM IMPLEMENTATION

Change management

1. Change is always tough to implement. You can never do enough training and communication.
2. Change management was largest challenge - getting users to change processes to match system best practices.

Communication

Consultants

3. First consultants were horrible and made bad choices for our campus that we are still living with.
4. Consultants underestimated the business requirements. We under-resourced the effort on our end. Consultants were not knowledgeable of anything outside their functional area, and some did not know their functional area. Developed a lot of work-arounds, later discovered standard functionality that accomplished the same objective.
5. Lack of knowledge on the part of consultants on the business of municipalities and more importantly...the ERP itself (due to its being relatively new on the North American market).
6. Last of public-sector trained consultants.
7. The consultants were ill-prepared for our situation, and many promises were not kept regarding specifically requested functionality.
8. Used third party consultants to implement. Not successful, may have been less expensive hourly rate, but expertise in SAP skills definitely lacking. Used SAP for our recent upgrade from original 4.5b to 4.7 (Enterprise), which was much more successful/less painful.

Costs

9. Budget constraints to implement necessary components that will and has impacted us now. Knowledge transfer from consultants.
10. This project began in 2000 with the first go-live in July 2002 and the last location to go-live in 2005. Cost was the largest problem.

Project management

11. 1. Staffing: management would not provide adequate user resources. There were no full time user team members 2. Multiple implementation vendors: IT has been outsourced to IBM, functional consulting was done by Cap Gemini, and a related project was done by PWC. Too many hands 3. Budget funding was not clearly defined between the parent company and the affiliate 4. Another project with significant impact on our project was going in concurrently, but was severely behind schedule, creating significant problems with our project.
12. Some units did not implement modules due to staffing/workload issues. 2. Insufficient attention to staff training 3. Did not run parallel to existing system for enough cycles 4. Implemented in middle of fiscal year, rather than beginning 5. Loaded historical data on a "hurry up" basis, resulting in numerous data errors. 6. Implementation team was not composed of best representative for each module due to failure of management to release key personnel for the project.

13. Business/functional representative resources had to continue day to day business activities as well as work on the project. A delay in computer hardware delivery compressed some of our timeframes. Existing business process knowledge was unavailable at times due to staff attrition through retirement or other reasons. Consultants were technical experts of the software but lacked business analysis (for process re-engineering) skills.
14. High customization demand from user community. Training plan shortcomings. Implementation team out of touch with technical support and user communities.
15. Implementation continued with additional sites for several years. Growth in transaction count and database size ultimately caused performance issues. Stability of the SAP software prior to the 46c release was poor. Other difficulties were more in terms of cultural acceptance of a generic system.
16. Internal resources, primarily expert users, leaving the organization shortly after go-live. Consultants having no practical implementation or post-live experience. Documentation was non-existent or inadequate.
17. It was a big undertaking in a short period of time. There was a lot of post-go live work and clean up.
18. Keeping on track with project. Some modules fell behind with setting up business processes. Delays. Information from end users not always accurate. People did not want to open their doors to people they had not worked with before.
19. Lack of willingness to change business processes to adapt to the software. Instead the software was re-coded to satisfy the existing business processes. Lack of vision of the activities that could be executed via the ERP package.
20. Lack of business involvement significantly delayed delivery.
21. Lack of business support initially.
22. Lack of knowledge of human resource modules and processes.
23. Mid-manager acceptance of the changed system. Technical community acceptance of legacy system replacement.
24. Modification of human resource system to address public sector requirements.
25. Most time and consulting was spent around sales order entry. Maintenance was no more advanced than our legacy system and had little buy-in out in the mill.
26. Not enough time or project members.
27. Not enough training for the project team, not enough knowledge transfer from consultant to team lead, key consultant turnover, poor end-user training, bad advice on showstoppers.
28. Not qualified and skilled team members. No prioritization of the project. Low involvement of line department managers.
29. Poor project management on part of third-party integrator.
30. Poor early direction from consultant leads and poorly trained consultants. Greater process changes required than anticipated due to less flexible, less configurable software than advertised. Larger than expected programming effort for interfaces, missing functionality and reporting.
31. Really required more business involvement and support. Management was not ready for change, they wanted SAP to mirror to some extent the legacy environment.

32. Relatively short project implementation time (15 months) to Go Live. To take advantage of Christmas shut-down and new year start. Very long hours for the team, which was over 200 people. But we did successfully implement on time, all modules, all plants, at one time (Big Bang).
33. Resistance on the part of end-users to learn new tools. Not enough training time. Difficulty in using EUP format for training, end users wanted to see screenshots. No integration with fund accounting for government in the version (4.5B) we implemented.
34. Resources were insufficient to do as thorough a job as was really necessary.
35. Too much to implement at once.
36. Warehouse personnel should have been involved in the project at its conception.
37. We have experienced some issues with employee buy-in. However, I feel that this buy-in would not have been eased by introducing another solution. Sometimes it is difficult to get ideas to change. Some of the other modules were not implemented with the features that would support our module the best, and thus has caused some redundancy in business processes within the finance side of the house. Some of the flexibility which is offered within our ERP is not supported corporately.

System/software

38. Data transport from development to production was the most problematic. Modifying schemas to allow for certain time management criteria was not resolved until well after the implementation. Neither was a problem with the "CATS" module.
39. Difficulty in getting the correct security access to the right people in a timely manner. Understanding of the reporting capabilities was difficult without being able to create in a test environment.
40. End user reporting was a problem, trying to reduce the number of custom reports.
41. Loading bad master data.
42. Lots and lots of software bugs and a software provider reluctant to make changes.
43. Minimal time/resources on legacy data cleanup lead to disasters and lost functionality gains. Consultants and team were inexperienced and missed opportunities in implementing certain functionality (some critical). Project team was too small and expanded too late, implementation was too fast (12 months).
44. Problems where the system would not handle the current processes. It did however, force changes that were good.
45. Security issues: Not being able to get vendor folks on site without clearance from DOD.
46. Standardization across Government. Not really ERP but Best of Breed license.
47. System constraints and the work arounds or modifications needed.
48. System was more complicated than planned or expected.
49. Customization to our business processes.

Training

50. Did not train our people well enough on what an integrated system means in terms of doing their job and it's impact on others.
51. LACK OF TRAINING LACK OF CONSULTANT SUPPORT LACK OF

MONEY LACK OF COMPUTER LITERACY AT USER LEVELS WE
HAVE EXPERIENCED AND CONTINUE TO EXPERIENCE EVERY
IMAGINABLE PROBLEM YOU CAN THINK OF!

52. Training. Basic knowledge transfer from consultants. Underestimated friction from some key executives Lack of documentation of ALL existing business processes.

Vendor Issues

53. Bad implementation partner.

General

54. Customizing the software to meet the state's unique business requirements.
55. Data quality issues.
56. Too many to list.

APPENDIX J

WHAT PROJECT MANAGERS AND TEAM MEMBERS WOULD DO DIFFERENTLY

Change management

Communication

Consultants

1. Better consultant selection and filtration. More up front education for the team. Clear and detailed functional specifications.
2. Demand expertise in consultants. Ensure adequate documentation.
3. Have highly competent consultants.
4. Limit the consultants; consultants should not manage the project.
5. More independent consultants, to keep costs down and get excellent expertise.
6. Implementation must include vendor consultants.
7. Initial implementation is always going to be different from an upgrade. We would not now be entirely reliant on consulting staff to teach us what we needed to know. Training would be conducted differently and we would no longer take the consultants word for everything.

Costs

8. Budgeting for the project should have been better estimated.

Project management

9. 1) More knowledgeable personnel assigned to the project. 2) Better communication with the end user as to why the legacy systems are no longer viable, why the new software was chosen, and what the scope of change is.
10. Allow more time for testing and validation.
11. Better scope out the project at the start. Garner commitment for backfill personnel in the various business areas. Start the change management process sooner.
12. Big Bang instead of phased installation. Re-engineer the business processes.
13. Complete selection to start project sooner, so actual project time was greater.
14. Create more buy-in out in mill prior to project.
15. Conduct better integration testing, have greater end user involvement and stronger top and middle management support and involvement.
16. Ensure business involvement in the project. More carefully monitor the quality of consultants supplied by the ERP vendor.
17. Establish politically-independent but operationally-interdependent implementation team; increase business process changes driven by system standards; increase implementation change management and training activities; change business processes prior to implementation.
18. Extend the project by a few months to be able to clean up some of the issues that we had post go live. Have new IT team identified and trained in new skills before the implementation. More change management for the user community, better communication.
19. Get a full ERP license especially Business Warehouse. Standardize more across departments and implement a Government wide production site instead of 15 separate instances of SAP
20. Hindsight is always 20/20, probably much more research into what is available in

- any, and a less complicated system would be beneficial.
21. Hire a stronger integrator. Get more resources (internal and external) for implementing core financial modules. Write a more detailed implementation plan.
 22. I would not be the project manager for another ERP project at this company, period. The consultants did a fantastic job, I was very happy with CGEY, and to some extent, I was happy with IBM. However, I was not at all happy with the way it went from our side. Too many hands between the affiliate and the parent company, and as Project Manager I did not have the authority or backing to make decisions that were critical to the project. In the end, it all went in successfully, but it was a miserable year that I will never repeat again. I will leave the company before I do another one of these!
 23. Implement smaller bundles of the ERP at once and reduce the big bang implementation.
 24. Insist on full-time team members with the needed skill set.
 25. Ensure team was large enough and broad enough in experience and background within the organization (no point in having chiefs on the team when the frontline staff are the experts). Ensure master data is cleaned and standardized - an **EXTREMELY IMPORTANT MUST!!!** Invest in adequate training resources (hire proven professionals) and ensure users have access to a Sandbox between training completion and go-live.
 26. Involve power users earlier and at a more detailed level. Emphasize knowledge transfer for everyone on the team.
 27. Longer timeline and more people.
 28. Monitor data more closely after go-live.
 29. Prepare better for the change process and politics involved.
 30. Properly staff from our end. Fire consultants whose performance was not acceptable. Work on a fixed-price contract.
 31. Push more aggressively to standardize processes around SAP rather than site by site configuration tailored to get the site to accept the system.
 32. Set-up a team that would only be allocated to implement the project. As that team would remain together to handle the oversight of the project. We do not currently have a dedicated staff that only deals with the project, we have all returned to our original assignments before the software purchase.
 33. Sharing of knowledge in different modules.
 34. Spend more effort on data cleansing.
 35. Spend more time on re-engineering processes.
 36. Spend more time setting up Production Support.
 37. This is my opinion only: 1) I would not have included Customer Information in the ERP implementation. The "out-of-the-box" ERP software we implemented was not good for our CIS process. As a result, our response time to answering customer calls has really taken a nose-dive. 2) Our ERP implementation process did not take advantage of the company's IT experience. Most technical issues were addressed by functional personnel. In my opinion, this was not the best use of resources. 3) The consultants who were hired to implement the ERP software

were released too quickly (money issues). This did not allow enough time for knowledge transfer. The company soon found itself in a bind when things went wrong and no one had the knowledge to fix them.

38. Transfer data from development to production on a more frequent basis. Consider more formal training for project members.
39. Try to obtain software used and proven in the liquor wholesale business.
40. Use a smaller packaged system.
41. Use direct SAP resources for all future configuration/modifications outside of internal resources.
42. Used a better method of data conversion.
43. We would not be the first state to implement a major module (which we were).
44. Would purchase a separate user friendly reporting tool. More resources would be nice, not sure it is feasible politically within the organization.
45. Longer time frame for implementation; better understanding of existing business processes; instill realistic expectations for ERP system among end-users; certified consultants; experienced project managers.

System/software

Training

46. Make sure we invest the training dollars upfront, assure that team lead perform some of the configuration work, improve end-user training, budget much more money, check the background and experience of implementation consulting company.
47. More training, better communication to organizational community.
48. More up-front and in-house training for implementation staff, more documentation from consultants.
49. My area was a small part of the whole implementation. For our employees the change over was not difficult. I would have like had access to experiment in a test environment. This system has vast capabilities that I am still exploring.
50. Overall, our implementation went extremely well. An improvement would be more training and review after implementation would have been extremely beneficial.
51. Provide more end user training. Devote more time to change management.
52. Train more.

Vendor Issues

53. Chose another hardware partner instead of IBM to go with perhaps Sun.
54. Use SAP America (Public sector) as the implementation partner.

General

APPENDIX K

ADVICE ON ERP SYSTEM IMPLEMENTATION FROM PROJECT MANAGERS AND
TEAM MEMBERS

Change management

1. Prepare all staff for business reengineering. Have a business structure with strong management to force direction.
2. Think and plan ahead. Change management is the key. Do not overlook end user training and make sure that CEO/CFO is on board and willing to increase budgets on a moments notice.
3. Spend more time on change management - however much time you have planned, it will not be enough. Spend more time managing user expectations - make sure they are in line with the functionality that will actually be launched. Training is critical - especially for casual users.
4. Look carefully at your current business practices first and make sure they are all documented. Identify up-front which business processes will need to be changed and start working on the changes first thing. Make sure your team worked together on the configuration settings, to be sure there were no integration conflicts. Do not allow them to wear blinders and ignore other modules etc.

Communication

5. Scope of requirements is key. Communication and organization is essential.
6. Communication and change management are key. Define scope and stick to it, avoid scope creep. Provide good training for users and IT folks who will support the system in the long term.

Consultants

7. Be very selective with the consultants that are assigned to your project; if they do not understand your business, get rid of them quickly. Place the strongest employees you have on the implementation team - even if they are not considered the "subject matter experts." Smart people can figure it out, and they will not have the baggage of someone with years in the positions - better able to affect change. Do not fight the software - use its functionality to run your business; if you keep thinking the software should do everything you dream of, stop your project ... even ERP software has limits
8. Be more hands on with the consultants during implementation. We were doing the implementation and our regular jobs at the same time and did not learn enough through on the job training.
9. Assure that each consultant documents their actions and procedures of their module. Cross train between modules as much as possible.
10. Encourage cross training between modules. Encourage knowledge transfer from consultants to project team members. Good documentation is very important.
11. Get competent consultants and beware of scope creep.
12. Limit the consultants; consultants should not manage the project, train before the implementation, practice before the implementation, expect to develop a post-implementation training program for the next 6 months to one year.
13. Ensure project members are fully involved in the implementation and do not allow consultants to do all of the development. Project member experience and knowledge of the system will reduce the need for future consultant assistance as

well as reduce associated costs.

Costs

14. When you begin paying license/maintenance fees, you are paying the vendor, not the third party consulting firm you hired to implement. After implementation, do not expect fee-free support from that third party firm. I advise that your implementation include vendor consultants (who are more likely to be fee-free contacts after implementation as their services are in large part paid by the maintenance agreement fee).
15. Most ERP type projects are under estimated by 50%. The same was true here. Although, this company has Implemented SAP 4 times on 4 separate projects, the cost has been significantly overrun each time. Do not allow the proliferation of multiple copies of the original ERP system. Keep the company together on one system as much as possible. Multiple systems and versions reduce the ROI and increases sustaining costs.

Project management

16. Do not rush it, even if it means losing a little money, because a bad implementation costs so much more in a damaged relationship with your customers.
17. Ensure executive staff understands the meaning of 'buy-in' for the project. Do not accept a verbal agreement. Spell out the impacts to the organization in terms of the demand from the project on staff's time for participating in the project (analysis, configuration, testing, etc.), training, and the initial loss of productivity.
18. Huge stressor for Project Team, prepare people and take care of any needs as much as possible. Bring in food, provide flexible hours so they go see soccer game and come back, etc. Roll specialty consultants on and off as needed instead of for duration
19. Several suggestions:
 - DO NOT choose one implementation partner for functional consulting, and another for technical implementation. That is an absolute nightmare.
 - Insist on a full time functional project team, fully dedicated to the project. Start planning well in advance of the kick-off date for replacements and training for those people.
 - YOU MUST HAVE 100% backing from the entire senior management team...not just the CFO.
 - Send your team to software training in advance of the implementation.
 - Send your team to some kind of team-building seminar...if you sense chemistry problems get rid of them....do not let it linger.
 - If you are the project manager....make sure you understand the limits of your authority, and if you do not feel you have enough to adequately do the job, decline to take the role, even if you have to quit.
 - Insist that the company come up with: a) an incentive program of some kind for the project team; and b) some idea of what you will do with them at the conclusion of the project
 - If your project is likely to result in consolidation of staff, etc. be upfront with people and plan accordingly...do not try to lie about potential future changes.

20. Have clear goals; establish ownership and buy-in from top managers; be certain an ERP is the mechanism to reach your goals; severely limit system customization; do not expect technology to drive business process change.
21. Have support of senior management and strong project management. Develop a good communication plan to keep various levels of the company apprised of progress and target dates.
22. Find the right people to work together on implementation. Management support is a must! End user training made simple. Support after go live for end users. The ability to adapt business processes to new functionality software.
23. Bury your implementation team in the technology and learn it better than the consultants. Get management to guide the sites toward standardized processes.
24. Overcoming the negativity and the politics are big hurdles.
25. Back fill positions so project members will not have to deal with production issues
26. A Big Bang implementation strategy sounds very scary, but is actually best as it eliminates the need for interfaces to other systems, and does not keep you tied to be compatible with data elements in those other systems. Full time dedicated team members, from business and IT. Executive management level support. Include organizational change management in the project, and involve "champions" from the business.
27. Be realistic about the resources needed for implementation. Communicate with end users and management a lot. Make certain that you have a friendly reporting tool for end users to use. Also, may want to encourage units within organization to restructure to have reporting experts and not expect managers to do reporting, unless they are techies or number crunchers.
28. Insure scope is reasonable and try to minimize scope creep.
29. The areas around top management backing and employee buy-in are very important both during project and years after.
30. Get upper management total support ahead of the project and buy in to changes that might be major.
31. After you have made the choice of vendor spend the time and money to learn the details of the system setup, and configuration. Do not let a third party consulting firm do the install. Learn from them but do the install yourself.
32. Staff the project team with mid-level managers who are self-starters, are not afraid to make decisions, and who will own the end result. Determine the requirements for and staff the production support organization before the end of the implementation.
33. Ensure executive and senior management support. Do not underestimate security and reporting. These are two pitfalls that can hurt a project. Interview your engagement consultants for experience. In certain instances, we ended up training the consultants.
34. Be realistic about the resources needed for implementation. Communicate with end users and management a lot. Make certain that you have a friendly reporting tool for end users to use. Also, may want to encourage units within organization to restructure to have reporting experts and not expect managers to do reporting,

unless they are techies or number crunchers.

35. Ensure scope is reasonable and try to minimize scope creep.
36. I think that staff involvement from the get go is imperative. Without the support, knowledge, and experience that our staff shared with us, this objective would not have been reached within the time frame scheduled. Without a real understanding of your business, the processes within your organization, and how your business integrates with your clients both internally and externally you will not have a successful implementation.
37. Carefully develop the scope, plan the project, work the plan, and be committed to success.
38. Dedicated and full-time team members, plus knowledgeable consultants are essential for a successful implementation.
39. Get everyone involved who will be an end user.
40. Make sure all departments are represented on the team; not just MIS people.
41. Have full cooperation from management and users.
42. Several Suggestions:
 - Break the implementation down into manageable parts, even if this may mean creating temporary interfaces.
 - Do not be financially tied to implementation dates. Allow the project to move at the pace it takes to complete everything properly.
 - Be sure to retain consultants long after the ERP process is implemented to allow enough time for knowledge transfer.
 - Be sure to take full advantage of your in-house IT expertise.
43. Plan, communicate, require upper management support, spend adequate time for training development and delivery, perform internal road shows, pray.
44. Strong project management skills, upper management buy in AND involvement; strong change management program among employees; project "temp" staffing; skill set change.

System/software

45. Do not modify the software, accept standard business practices. Even public sector organizations should be aware of costs and savings opportunities.

Training

46. Work on a fixed price contract. Send your team to education classes. Be significantly involved in the SAP User Group (ASUG) even if you have not yet implemented. Get lots of references and make site visits to evaluate software and consultants. Talk with real users.
47. Make sure that you have end user involvement and training.
48. Do not rely solely on web-based training. Hands on training with instructor led classes are best.

Vendor Issues

49. Use SAP as the implementation partner and quality assurance vendor.
50. When looking at ERP system every vendor will show how their system will do everything. While this may seem like strong benefit. The reality that has been seen is that each system comes from one background or another (Accounting, Project Management, Material Management, etc.) and the way they approach

areas that are outside of their background does not necessarily translate well.

General

51. Make certain other like entities are already using it. (i.e., higher education, public funded, healthcare, etc). Visit their campuses, ask very direct, pertinent questions.
52. Do not skimp. Be demanding.
53. Do homework up front before hand.
54. Get lots of end user participation early on. Define business needs in sufficient detail in advance.
55. Get it all under standard your requirements and get good SAP advice.
56. Do your homework! Know the new systems capabilities. Do not just look at current processes and how they map out (where you are) look at the new software's functionality and merge it with where you want to be! It's as good a time as any to improve on things. Otherwise, you just end up with a very expensive newer version of your legacy system.
57. ONGOING TRAINING, ONGOING CONSULTING, ON SITE SUPPORT FOR 2 YEARS MINIMUM, HAVE EXTRA MONEY SET ASIDE FOR UNKNOWNNS.
58. Talk heavily with those that have done it, same industry, and same software. Get some experienced team members. Educate them/in the long run, smarter to learn it up front than depend on consulting. Be very selective with consulting.
59. Test, test, test.
60. Do not settle for one player. Allow and take the time needed to explore what is available, even if that means upsetting your timeline. (Our request for bids resulted in only one response.)
61. I think that staff involvement from the get go is imperative. Without the support, knowledge, and experience that our staff shared with us, this objective would not have been reached within the time frame scheduled. Without a real understanding of your business, the processes within your organization, and how your business integrates with your clients both internally and externally you will not have a successful implementation.
62. It is a very big change, but it can be done with hard work.
63. Change/Improve business processes first before implementing solution

APPENDIX L
UCF IRB APPROVAL LETTER



Office of Research

June 12, 2003

Joycelyn L. Harrison
4352 S. Kirkman Road #1203
Orlando, FL 32811

Dear Ms. Harrison:

With reference to your protocol entitled, "Dissertation Study: ERP Implementation in the Public Versus Private Sector," I am enclosing for your records the approved, executed document of the UCFIRB Form you had submitted to our office.

Please be advised that this approval is given for one year. Should there be any addendums or administrative changes to the already approved protocol, they must also be submitted to the Board. Changes should not be initiated until written IRB approval is received. Adverse events should be reported to the IRB as they occur. Further, should there be a need to extend this protocol, a renewal form must be submitted for approval at least one month prior to the anniversary date of the most recent approval and is the responsibility of the investigator (UCF).

Should you have any questions, please do not hesitate to call me at 823-2901.

Please accept our best wishes for the success of your endeavors.

Cordially,

A handwritten signature in black ink, appearing to read 'Chris Grayson'.

Chris Grayson
Institutional Review Board (IRB)

Copies: William Bozeman
IRB File

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