ACHIEVING SUCCESS THROUGH ADOPTION OF
ENTERPRISE RESOURCE PLANNING – A QUANTITATIVE ANALYSIS OF SAP USERS
IN NORTH AND SOUTH AMERICA

by

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Abstract

Technology is a tool that, when used properly, can make dramatic improvements in the productivity of operations and the work of support employees. As organizations strive to become more competitive in their product or service offering, they find themselves at the mercy of unanswered questions, excellence as achieved by their competitor's best practices, and ever changing technology. While low cost, on-time delivery, flexibility, high quality, and exceptional service are the competitive priorities organizations have competed on for decades, the ability to excel in more than one or two of these areas stagnated competition among rivals through the mid 1990's. As changes in technology rapidly advanced in the 1990's, a new competitive element was born that enabled organizations to compete on multiple competitive priorities, making them more competitive and driving competitors far behind. The new technological offering, initially introduced as an answer to antiquated systems and year 2000 issues, was called Enterprise Resource Planning. This new mammoth technology formed after its predecessor Materials Requirement Planning, enabled organizations to connect vendors, the organization, and customers in an almost seamless manner with real-time accurate communication and information. Enterprise Resource Planning comes with a high price, complex system of database and modules, and plethora of changes in the way support staff do their job. Organizations striving for the benefits Enterprise Resource Planning has to offer, often find themselves in self destruct modes and eventual bankruptcy. In order to insure success in Enterprise Resource Planning adoption, successfully completing the implementation process is a

critical undertaking. Critical success factors and attention to the change in technology being adopted, the change management in people affected by the technology, and the adoption of proven best business practices lead to the achievement of success in the adoption of these systems. This research studies the effects of critical success factors grouped into categories of change in technology, change management, and best business practices in an effort to test for a significant link between each separately and combined during implementations, to successful Enterprise Resource Planning adoptions in hopes that future adoptions find increased success.

Dedication

This research is dedicated to those whose support, guidance, encouragement, and love made it possible for me complete this achievement:

To my parents, Robert S. and Betty Jean Thomas, whom at my tender age of 6 months, God, gave to me; whose love, support, and inspiration are second to none on this Earth, and to whom I miss each and every day.

To my son, Chris, for being the promising young talented man that he is; for his love, support and understanding both now and in the future. Use what God has blessed you with to make yourself and the world a better place.

To my wife and woman I love with all my heart, Carol, whose love, encouragement, and companionship make my life complete, whose knowledge and dedication have contributed to my completion of this work, as well as many other successes in our lives.

To my stepchildren, Amanda and Andrew, whose encouragement and support have been instrumental.

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And finally to God and Christ, whose love is unsurpassed in all given to us, who has blessed me with the many gifts in my life. I pray this work and all I do, is to God's will.

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

Manufacturers looking to gain strategic advantage by competing on multiple priorities have found the use of Enterprise Resource Planning (ERP) systems in today's business world to be a valuable asset in gaining a competitive edge (Porter, 2001).   This achievement of competitive edge has made ERP applications the most popular means of overall business process improvement since the North American adoption of the Japanese led concept of Just-in-time management in the 1970's (Oliver & Romm, 2002).

ERP systems are cross-functional enterprise systems driven by an integrated suite of software modules that maintain the central internal business processes of a company giving an integrated real-time view of core business processes. These modules operate interactively utilizing one database which shares all information necessary for each module's purpose, as well as user requirements (Scalle & Cotteleer, 1999).

While the majority of *Fortune* 500 companies have adopted ERP systems and the high end of the market has become saturated, ERP systems have gained popular reception and are now filtering down to medium-sized organizations throughout Europe and North America. Successful ERP systems can provide the backbone of business intelligence for an organization. This gives management a unified view of its processes and better enables control over those processes (Gale, 2002).

Competitive advantage is gained in ERP systems by merging and centralizing all the information systems required by the firm in one single system driven by one single massive

database. Accounting, manufacturing, distribution, human resources, and all other operational and non-operational units now subscribe to one seamless computing system. This provides a more effective and efficient environment working from one database of information instead of relying on islands of information originated previously from each independent area of the organization (Rowe, 1999).

Considering the vast difference from ERP and existing management practices, the cost versus benefits of an ERP implementation project are often hard to project much less prove; thus, supporting the theory that ongoing measurement of attributes is an important part of the ERP implementation process (Adam & O'Doherty, 2000). ERP requires a change in the cultural of the way businesses are managed and run (Gale, 2002). A large part of this culture change is communication and accountability. A lack of understanding on the part of employees as to why it is important to adhere to ERP system input requirements ultimately lead to employee shortcuts, lack of data input, and subsequent ERP implementation disaster (O'Leary, 2002).

Problematic attributes associated with ERP implementations are vast and diverse and include an excessive functional approach (without training personnel to know the impact of their role in the grand scheme of the ERP environment), inappropriate scope, lack of testing and non-proven processes, data quality issues, and unknown business results. In addition, participation of users, fragile human capital, lack of upper management support, and participation of users in ERP implementation decision making add to the quandary of problems. Upper management often hastily makes the decision to cut training budgets and user involvement creating a negative impact on ERP success as well (Markus, Axline, Petrie, & Tanis, 2000).

ERP's integrated approach to business problems, incorporating the use of one common database, provides the crux of the value added (Rowe, 1999). A requirement of ERP implementations is the standardization of business transactions which often require re-engineering of business processes in order to feed the necessary input to the ERP environment. Measurement of the results of these business processes (accompanied with comparison to historical data and world class benchmarks) is required to track ERP progress and improvement (Oliver & Romm, 2002).

ERP's added degree of complexity and change to the organization requires a culture change on behalf of the organization. This culture change should incorporate communication of the new expected re-engineered roles of personnel, the responsibility of personnel to the new ERP environment, and how each individual's role is important to the new ERP environment. The practice of change management from all levels of management is required (Gale, 2002).

Identifiable attributes for success include having measurable business processes and goals which can be used relative to benchmarks and past data for improvement identification, organization of a cross-functional ERP implementation team, the employ of a strong project / program manager to lead the ERP implementation, and practicing change management within all levels of the organization (Hislop, 2000). Many organizations attempt to implement ERP as a change in technology ignoring the necessary change management required at impacted levels of the organization, as well as ignore the adoption of best business practices that opportunely exist during such an implementation.

Background of the Study

This research study deals with the implementation of information technology, namely ERP. It focuses on the presence or lack of documented and proven critical success factors further grouped into elements of the change management / management of people, adoption and deployment of new best business practices, and the deployment of new technology. The concept of ERP methodology is entity comprehensive for the "enterprise" employing ERP, as well as the customer and supplier enterprises integrated into the service or goods provider who is employing ERP in their organization. This marriage of once dissimilar information systems and the required change of business processes with the goal of "optimization enabled through integration" make the implementation of ERP an extremely immense and complicated task (Buckland, 1991; Debons et al., 1988; Debons & Larson, 1983).

The benefits of ERP systems are immense and in some instances necessary for competitive survival in today's global business climate. Along with the potential for huge benefits comes a huge price tag accompanied with well documented failures driving some large organizations into bankruptcy. Many executives believe ERP implementation provides at least a moderate chance of damaging their organization because of possible problems encountered during the implementation of this vast system (Honig, 1999).

While the ERP methodology is an attractive and desirable tool for most twenty-first century corporations, successful implementation of ERP is difficult, challenging, expensive, and as a result frequently detrimental to organizations. Organizations that have implemented ERP have followed various approaches for successful implementation. Many attempt to implement ERP as they would any other type of change in information technology. Others follow a more

intensive time consuming approach in pursuit of best business practices. Numerous other

approaches are documented. After approximately 10 years of heightened use of ERP systems,

successful ERP implementation is still somewhat of a mystery (Honig, 1999).

Statement of the Problem

There have been many theories and approaches to ERP implementation which have

proven both success and unsuccessful results. Identification of the many critical success factors

that underlie these approaches have been the objective of other scholars research efforts. The

intent of this study was to identify correlation between successful implementation of ERP and

the presence and/or absence of three target areas of implementation focus – a change in

technology, attention to change management efforts within the work force, and a change in

business practices.

Purpose of the Study

While ERP positions firms to compete using multiple competitive priorities, the

complexity and vastness of ERP systems often leads to implementation failure as well as

subsequent business loss and/or failure (Davis & Heineke, 2005). Many documented research

efforts have been conducted on the topic of ERP's required technological change, as well as ERP

imposed people and culture related issues.   However, research lacks in the study of the possible

root cause of failure from the perspective of ERP requiring a paradigm change, or associated

culture shift, versus a the view of a simple transition from one system and technology to another.

The purpose of this research was to explore ERP implementations and determine whether

successful implementations result from a focus on ERP as a change in technology, change

management of the people using the ERP system, change in best business practices, or from a

combined focus of any or all of these three foci area. The results from this research can be used to assist other companies implementing ERP in the future to plan implementation with a higher confidence level for success.

<center>Rationale</center>

Due to the vast degree of change necessary to integrate all functional areas and responsibilities through a single database, ERP involves vast change management. Implementation of ERP is a process aimed at "producing a radical logistical" innovation for the organization (Kraemmerand et al., 2003).

ERP systems can be complex and difficult to implement. A strong structured and disciplined approach can greatly facilitate a successful implementation (Umble et al., 2003). While several schools of thought exist in developing implementation plans, those that focus more on people and business related issues, rather than plan exclusively for technological related issues prove to be more successful (Davenport, 1998). Accordingly, implementation strategies should incorporate a blend of business, people, and technological steps (Somers & Nelson, 2004; Yusuf et al., 2004).

Change management deals with the human aspect of ERP implementation. Stakeholders and employees should be kept informed of the status of the ERP project as well as how it impacts them personally. A comprehensive plan analyzing anticipated change should be taken into consideration when planning for appropriate change management. Communication of change management issues is most critical (Okrent & Vokurka, 2004).

Critical success factors can be traced to people, business, and technological related origins. While many failed ERP efforts have focused on technological change, organizations

that focus on business and people issues and problems find more success in implementing ERP as these areas are the more common causes of failure (Davenport, 1998). Organizations that adopt a solid ERP implementation plan, placing primary emphasis on business and people related critical success factors, are more likely to find success in their implementation efforts (Somers & Nelson, 2004).

Research Questions

ERP is a costly, complex, comprehensive system when successfully implemented, can yield desirable results for many organizations. Benefits including heightened competitiveness, better communication, higher accuracy of information, and more timely information are all positive attributes gained by organizations with successfully implemented ERP systems. These attributes lead to better decision making, better vendor and customer relationships, and stronger customer loyalty.

Considering the high risk for failure observed through many non-successful ERP implementations, the need exists for knowledge supporting successful ERP implementations. With this in mind, the following questions are raised:

1) Is a focus on the change in technology required by an ERP adoption observed in successful ERP implementations?

2) Is a focus on change management sensitive to the changing requirements of employees as required in an adoption of ERP versus employees' current practices using legacy systems, present in successful ERP implementations?

3) Is a focus on change to best business practices with which adoption of ERP systems promotes present in successful ERP implementations?

4)   To what degree does the combined presence of focus on: a) the change in technology, b) change management, and c) change to best business practices, correlate to successful ERP implementations?

These questions form the basis for this study, and are thus fundamental to the research prepared in the following chapters. The selection of instrument and collection of data supported the researcher with analyzing the achievement of success gained by adoption of ERP systems as correlated to the presence of focus in ERP implementation on change in technology, change management, and change to best business practices.

Significance of the Study

This study is significant for a number of reasons. To the manufacturer of goods or provider of services, ERP provides the infrastructure to compete on multiple competitive priorities without experiencing loss due to tradeoffs. To illustrate, consider the competitive priorities as identified by the works of Roth & van der Velde (Roth & van der Velde, 1991) and Michael Porter (Porter, 1980, 1985; Porter & Millar, 1985). The five competitive priorities organizations historically have had the capability of focusing on are cost, quality, flexibility (lean competitor), speed of delivery, and service (Davis & Heineke, 2005). Traditionally, organizations have found themselves limited to the use of only one (sometimes two) competitive priorities with which to compete, as focus and trade-offs have prohibited organizations from basing their strategy on more than one (Skinner, 1969). For example, if an organization wanted to focus on speed of delivery, it could not be flexible in terms of its ability to offer a wide range of products. McDonald's, for example, provides fast service but does so with a limited menu of highly standardized fast food offerings. The advantage given by information technology as

observed by the improvement of communication between customers, suppliers and providers of goods and services (through ERP) gives the firm the ability to compete on multiple competitive priorities (O'Brien, 2005). This advantage has taken organizations to a new heightened level of competitive strategy. Considering the high rate of ERP failures due to problems and delays in implementation, the study and correlation of factors / methods contributing to the successful implementation of ERP proves valuable to organizations who wish to implement ERP in the future.

In addition to organizations, the software and consulting industries that have been created as a result of ERP account for nearly $25 billion and $17 billion of our annual world economy, respectively. Considering the positive impact that can be gained from successful implementations to the future organizations using ERP, as well as the positive impact to the industries providing ERP software and consulting, the study proves to be significant.

Finally, by publishing the results of correlation research between ERP people, business practice, and technology change, the study has the potential to make a contribution to the theory and ERP literature that exists today.

<div align="center">Definition of Terms</div>

The following terms are used throughout the course of this research:

Americas' SAP Users' Group. The world's largest, customer-driven community of SAP professionals and partners which consists of more than 45,000 individuals and 1,700 companies. ASUG delivers value to member companies through access to a year-round community capital, networking opportunities, and a forum to influence SAP.

Business Intelligence. A broad term that leads to decision making that may be automated requiring no human intervention, semi-automated, or automated. It may be based on DSS (Decision Support Systems) that use data warehousing and OLAP to answer questions about operations including Sales and Supply chains, etc. (Haag et al., 2005).

Business Re-engineering. The process of rethinking and restructuring an organization (Hammer, 1993).

Change Management. The process of developing a planned approach to change in an organization. Typically the objective is to maximize the collective benefits for all people involved in the change and minimize the risk of failure of implementing the change. The discipline of change management deals primarily with the human aspect of change (Wikipedia, 2006).

Competitive Advantage. Providing a product or service in a way that customers value more than what the competition is able to do (Haag et al., 2005).

Critical Success Factors (CSFs). A factor critical to the success of a project or organization (Haag et al., 2005).

Cross-functional Engineering (Concurrent). The simultaneous and coordinated efforts of all functional areas, which accelerates decision making and the time to market for new products (Davis & Heineke, 2005).

Culture Change. Change in the collective personality of a business or organization encompassing such attributes as language, traditions, and acceptable behavior, among other things (Haag et al., 2005)

Customer Relationship Management (CRM). Software focusing on the interface between the firm and its customer, which collects customer-specific data and has order entry capability (Davis & Heineke, 2005).

e-Commerce. Commerce accelerated and enhanced by information technology, in particular, the Internet (Haag et al., 2005).

Enterprise Resource Planning (ERP). System which provides a firm with a common software infrastructure and database that facilitates transactions among the different functional areas within a firm, and between firms and their customers and vendors (Davis & Heineke, 2005)

ERP Implementation. The various steps involved in installing an ERP system. Due to the vastness of the system, the ERP implementation phase is in-depth and can involve virtually all aspects of an organization (Haag et al., 2005).

"Go Live" Date. Known also as the "cut over" date, the "go live" date is a point in time when an organization implementing a new system changes from their legacy system to the new ERP system (Anderegg, 2000)

Just-In-Time Management. Operations management methodology which requires the production of precisely the necessary units in the necessary quantities at the necessary time, with the objective of achieving plus or minus zero performance to schedule (Davis & Heineke, 2005).

Productivity. In a production environment, the efficiency with which inputs are transformed into outputs (Davis & Heineke, 2005).

Project Scope. Clearly defines the high-level system requirements of a project (Haag et al., 2005).

SAP. business application software firm that leads the market for enterprise resource planning (ERP) software, such as programs that synchronize the various aspects of industrial production (John Wiley and Sons, 2003).

Supply-Chain Management (SCM). System that primarily focuses on how firms interact with the suppliers that are part of their overall supply chain, in an effort to provide the firm and customers with high-quality materials, components, and services that are competitively priced (Davis & Heineke, 2005).

Assumptions and Limitations

The following assumptions and limitations apply to this research:

1)   The areas represented in the survey instrument were extracted from critical success factors and grouped into three categories: technology (of which change in technology is focused), people (i.e. users or employees, of which change management is focused), and business practice (of which change from a currently employed practice to a new best business practice is focused).

2)   The assumption was made that a successful ERP implementation can be determined by identifying minimum goals of an ERP system which are identified in the literature review.

3)   The respondents honestly answered the survey.

4)   Data to corroborate the existence of a correlation between ERP success and successful ERP implementation attribute groups can be gathered through the survey instrument.

5)   Respondents of the survey had responsibility, as well as the appropriate proficiency for making decisions regarding ERP implementation, for their respective companies implementing ERP.

6)   The survey instrument was structured for the purpose of finding comprehensive factual unbiased information was appropriate for the assessment of such information, and the statistical procedures applied were appropriate to measure the significance of a measured correlation between success and the existence of the focus areas previously mentioned.

7)   The survey instrument was dependent upon self-reported data as well as subjective opinions.

Nature of the Study

This research is conducted in a quantitative methodology approach. The nature of a quantitative approach is to research many observations, and quantitatively determine facts and other information from the results of survey or questionnaire instruments. In contrast to a qualitative approach which focuses on few instances, the researcher felt a more conclusive and representative study could be conducted using the quantitative methodology.

From the America's SAP User Group (ASUG), 500 organizations who have implemented SAP within the past 5 years represent the sample studied in this research. A comprehensive survey/questionnaire is used to derive statistical information about the nature and approach of each organizations ERP implementation, as well as measure the success of the ERP system one year after implementation. A study of the correlation between those organizations achieving

success through ERP and the presence (or lack thereof) of focus on change in technology, change management, and best business practices, was conducted using this data.

Organization of the Remainder of the Study

The remainder of this research is in four chapters. Literature relevant to ERP, success gained through adoption of ERP, failure and success of ERP implementations, implementation critical success factors, and other applicable contributions are included in Chapter 2. Chapter 3 covers the research methodology employed in this study. This chapter includes a description of the methodology, sample and population information, instrumentation, data collection and analysis procedures employed, researcher's philosophy, and theoretical framework guiding the research. Chapter 4 presents the data obtained in the study. This chapter addresses each research question identified in the study. Chapter 5 concludes the research with a discussion of the findings, conclusions gained from the study, and recommendations for further research beyond this study.

CHAPTER 2. LITERATURE REVIEW

Introduction

As organizations search for new ways to improve productivity, increase their competitive advantage, and satisfy customer demands, information technology promises to provide answers and solutions. A contemporary concept and approach to the use of information technology in the production of goods and services is enterprise resource planning, commonly known as ERP. According to contemporary thought, enterprise resource planning (ERP) is the foundation of today's business management and strategic positioning (Stevens, 1999). Most major corporations have transformed their operations to organizations led by ERP systems since the mid 1990's (Oliver & Romm, 2002). ERP is an integrated information system that manages all aspects of a business entity (Scalle & Cotteleer, 1999). Utilizing a single data base approach integrating all functional areas, it streamlines data flows throughout the organization allowing managers access to real-time information. By virtue of data integration, counter-productive processes and cross-functional coordination problems are reduced or eliminated within the organization (Somers & Nelson, 2004).

While ERP has been widely accepted, its complexity, vastness, and degree of required change make its successful implementation and use an ominous task. Poorly planned and managed ERP implementations have brought organizations to their knees and in many cases, caused bankruptcy.

The Nature of Enterprise Resource Planning - ERP

ERP systems integrate all functional areas of an organization into a single data base approach. ERP systems offer companies three major benefits, 1) business process automation, timely access to management information, and improvement in the supply chain via the use of E-communication and E-commerce (Yusuf et al., 2004). Information technology proves to be a vital tool by providing "end-to-end" connectivity in an organization through implementation of ERP systems (Rajagopal, 2002).

The intent and value of ERP comes from its ability, when successfully implemented, to link all areas of an organization including order management, manufacturing, human resources, financial systems, and distribution with external suppliers and customers into a tightly integrated system with shared data and visibility (Chen, 2001). This concept streamlines data flows allowing managers access to real-time information (Scalle & Cotteleer, 1999). Counter-productive processes and cross-functional coordination problems are reduced or eliminated within the organization by virtue of ERP's data integration efforts (Somers & Nelson, 2004). The benefits of a successful ERP system can be significant. Average firms experience improvements of 25 - 30% in inventory cost, 15% in raw material, up to 95% of planning cycle time, 10 – 40% of delivery times, 10 – 50% of production times, and 20 – 25 % of late deliveries (Adam & O'Doherty, 2000; Ragowsky & Somers, 2002).

The benefits of a well selected and successfully implemented ERP system are accompanied by substantial investment and risks. Implementation can range from $200,000 - $800,000 for small to medium sized companies with approximately $10 to $70 million in sales, to millions for larger organizations (Ragowsky & Somers, 2002). From a risk perspective,

studies show an estimated 50-75% of United States firms experience failure in some manner, while 90% of ERP implementations end up late or over budget (Umble et al., 2003).

Companies have spent billions of dollars and numerous man hours implementing sophisticated ERP systems (Yusuf et al., 2004). A study of 63 companies varying from $12 million to $43 billion in corporate revenue, reported average ERP implementation time of 23 months, an average implementation cost of $10.6 million, plus an additional average $2.1 million spent on maintenance over a two year period (Stein, 1999).

ERP has become a "must have" system for almost every firm to improve competitiveness. As of the year 2000, over 60% of companies have installed or plan to install a packaged ERP system (Hsiuju & Chwen, 2004). The rapid trend toward ERP has created a new software and consulting industry which is projected to reach [have reached] $79 billion in 2004 (Ragowsky & Somers, 2002).

The Use of Enterprise Resource Planning Systems in Today's Business World

Enterprise Resource Planning (ERP) has been the most popular means of overall business process improvement since the North American adoption of the Japanese led concept of Just-in-time management. The majority of Fortune 500 companies have adopted ERP systems. Most major corporations have transformed their operations to ERP system led organizations since the mid 1990's. As a result, as the high end of the market has become saturated, ERP systems have gained popular reception and are now filtering down to medium-sized organizations throughout Europe and North America (Oliver & Romm, 2002).

What's so special about ERP? "ERP Systems represent the implementation of the old managerial dream of unifying and centralizing all the information systems required by the firm in

one single system…" (Rowe, 1999). This single database system potentially places all elements of the organization in a position to work from one source of interrelated data – not multiple departments driven by islands of information.

When used appropriately, ERP software integrates information used by the major (if not all) areas of an organization – accounting, manufacturing, distribution, and human resources – into a seamless computing system. This provides a more effective and efficient environment working from one database of information instead of relying on islands of information originated previously from each independent area of the organization. Successful ERP systems can be the backbone of business intelligence for an organization. This gives management a unified view of its processes and better enables control over those processes. ERP systems have a reputation for being very costly and often providing scanty results (Gale, 2002).

Contemporary thinking today is that ERP is the foundation of today's business management and strategic positioning (Stevens, 1999).

Reports of many reasons why ERP systems have been adopted exist. Many of the reasons are based on informed opinion rather than extracted by research study. A significant portion of the justification for adopting ERP systems is founded upon technology issues such as integration, and dissatisfaction with existing administrative systems, procedural issues such as information access, process improvement, and standardization, organizational issues such as business vision, service and quality, and people issues (Oliver & Romm, 2002).   Regardless of the reason, the issue of cost versus benefits is ever-present mandating management to justify the high cost of ERP with theoretical justification promising increased productivity and market share, while reducing costs.

Moving to ERP is often justified more by political reasons than by sound managerial reasoning (Adam & O'Doherty, 2000). While popular, political reasons are often costly and least understood. Many organizations feel unjust pressure to implement ERP to provide upper management a standard framework by which to operate multiple business instances. While justifiable from the upper management standpoint, this is often not understood from the instance or individual business subsidiary standpoint.

To generate return on investment, companies are adding strategic applications on top of ERP to find value. These value-added applications, or "bolt-ons", include solutions in customer-relationship management (CRM), supply-chain management (SCM), advanced planning and scheduling, strategic procurement, e-Commerce, and business intelligence (Stevens, 1999). Business integration in dealing with organization wide ERP is the ultimate proof for companies as they move into the post-implementation phases of their ERP initiatives ("Enterprise resource implementation still tough", 2001). Many organizations have found merit in expanding ERP efforts throughout their organizations. Demonstrated results of ERP implementations include:

1) Reduction of planning cycle (95%)

2) Reduction of delivery times (10 – 40%)

3) Reduction of production times (10 – 50%)

4) Lower stock levels (10 – 25%)

5) Reduction of later deliveries (25 – 50%)

6) Increase in productivity (2 – 5%)

The above results exemplify the effects of synergy in including (and / or combining) the supply chain management function within the ERP environment (Adam & O'Doherty, 2000).

These improvements show the significant potential of ERP implementation when properly planned, and orchestrated.

<div align="center">ERP Implementation Considerations</div>

Many organizations consider the implementation of ERP to be a transition from one technological platform to another. While many organizations plan for the technological impact of an ERP implementation, they fail to consider the people and culture related impact. Due to the vastness of ERP systems, and the associated degree of change management involved, many of the risk issues involved in implementation of ERP are more people and culture related than technological related (Ragowsky & Somers, 2002). ERP systems often fail due to lack of top management commitment, lack of proper training, and lack of communication – all of which are people and cultural related issues (Davis & Heineke, 2005). Consequently, a significant amount of focus in the change management process of ERP implementations should be devoted to people and culture related issues.

The aforementioned evidence promotes questions as to whether ERP implementation should be considered as a transition from one technology or system to another, or whether ERP implementation should be approached as a culture change, or paradigm shift for the organization to embrace. A transition is a change from one state to another, while a paradigm shift is much more complex and comprehensive than a mere change. A paradigm shift is a change from one set of interrelated assumptions to another. These interrelated assumptions form a philosophical and conceptual framework for which an environment exists (Kuhn, 1962). Considering the importance and correlation of this issue to the success of ERP implementations, a study of the change management approach of ERP as a transition of technology versus culture change or

paradigm shift, is in order. The appropriate selection of research method to such a study is imperative in order to effectively discover and communicate new knowledge for future ERP system use.

<center>ERP Implementation – Technology Challenge versus Business Problems</center>

As documented evidence illustrates, many ERP implementations result in failure. Often times, the approach to which the organization takes in planning implementation is faulty. While many anticipate the technical challenges to be the focal point of implementation efforts, they are often times not the main reason enterprise systems fail. ERP implementations focusing exclusively on information technology aspects, and not on the overall implementation of a system, are structured for failure. (Hsiuju & Chwen, 2004). The companies that have the kind of problems that lead to disaster are those that install ERP without thinking through its full business implications (Davenport, 1998).

"The companies deriving the greatest benefits from their systems are those that, from the start, viewed them primarily in strategic and organizational terms. They stressed the enterprise, not the system…" (Davenport, 1998). The leading problems are business problems. Companies fail to reconcile the technological imperatives of the enterprise system with the business needs of the enterprise itself (Davenport, 1998).

Adapting an approach to ERP implementation which focuses on the business issues of the organization includes several specific considerations. The people and culture of the organization should be included. People are change adverse in nature, while "IT projects are complex undertakings with a lot of human factors, and that means they're inherently fraught with danger." (Wilder & Davis, 1998).

Considerations for effective communication should be considered to avoid unnecessary results from human factor related problems. One issue of communication, which impacts all personnel of the organization, especially upper management, is when the ERP implementation is invisible with regards to the new system and new technology.   Invisible introductions are a major cause of implementation failure. Creating an understanding of the linkages among implementation funding, support, and technology success can be one of the most difficult perceptions for project managers to construct. Executives must understand that money, time, and attention are vital to the successful use of the technology. Executives typically must see success before they will support implementation (Griffith et al., 1999).

Creating a context that supports implementation is project manager's first responsibility in the implementation process. Without the support that visibility generates, there is little opportunity to use the tools and techniques provided by the implementation literature. And without those tools and techniques, successful implementation is a long shot (Griffith et al., 1999).

<center>ERP Implementation Activities</center>

All implementation include a standard set of activities. These activities include 1) market research and acquisition of hardware, software, and services, 2) software development (if necessary), 3) data conversion, 4) end user training, and 5) conversion from old to new system (O'Brien, 2005).   The following sections detail the steps taken in an ERP implementation process. While most implementation processes take on a more technical focus, as detailed by the steps above, ERP implementations require focus on people and business issues as well (Davenport, 1998).

ERP Implementation Strategies

While ERP systems are intricate and complicated systems to implement, a planned and closely controlled approach can greatly aid the implementation process (Robey et al., 2002). ERP implementation strategies can take on many different approaches – some proving to be successful, while others are labeled for failure. While some approaches provide more specific criteria, others include general phases or stages for adoption of stage specific steps. For example, (Rajagopal, 2002) proposes a six-stage model for ERP implementation which consists of initiation, adoption, adaptation, acceptance, routinization, and infusion. The first four stages of this model represent pre- "go live" stages, while the last two represent post-adoption behaviors (Rajagopal, 2002). Somers and Nelson (Somers & Nelson, 2004) incorporate this approach using the Markus and Tanis (Markus & Tanis, 2000) key players and key activities framework (critical success factors) into each stage. These critical success factors consist of key players which include top management, a project champion, a steering committee, implementation consultants, a project team, vendor-customer relationships, vendors' tools, and vendor support. In addition, fourteen key activities compose additional critical success factors and more specific steps in the implementation process. These key activities include: 1) user training and education, 2) management of expectations, 3) careful selection of the appropriate package, 4) project management, 5) customization, 6) data analysis and conversion, 7) business process reengineering, 8) defining the architecture, 9) dedicating resources, 10) change management, 11) establishing clear goals and objectives, 12) education on new business processes, 13) interdepartmental communication, and 14) interdepartmental cooperation (Somers & Nelson, 2004). These critical players and activities interface with the six ERP project life cycle stages to

establish the implementation plan. The advantage of this approach is the controlled, yet flexible structure to implementations incorporating both pre- and post-implementation behavior (Umble et al., 2003).

Umble et al. (2003) use input from the works of Langenwalter (2000), Oden et al. (Oden et al., 1993), Ptak (Ptak, 1999), and Ptak and Schragenheim (Ptak & Schragenheim, 2000) to derive an eleven step specific implementation approach as an alternative method to implementing ERP. The steps within this process include 1) a review of the pre-implementation process to date, 2) install and test any new hardware, 3) install the software and perform the computer room pilot, 4) attend system training, 5) train on the conference room pilot 6) establish security and necessary permissions, 7) ensure that all data bridges are sufficiently robust and the data are sufficiently accurate, 8) document policies and procedures, 9) bring the entire organization on-line, either in a total cutover or in a phased approach, 10) celebrate, and 11) improve continually (Langenwalter, 2000; Oden et al., 1993; Ptak, 1999; Ptak & Schragenheim, 2000; Umble et al., 2003).   This specific implementation strategy focuses on post ERP system selection steps which represents an ominous task within the implementation process and thus must be considered prior. The downside to this approach is that it lacks the communication, accountability, and responsibility associated with the individuals who selected the system to be implemented. Umble et al. (2003) study of Huck International, Inc., and their related ERP implementation, justify support for the use of the eleven step process. Following these steps, the organization found success in their ERP implementation efforts.

Development of an Organizational Change Management Strategy

An often overlooked aspect of ERP implementations is the effect that the new system will have on employees and other stakeholders. Change management is the "human side" of the ERP implementation (Okrent & Vokurka, 2004). ERP systems introduce large-scale change that can cause resistance, confusion, redundancies, and errors if not managed effectively. Many ERP implementations fail to achieve expected benefits possibly because companies underestimate the efforts involved in change management (Somers & Nelson, 2004).

The focal point of an organizational change management strategy that will maximize productivity and customer satisfaction as leveraged by the benefits of ERP technology should be centered on the same three factors that successful ERP implementation focus on the change impact on people. The experience of Rolls Royce validates this choice in that Rolls identified cultural (people) was a problem in their ERP implementation (Yusuf et al., 2004). People and business issues are documented in originating more ERP problems than technology (Davenport, 1998; Hsiuju & Chwen, 2004). Proper change management is an important attribute affecting people issues in all organizations.

Communication, planning, teamwork, and education are the primary issues from a people perspective of change management related to an ERP implementation. Communication is the first and most critical aspect of change management for an ERP implementation. It includes a clear understanding of strategic goals as related to the ERP implementation, a clear understanding of implementation steps and their impact on workers at all levels (Umble et al., 2003), a clear understanding of new business processes and the new responsibilities new processes bring upon employees, and finally an understanding of measurements used for tracking

implementation progress (Somers & Nelson, 2004). Both vertical (up and down the management chain) and horizontal (peer to peer) communication is imperative to a clear understanding of roles and responsibilities of the new system, as well as managing expectations of ERP change (Somers & Nelson, 2004). In addition, communication to suppliers and customers is critical as the success of ERP implementation, to a large degree, is contingent upon linking these important players into the ERP system (Bingi et al., 1999).

Appropriate planning is the second attribute of a successful change management strategy for maximizing ERP implementation productivity and customer satisfaction. Poor planning was identified by Information Week as one of the top three reasons an ERP project fails (Brown, 2001; Umble et al., 2003). A project manager, who is well poised in the "as-is" business conditions and the "to-be" future state under the new program, is crucial to leveraging the benefits of ERP. Key to proper planning is the strength of project management (Mabert et al., 2003). A well trained cross functional implementation team is imperative to successfully planning (Umble et al., 2003).

In addition to communication and project management, user education and training are critical to the change management process. Lack of user training and failure to understand how enterprise applications change business processes frequently appear to be responsible for many problem ERP implementation failures (Griffith et al., 1999; Somers & Nelson, 2004). Training is most essential during the acceptance phase when employees are uncertain about the existing change (Somers & Nelson, 2004).

Teamwork is a crucial change management matter when dealing with people related issues. Cooperation and involvement of all people involved is essential to success. A cross

functional strategy is most effective in tearing down departmental boundaries, exposing hidden agendas, and delivering appropriate communication to all areas affected by change (Murray & Coffin, 2001).

Other people issues to incorporate in a change management strategy for ERP are involvement of employees in the decision making process (drive accountability to the lowest level), and commitment and support by top management. Successful implementations require strong leadership, commitment, and participation by top management (Umble et al., 2003). Lack of business management support is rated as one of the top three reasons ERP projects fail (Umble et al., 2003).

The ERP Metamorphosis

Implementing ERP involves automating standard transactions and thus developing new business processes. When a company optimizes operations, account management, or management information, they are creating new business processes (Stevens, 1999). Recognizing such when launching an ERP project is important due to the necessary communication required to alert system users of new processes and procedures that will arise. Even the slightest failure to acknowledge user responsibility could result in one required element of the single database to not be updated thus creating corrupt data and resultant disaster for other users and decision makers.

In association with required new processes, reengineering of the organization is often both a desirable and necessary step of ERP projects. Because ERP represents a new way of managing an organization, employees are often required to do additional functions or functions outside their previous scope of performance. Thus, an evaluation of the appropriateness of

business re-engineering is a major first step in the ERP implementation process. It is rare that some kind of re-engineering is not required (O'Leary, 2002).

Business re-engineering requires observance and documentation of current processes and procedures in an effort to map future ERP required processes and procedures. Consultants are often used to perform such studies as organizations do not typically have existing resources to conduct such.

<center>The Required Culture Change of ERP</center>

ERP is more than just a new software system; it's a cultural change (Gale, 2002). A culture change of this type involves many aspects. One, for example, is helping employees understand that ERP systems usually require them to do more work or different administrative tasks that do not add obvious value to their individual jobs. Given a lack of understanding as to why it is important to adhere to ERP system input requirements, and therefore why the information they are inputting is important, employees will typically find a way to work around performing the necessary tasks in the ERP environment ultimately leading to ERP implementation disaster (Gale, 2002).

Managing change requires consideration for the inter-relationship between knowledge, networks of organizational leaders, and power at the various management levels. The development and use of both networks and knowledge during an ERP implementation process cannot be separated from issues of power and politics (Hislop, 2000).

In addition to change, patience and analysis is required of ERP implementations. Anticipated results can be slow and take longer than projected to achieve. According to the "ERP Trends" survey, while 24 percent of survey participants reported no decrease in

productivity following implementation, 75 percent experienced a moderate to severe productivity dip. One-fourth of the companies surveyed had dips lasting up to one year while the majority of the participants reported dips lasting less than six months ("Enterprise Resource", 2001).

Additional studies have discovered that 45 percent of firms perceived no improvement from ERP implementation while 43 percent claimed no cycle reduction had been experienced (Adam & O'Doherty, 2000).

Risk and Implementation of ERP – The Price of ERP

Cost of ERP is a concern for many companies. Implementation costs, on average, are 25 percent over budget. Considering the high price tag for ERP implementations, this overrun is of significant concern and can (has) put large organizations in a going concern questionable state. In addition to implementation cost, support costs are often underestimated by 20 percent for the year following implementation. A comparison of previous system costs to post ERP implementation system costs finds most companies with an increase in support cost as a whole on an ongoing basis ("Enterprise Resource", 2001). Efficiency, productivity, market share, and other gains, as a result of ERP, are expected to offset this increase in support cost.

The financial impact of ERP to both the software provider and knowledge consultant industry is significant. By 2000 the ERP revolution generated over $20 billion in revenues annually for suppliers and an additional $20 billion for consulting firms (Willcocks, 2000).

Risk and Implementation of ERP – Risk Factors

In a search for common factors associated with risk and implementation of ERP projects, Mary Sumner studied seven ERP project implementations representing seven diverse industries

implementing implementations of three major ERP providers: SAP, PeopleSoft, and Oracle. Her

findings represent the most common risk factors mentioned in the seven implementations and are

illustrated in Table 1 below.

Table 1. Common Risk Factors of ERP Implementations

	Risk Factor	Category of Risk Factor
1	Failure to redesign business processes to fit the software	Management
2	Lack of senior management support	Management
3	Insufficient training and reskilling	People Skills
4	Lack of ability to recruit and retain qualified ERP system developers	Technical
5	Insufficient training of end-users	People Skills
6	Inability to obtain full-time commitment of 'customers' to project activities and management	Customer
7	Lack of integration	Technical
8	Lack of a proper management structure	Management
9	Insufficient internal expertise	People Skills
10	Lack of a champion	People Skills
11	Lack of "business" analysts	People Skills
12	Failure to mix internal and external personnel	Management
13	Failure to emphasize reporting, including custom report development	Management
14	Insufficient discipline and standardization	People Skills
15	Ineffective communications	Management
16	Avoid technological bottlenecks	Technical

Data extracted from Sumner, 2000.

Risk and Implementation of ERP – The Price for Failure

The high level of risk associated with such projects correlates to the beneficial effects of

implementing ERP. Enterprise resource planning projects are complex. Re-engineering of key

business processes prior to their implementation, and the required culture change create a need

for change management within the organization. In addition, ERP projects require reliance on

many different types of expertise outside the firm's traditional internal means. Consultants, software vendors, and trainers are often an integral part of the ERP project team. The complexity of ERP, vast amount of radical change and introduction of new players to the environment all add to the dangers inherent in such vast projects. Some large organizations have incurred bankruptcy after years of unsuccessful implementation efforts of ERP systems. In the case of Foxmeyer, who incurred bankruptcy in 1996 after years of unsuccessful ERP implementation, software vendor SAP and the consulting branch of Arthur Anderson were sued as a result of problems associated with Foxmeyer's attempts at implementing ERP. Failure of large companies and legal action against implementation support players is illustrative of what can happen when implementations go wrong (Adam & O'Doherty, 2000).

Attributes for Failure

"ERP Trends," a survey conducted by The Conference Board (an independent research organization), reported 40 percent of study ERP study participants failed to achieve their business case one year after implementation of their enterprise resource planning. When benefits of the ERP project were achieved, it took six months longer than expected or planned. The lag in achieving benefits, as documented by the study, was primarily due to pressure to "go live" before the organization was ready to cutover to their new system. This resulted in substantial post-implementation efforts to identify and measure shortcomings and deficiencies associated with problems in the cutover ("Enterprise Resource", 2001).

Problems relating to ERP implementation are vast, sudden, and expensive. The most frequent and devastating problems include: 1) approaching ERP implementations from an excessively functional perspective, 2) inappropriately cutting project scope, 3) cutting end-user

training, 4) inadequate testing, particularly of interfaces, modifications integrations and exceptions, 5) not first improving business processes where this needs to be done, 6) underestimating data quality problems and reporting needs, 7) unknown business results, 8) disappointing business results, 9) fragile human capital, and 10) migration problems (Markus et al., 2000).

Another study conducted by O'Leary analyzes problems by identifying ERP stages and associated problems within each stage. The ERP life cycle includes six stages: 1) deciding to go ERP (business case state), 2) choosing an ERP system, 3) designing an ERP system, 4) implementing an ERP system, 5) after going live, and 6) training. According to a study conducted by Daniel O'Leary, 27.3 percent of the time, the main problem with ERP implementations is a lack of participation by the users. However, this measure is questionable due to the question as to whether users were adequately trained or not. Other problems could possibly underlie training and user involvement such as insufficient buy-in regarding personnel as well as insufficient support of management (O'Leary, 2002).

Other studies have revealed factors that affect risk inherent in major information system projects to include organizational fit, personnel skill mix, management strategy and structure, software systems design, user involvement and training, technology planning, project management, and social commitment (Sumner, 2000).

Middle management within production departments is often the source for most resistance to ERP projects. Their main objections to changes of ERP nature are typically that they are fundamentally unnecessary and that the organization can remain competitive through focus on development and production of technically innovative products (Hislop, 2000).

In addition to personnel issues, the change in adopting new technology has been noted to play a role. "Faulty technology is often blamed, but eight out of nine times, ERP problems are performance-related…" according to pat Begley, senior vice president of educational services at SAP, a major ERP software provider (Gale, 2002).

One of the biggest mistakes that companies make when they launch new ERP applications is assuming that they are going to be like any other piece of software… Microsoft word is a productivity tool – whether you use it doesn't impact anyone else in the company. But ERP is a totally new environment. Everything you do in an ERP environment affects the success of the company (Gale, 2002).

One area where many companies implementing ERP all to often first look to cut expense due to project overruns in training of ERP users. This is a very dangerous expense to minimize. Training is often last minute and weak. It typically covers, on a minimal basis, how to do specific job-related tasks, with no explanation of the effects of those actions (or lack thereof) within the business cycle. Training should cover why each task is important and how every transaction is part of a larger process. If this is not done properly, end-users are less likely to use the application correctly or consistently. ERP training should not be limited to teach end-users how to fill in fields and click buttons. End-users should know how their actions impact their colleagues as well as the entire new ERP management environment (Gale, 2002).

According to another study conducted by Daniel O'Leary, when companies discuss problems with ERP system implementations, it generally involves one of the following problems: 1) budget over-run, 2) time over-run, 3) lack of benefit, 4) meets or does not meet

business plan criteria (O'Leary, 2002). The O'Leary study was the only one to exclude specifically people issues from its recognition of problem areas.

Attributes for Success

How does an organization determine if it is successful in its ERP implementation efforts? Quantitative operational objectives that are often sought for and met from ERP adoptions are: 1) experienced reduction in scheduling and planning cycle greater than 50%, 2) experienced reduction in delivery times by at least 10%, 3) realized reduction in production time by at least 10%, 4) reduced inventory stock by at least 10%, 5) reduced late deliveries by at least 25%, and increased productivity by at least 2% (KPMG, 1997).   A survey of 62 Fortune 500 companies shows these success measures to be on the low end of the demonstrated scale (Fryer, 1999). Successful ERP adoptions also show evidence of improved operating margins of 1.5%, reduced operating cost by 5%, and increases in on time delivery rates to 99% (Sweat, 1998). For a project of the size and investment of ERP, organizations often look at return on investment as a benchmark for success. Organizations often set a ROI goal for their ERP oftentimes as much as 5% or greater (Bradford, 2001) with ROI results reported as high as 33% (Fryer, 1999). ROI is of particular interest to upper management personnel, such as controllers and CFO's who are responsible for monitoring the return on the ERP investment to measure whether proper quantitative success is achieved (Lutchen, 2004). With greater emphasis on ROI, organizations can find increased financial success via there ERP investment dollars (Scherpenseel, 2003).

A quantified business need is a prerequisite for a high level of satisfaction with enterprise resource planning initiatives ("Enterprise Resource", 2001). "… Companies that differ

substantially in how they defined success in the project phase because they differed in their definitions of the project itself… The larger organizations tended to define the ERP experience in much more expansive terms than smaller ones. They often demanded business results from "IT" projects. In many cases, these organizations were planning for multiple of ERP installations and realized the importance of learning how to implement and upgrade ERP systems better each time. They were more likely than smaller organizations to start planning for the onward and upward phase during the project phase" (M. L. Markus & Tanis, 2000).

Developing a cross-functional project team representing all departments impacted by the ERP project is an important step to successfully managing change and implementing ERP. Allowing individual groups to accept or resist ERP can result in problems for the implementation. For example, Pharm-Co, a UK based provider of nuclear medicines, underwent resistance to ERP from their production middle management. This group felt the existing system fit their company goals and no alteration was necessary for increased productivity, improved efficiencies, or increased competitive strategy to capture additional market share. Anticipating this reaction, Pharm-Co organized their ERP project team around the production middle managers including members of all other affected departments. The production middle managers held their ground firmly throughout the entire ERP implementation, but succumbed to political pressure as well as their inability to influence other middle managers in outlying support departments. Their inabilities to form a cross-functional resistance (especially to include the senior management level) led to their loss of power in affecting the issue (Hislop, 2000).

While the Pharm-Co case worked, it is not the preferred form of building cross-functional ERP implementation team. Meeting the potential resistance head on gaining buy-in to

the project early on in the ERP pre-implementation phase, could have resulted in a much more efficient and productive implementation.

The design of ERP program management can contribute to the success of ERP's complex software implementation. In their study of 15 ERP cases, Pieter M. Ribbers, PhD, and Klaus-Clemens Schoo identified five implications for practice of complex ERP program management. The first of these implications for practice deals with coordination. Deemed to be of critical importance, coordination with suppliers and employees across individual projects is necessary to achieve process efficiency. The second implication was a strict adherence to a "no change policy" during the rollout phase of enterprise-wide ERP implementations. The third implication deals with ERP implementations with high integration complexity. The need for complete alignment mechanisms (such as steering committees, reviews, and release controls) is of critical importance. In particular, steering committees should be primarily focused for adherence to planned changes (those involving integration complexities) and place less emphasis on unplanned disruptions (i.e. "fire fighting").   The fourth implication cited by Ribbers and Schoo involves implementation approaches. According to Ribbers and Schoo, "Successful programs (ERP implementations) differentiate their implementation approaches according to the extent of the different complexities they encounter…" These changes involve decisions such as the number of parallel rollout activities and the changes during the parallel activities. In environments of high integration complexity, organizational changes may also be required to be implemented together with technical changes. The final implication deals with attention from management to complex ERP implementations. As cited by Ribbers and Schoo, complexity further complicated with high variety (i.e. multiple locations) demands greater general

management attention. Greater general management attention requires communication and sponsorship in order to be effective (Ribbers, 2002).

In another study of success achieved from adopters' experiences with ERP, Markus, Axline, Petrie, and Tanis study ERP implementation experiences through the sponsorship of an ERP vendor interested in helping customers be more successful in ERP implementation. Markus et al. identify three distinct phases in the "ERP experience cycle" to group successes attributes within: 1) the project phase (where ERP software is configured and rolled out to the organization), 2) the "shakedown phase" (where the organization makes the transition from "go live" to "normal operations), and 3) the "onward and upward" phase (where the organization experiences the majority of business benefits from ERP and plans their next steps for business improvement) (M. Markus, Axline, S., Petrie, D. & Tanis, C., 2000).

Success in the project phase, according to Markus et al., is characterized by: 1) project cost relative to budget as controlled by people, 2) project completion time relative to schedule as controlled by people, and 3) completed and installed system functionality relative to original project scope as controlled by people.

Success in the "shakedown phase" is characterized by: 1) short-term changes occurring after system "go-live" in key business performance indicators such as operating labor costs, 2) length of time before key performance indicators achieve "normal" or expected levels, and 3) short-term impacts on the organization's adopters, suppliers and customers such as average time on hold when placing a telephone order all of which are controlled by people.

Success in the "onward and upward phase" is characterized by: 1) achievement of business results expected for the ERP project, such as reduced IT operating costs and reduced

inventory carrying costs, 2) ongoing improvements in business results after the expected results have been achieved, and 3) ease in adopting new ERP releases, other net Its, improved business practices, improved decision making, etc., after the ERP system has achieved stable operations (Markus et al., 2000). Once again, these are all controlled by people.

As stated earlier, measurables in the ERP process are important. In general, companies that do not deliberately set out to achieve measurable business results do not obtain them. These same companies never realize that they have obtained the optimal levels not measured as well (Markus et al., 2000).

ERP implementations are socially complex activities. Up to 12 or more external parties (including the ERP vendor, vendors of ERP product "bolt-ons", vendors of hardware, software consultants, telecommunications specialists, implementation consultants, etc.) may be involved in different aspects of an organization's ERP implementation. Dealing with numerous parties can be difficult to manage. (Markus et al., 2000)

Because of its vastness, complexity, high risk for failure, and significant price tag, the ERP project manager has a huge responsibility. Few (if any) information technology products and services firms are willing to take end-to-end responsibility for coordinating all parties. While true they also generally seem to take exception to accepting secondary roles to other such firms as well. In addition, product and service firms demonstrate widespread lack of knowledge about the details of ERP products in the sales cycle especially when integration and interface questions are posed (Markus et al., 2000).

One of the greatest challenges in effectively implementing ERP environments is recruiting and retaining highly sought information technology professionals with the specialized technical and application-specific skills (Sumner, 2000).

"At the start of an ERP project the organization is really not aware of the scope of the implementation, the impact it will have. Due to fixed deadlines there is no time to train the end users, or they only have a couple of days… what you see then is a lot of end users struggling to use the system making all kinds of errors. Companies want to do more with less. They are not going to cut designing a business process, if an organization is going to cut something it will be security and controls, and that all hinges on the control philosophy…" (Wright, 2002 Spring Supplement).

Training should include information about their new roles and responsibilities, the business objectives of the ERP initiative, and the projected benefit to the company and to users. People will embrace a new system if you give them the skills and support (training and other tools) to use it (Gale, 2002).

<center>ERP Related Failures</center>

While ERP can provide significant competitive advantage and improve organizational efficiency and productivity, the growing number of horror stories regarding failed or out-of-control projects gives organizations reason to evaluate a move to ERP. FoxMeyer Drug argues that its system helped drive it into bankruptcy. Mobil Europe spent hundreds of millions of dollars on its system only to abandon it when its merger partner objected. Applied Materials gave up on its system when it found itself overwhelmed by the organizational changes involved. Dow Chemical spent seven years and close to half a billion dollars implementing a mainframe-based

enterprise system and later decided to start over again on a client-server version (Wilder &

Davis, 1998).

Critical Areas of ERP Implementations

The issues and challenges of ERP implementations can be summarized into three areas:

1) people, 2) technology, and 3) business. These areas are derived from the study of Critical

Success Factors (CSFs) from past ERP implementations as researched by four scholarly efforts –

Nah et al. (2003), Somers and Nelson (2004), Laughlin (1999), and Krammeeraard et al. (2003)

and are summarized in Table 1 – CSFs by Scholar. CSFs often have common characteristics and

can overlap from one area into another.

People and business related CSFs outnumber technological factors. Studies of ERP

implementation failure support this emphasis on people and business related CSFs. In a survey

of information technology managers, Information Week found the top three reason ERP projects

failed were attributed to poor management (people / business), change in business goals

(business), and lack of business management support (people / business) (Umble et al., 2003).

Thus, ERP implementations often find failure not because of the technology, but because of

business and people issues (Somers & Nelson, 2004). Further, a study conducted of Fortune

1000 chief financial officers, CFO's ranked the five top CSFs of ERP implementations as top

management support (people), project champion (people), ERP teamwork and composition

(people / business), project management (business / technology), and change management

(people) (Nah et al., 2003). In addition, Rolls-Royce found in their ERP implementation cultural

(people), business, and technical difficulty were the primary areas of concern during their

successful ERP implementation (Yusuf et al., 2004). Accordingly, CSFs should be grouped and viewed within these areas.

Other Critical Factors Success Approaches – Logical Associations

One approach to successful implementation of ERP follows the strategic alignment model of Henderson and Venkatraman (1999) which suggests the success depends on different effective patterns of logical links, or "fits", among the "domains" of a firm. These domains are identified as business strategies, information technology strategy, organization infrastructure and processes, and information technology infrastructure and processes (Henderson & Venkatraman, 1999). Three factors for ERP success can be derived from these "fits". The first critical factor is the fit between business strategy and information technology strategy. The second fit is between the level of maturity of the information technology infrastructure and the strategic role of information technology in relation to ERP. The third fit the fit between the methods used for implementing ERP and the change in organizational processes (Voordijk et al., 2003). The approach of Henderson and Venkatraman (1999) further support the segregation of CSFs into the areas of people, business, and technology related areas.

People, Business, and Technology Related ERP Critical Success Factors

The results in table 2 show the study of ERP implementation CSFs emphasizes factors that affect people, business, and technology issues.

Table 2. Critical Success Factors of ERP Implementations by Scholar

Group	Critical Success Factor	Scholar			
		Nah et al. (2003)	Somers & Nelson (2004)	Laughlin (1999)	Kraemmeraard et al. (2003)
Technology	Appropriate Business & IT Legacy System	X			
Business	Business Plan & Vision	X	X	X	X
Business	Business Process Reengineering	X	X		X
People	Change And Expectation Management	X	X	X	
People	Communication	X	X	X	
People	ERP Teamwork & Composition	X	X	X	X
Business	Monitoring & Evaluation of Performance	X			
People	Project Champion	X	X		
Business	Project Management	X	X	X	
Technology	Software Development, Testing, & Troubleshooting	X			
People	Top Management Support & Involvement	X	X	X	X
People	Steering Committee		X		
People	Implementation Consultants		X		
People	Vendor-Customer Partnership, Tools, and Support		X		
People	User Training and Education		X		X
Business	Appropriate Software Selection		X		
Business	Minimize Customization		X		
Technology	Data Analysis and Conversion		X		
Technology	Defining the System Architecture		X		
Business	Dedicating Resources		X		
Business	Aggressive Schedule and Timelines			X	
Business	Focused Issue Resolution			X	
Business	Limited Scope			X	
Business	Early Success			X	
Business	Justification				X

The majority of organizations realize their employees (people) are their greatest asset.

People represent any organization's defining asset. Excellence in people management can add

massively to shareholder value in every aspect of their performance, including their reception and acceptance to change (Somers & Nelson, 2004). Employee costs exceed 40% of many companies' total expenditures. These employees represent the internal users of ERP and have a major role in ERP and business success. "A company is nothing without its people…"(Kingsmill et al., 2005). CSFs impacted by people include, 1) change and expectation management (including user education and training), 2) communication, 3) cross functional ERP team composition and teamwork, 4) evaluation of business performance, 5) appropriate project champion, 6) support of upper management, 7) support of steering committee, 8) knowledgeable implementation consultants, and 9) establishing vendor / customer relationships. (Kraemmerand et al., 2003; Laughlin, 1999; Nah et al., 2003; Somers & Nelson, 2004).

Critical to implementation, ERP requires enterprise wide culture and structure change management (Rosario, 2000). Important to the change management process necessary for ERP implementation is recognizing the need for change, culture and structure management, user education, and training (Nah et al., 2003). Recognizing the need for change through all levels of the organization is critical to the acceptance of ERP. The integrated single data base theory and structure of ERP, as compared to the traditional management process practiced in pre-1990 management, require a vast amount of change from many aspects of the organization implementing ERP (Somers & Nelson, 2004). Once identified, managing the subsequent cultural and structural change resultant as a consequence of ERP, becomes an ongoing task that the organization should not take lightly as vast change in procedure, responsibility and accountability prevail (Somers & Nelson, 2004). User education and training are extremely important and often subject to non-existence as ERP projects finding budget overruns often look

to this area for cost cuts. Sadly enough, organizations guilty of this implementation offense often find failure – the organization invests millions in a system in which employees have no idea how to run (Somers & Nelson, 2004).

In addition to managing people from a cultural change management aspect, communicating with employees is another critical people success factor for ERP implementation success. Successful implementations are related to successful management of user expectations (Somers & Nelson, 2004). Goals and expectations of ERP should be communicated at every level of the organization in order to create an expectation of change and create an environment for success (Falkowski et al., 1998). The aspect of successful communication efforts, as a critical successful factor, include identifying what information needs to be communicated to which employees, communicating in a timely and effective manner, communicating ERP information to stakeholders (i.e. suppliers, customers, etc.), communicating expectations of all levels of the organization, and communicating the progress of the ERP project. In addition to these unilateral communication efforts, bilateral communication involving users to provide input and make choices when appropriate is necessary for successful ERP implementation (Falkowski et al., 1998; Holland et al., 1999; Rosario, 2000).

Another CSF for ERP implementations which focuses upon the area of people is the aspect of ERP teamwork as well as the composition of the team. The joint effort of implementer, vendor, consultants, and the ERP internal implementation team are critical to the success of the ERP implementation (Nah et al., 2003). The team should consist of a cross-functional workgroup of full-time employees empowered to make and carryout decisions. Superior technical and business knowledge should be characteristics of which team members, as

a group, should possess (Somers & Nelson, 2004). The best people in the organization should be recruited into the ERP team (Falkowski et al., 1998). The ability for the cross-functional team to support each other, as well as support and promote the ERP implementation is critical. This team of business experts is a very powerful group and plays an important role in the success of the ERP project. Their ability to work together as a team is a determinant factor in the success of the implementation (Nah et al., 2003). Incentives and risk-sharing agreements are encouraged for motivation for the ERP team to reach desired goals (Umble et al., 2003).

One of the most important aspects of people related CSFs is the project champion. This individual shoulders the success of the organization. This individual should have the endorsement of a high-level executive sponsor willing to provide the project champion with the power to set goals and the authority to implement change within the organization (Somers & Nelson, 2004). The project champion should be self motivated and capable of enduring long hours, stress, and the ability to boost the moral of others impacted by the ERP implementation (Rosario, 2000).

The final critical factor relating to people could dually suffice for a business critical factor – the support of upper management. Continual support from upper management is cited as the most relevant factor in many studies to ERP implementation success. According to Somers and Nelson (2003), "… no single factor is as predictive to ERP project success." Public and explicit support for the ERP project should be a top priority of upper management (Laughlin, 1999). Should this support and endorsement not be present from upper management and employees resist to the change brought about by ERP, their support will alienate the project (Shanks et al., 2000).

Somers and Nelson (2003) consider the use of a steering committee to be an effective means of ensuring appropriate involvement and making ERP succeed. An effective steering committee should consist of members of senior management, senior project management representatives, and ERP end users. Steering committees often are charged with the ominous task of ERP system selection in addition to as well as provide support during implementation (Somers & Nelson, 2004).

Somers and Nelson's (2003) comprehensive list of CSFs includes the importance of knowledgeable consultants. The role of consultants is critical for setup, installation, and customization of ERP software systems (Somers & Nelson, 2004). Success of the ERP project is impacted by their experience with previous implementations and the software application, as well as their comprehensive knowledge of system components and modules. Their ability to interface effectively with the ERP project team is imperative (Nah et al., 2003).

The final people related ERP CSF deals with the relationship established between the vendor and the organization implementing ERP and the tools and support offered by the vendor. Just as selection of the ERP software is critical, a positive correlation exists between the "fit" of the software vendor and user organization (Somers & Nelson, 2004). As a result, this relationship is strategic in nature and critical to early stages of implementation.

Vendor tools provided by the software vendor can provide a more efficient implementation in adopting and adapting to an ERP system. Vendor tools are important for gaining knowledge regarding the use of the software, as well as understanding the business processes and best practices of the software system. As a result, they can significantly reduce costs and time of deployment (Somers & Nelson, 2004).

As ERP systems require substantial investment and strain on business efforts, their successful adoption should employ a substantial period of use. Continual investment in new modules and upgrades are necessary for additional functionality and problem resolution. Vendor support is critical to long term success of ERP use. Technical assistance, emergency maintenance, updates, and training are important factors required of continual vendor support (Somers & Nelson, 2004).

<div style="text-align:center">Business Related ERP Critical Success Factors</div>

In addition to CSFs impacted by people, business represents another major area affecting ERP implementations. CSFs exist within the business area include: 1) well defined business plan and vision based on appropriate project justification, 2) proper business process reengineering, 3) continual and effective project management, 4) monitoring and evaluation of performance, 5) stringent customization policy, 6) appropriate dedication of resources, 7) aggressive schedule and timeline, 8) a plan for issue resolution, 9) limited scope, and 10) early success (Kraemmerand et al., 2003; Laughlin, 1999; Nah et al., 2003; Somers & Nelson, 2004).

Due to the length of time ERP implementations take, and the impact which they have on ongoing operations, clear goals, a business plan, and vision for the organization are essential to lead the ongoing organizational effort (Rosario, 2000). Reaching business goals is a critical aspect to successful ERP implementation. Goals and measurement of the organization's efforts to achieve those goals aids in justifying ERP investment keeping new business processes on task with the future objectives of the organization (Falkowski et al., 1998). In addition, the goals and vision should be based on a clear justification of the project based on reliable support and carefully evaluated assumptions (Kraemmerand et al., 2003).

In addition to clear vision, business process reengineering should take place iteratively to benefit from the best practices offered by the ERP system. The closer existing business practices resemble those of the new ERP system, the easier business process reengineering can be accommodated (Somers & Nelson, 2004).   The willingness to accept and utilize the embedded best practices and model business methods accordingly enables business process reengineering for those businesses where practices do not resemble those of the new ERP system. The goal of this CSF is to minimize and avoid customization whenever possible due to the negative implications for future upgrades of the ERP system (Roberts & Barrar, 1992).

An individual or group of people should be given responsibility to drive the success in project management (Rosario, 2000). Project management should include defining project milestones and assigning responsibility. Milestones should be realistic and reflect begin and ending dates (Murray & Coffin, 2001). Project management should coordinate project activities across all affected parties (Falkowski et al., 1998). In addition, clearly establishing the project scope while maintaining and managing changes the scope of the project is critical as resistance to changes may gravitate users back to past system practices (Rosario, 2000). Accordingly, proposed changes should be evaluated as changes can prove to be costly compared to business overall benefit (Sumner, 1999).

In order to effectively determine whether the goals of ERP implementation have been met, monitoring and evaluation of performance is necessary. This CSF works together with the need for early success. Milestones and targets need to be actively monitored to track the progress of an ERP project (Murray & Coffin, 2001). Evaluation should be split into two distinct areas in order to measure costs, quality, and adherence to completion dates. "Proof of success is

crucial to the management of skepticism…" (Rosario, 2000). Evaluation of performance can facilitate this need (Nah et al., 2003). Success achieved early in the ERP process provides momentum for future success in the project (Laughlin, 1999).

Critical to the success of ERP implementation is the business need for proper identification and limitation of project scope. The initial implementation should incorporate critical business needs and leaving other requirements for future releases and improvement (Laughlin, 1999). Prevention of scope creep and feature creep are vital to avoid the project from losing sight of its intended objectives (Haag et al., 2005).

ERP implementation success is contingent on other CSFs. A policy to minimize customization of the software (while possibly considered a technical CSF) is essential to prevent problems and delays with future upgrades (Somers & Nelson, 2004). A policy to appropriately dedicate needed resources, approved and supported by upper management, is critical to avoid project failure (Somers & Nelson, 2004). Establishing aggressive schedules and timelines that promote a sense of urgency are critical to prevent business loss. Though aggressive, schedules and timelines should be practical and achievable (Laughlin, 1999). Finally, a structured problem solving methodology focusing on issue resolution is critical to identify, track, and resolve issues in a timely manner. The approach should be based on root cause, factual based methods (Laughlin, 1999).

<div align="center">Technology Related ERP Critical Success Factors</div>

While numerous CSFs have been identified as being impacted by either business or people issues, surprising to many, ERP implementations often find failure not because of the technology, but because of business and people issues (Somers & Nelson, 2004). CSFs impacted

by technology are identified: 1) appropriate business and information technology legacy systems, 2) software development, testing, and troubleshooting, 3) appropriate software selection, 4) data analysis and conversion, and 5) defining system architecture. The greater the complexity of legacy systems, the greater the amount of technological and organizational change required. To be successful, ERP implementation efforts must overcome issues of complexity arising from business and information technology legacy systems. A stable and successful business setting is essential, and success in other business areas is necessary for ERP implementation success (Roberts & Barrar, 1992).

In conjunction and addition to appropriate business and legacy systems, software development, testing, and troubleshooting issues are CSFs for ERP implementations. Due to the high degree of integration of systems across the organization, development and testing perspectives unique to ERP projects must be well thought-out and managed. The overall ERP architecture should be established before deployment considering the most important requirements of the implementation (Murray & Coffin, 2001). Consequently, the use of appropriate modeling methods will aid in achieving ERP success. Requirements definitions should be created documenting systems requirement definitions. Having a written signed off requirements definition protects all parties from downstream attack for non-documented "creeps" of scope and oversights within the creation of requirements definitions (Holland et al., 1999). While troubleshooting errors is critical, rigorous software testing eases implementation (Rosario, 2000).

Additional technological CSFs include data analysis and conversion and defining the system architecture. Accurate data is a fundamental requirement for the effectiveness of any

system. The management of data converted and entered into the ERP system is a critical issue.

Defining system architecture is a critical success factor as this provides the basis for running

ERP software. Architecture choices and planning are especially during the design and

procurement phase as system requirements of ERP systems may predicate specific needs

(Somers & Nelson, 2004).

CHAPTER 3. METHODOLOGY

Introduction

The purpose of this study is to determine if organizations who adopt ERP systems achieve greater success when implementations focus on change in technology, change management, best business practices, or some combination of any of these three foci.

This study was conducted by grouping ERP critical success factors during implementation into three categories people factors (testing for the presence of change management practices), business factors (testing for the presence of best business practice adoption), and technology factors (testing for the presence of changes in technology). The instrument tests for the presence of these factors as well as the success before the implementation of ERP and at least one year after the completion of ERP implementation.

The results from this research identified success as correlated to the presence of the success factor groups and/or combination of groups. This research can be used to assist organizations achieve operational success in future implementations of ERP systems.

Description of Methodology

To effectively study these questions, the researcher utilized a quantitative method approach. Quantitative research has been used historically to inquire into causes and effects and to verify the validity of theoretical constructs. By gathering statistical data and analyzing data with SPSS, identified variables are examined to gather information about how they impact the theoretical claim (Creswell, 2003). In this research, the theoretical claim is that organizations

that focus ERP implementations on a change in technology, change management in people (i.e. culture change), and/or the adoption of best business practices required, or some combination of any or all of these three foci, are more successful one year or more after implementation, than organizations that focus only on the required change in technology or other foci. This study tested this assumption for validity using an instrument previously used to test for similar critical success factors in ERP systems implemented in educational and governmental environments.

Design of Study

This research goal is to identify a correlation between success, as achieved by virtue of adoption of ERP systems, with the underlying focal approach to implementation of the successful ERP system as segmented into three categories, focus on change in technology, focus on change management (with people affected by the change or culture change), and focus on adaptation to best business practices. A survey of 500 SAP implementations was conducted. Examples of the survey questionnaire and cover letter are in Appendix A. The main objectives of the survey were to first determine if success was achieved after one year of ERP implementation, and if so what correlation exists between success and ERP focus. The survey is scheduled for administration in early December 2006 of the 500 organizations using SAP as administered via the independent online survey agency and ASUG.

Population and Sample

Participants in this study came from North and South American organizations that completed their implementation of ERP in their organization more than one year prior to the date

of the survey. The ERP systems implemented were developed and marketed by SAP, the world's

leading provider of ERP systems as presented in Figure 1 below:
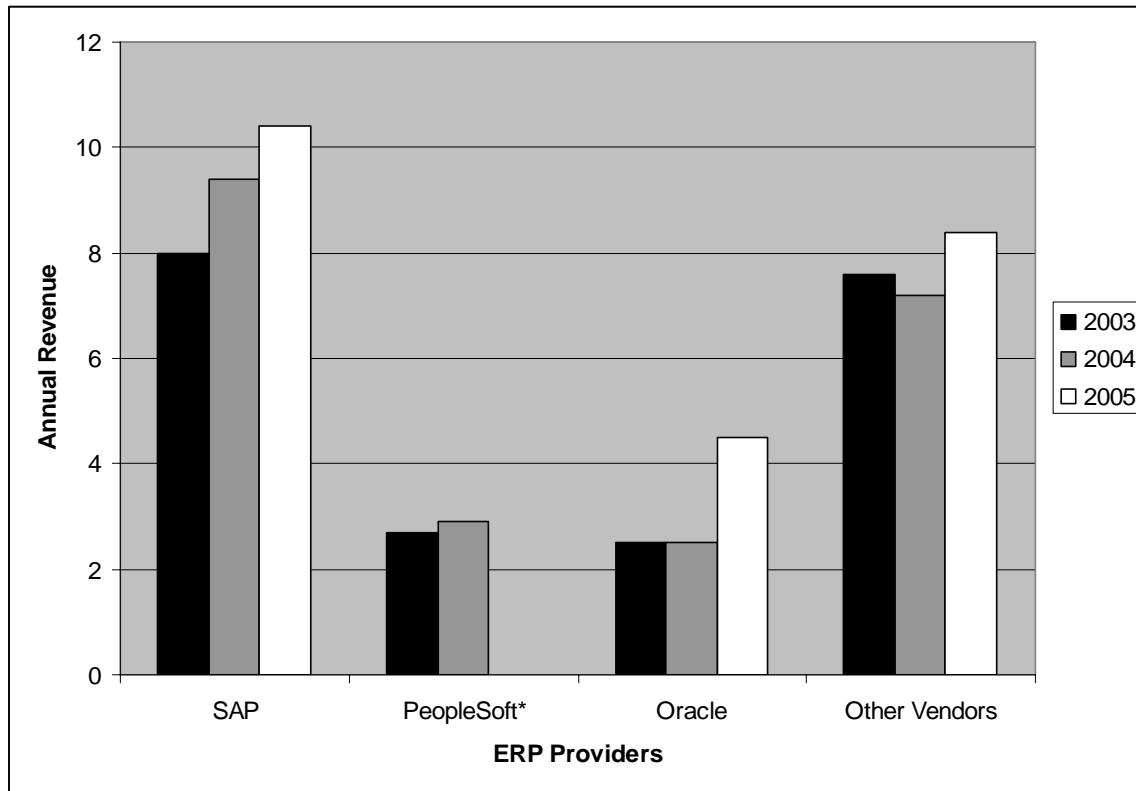
Figure 1: Comparison of top ERP provider revenue

    * PeopleSoft was acquired by Oracle in 2005

    USA Today (2005). *Oracle, SAP Wage Bare-Knuckle Fight for Dominance. USAToday*

The population was selected because of SAP's leadership in the ERP industry and the

demographic diversity in composition of SAP's user population. The population consists of over

3500 SAP users who are members of the Americas' SAP User's Group (ASUG). A sample of

500 random SAP user organizations having completed implementation of ERP more than one year ago will be surveyed.

Data Collection and Instrumentation

Quantitative research often relies on survey instruments for data collection. Questions designed to research data specific to individual observations and then analyzed collectively form the basis for this research. The survey to be used in this research was previously developed and used in two prior publications (Al-Sehali, 2000; Harrison, 2004). The two instruments used in these dissertations were combined and modified to accommodate the combination of tools and prevent redundant questions.

The instrument contains four sections which include demographic information, expected results and benefits, implementation critical factors for success, modules implemented, and implementation concerns.

Validity

The validity of an instrument in a research process determines the extent to which a test measures data relevant to the desired study of the researcher. It gives the researcher an indication of the degree to which differences found with an instrument reveal true differences among the sample population being tested (Cooper & Schindler, 2003). A necessary precondition from validity is that the measuring instrument be reliable (Burton, 1995). This research instrumentation is tested for content validity, criterion-related validity, and construct validity. While these three forms of validity are addressed individually, they are interrelated from a theoretical and operational perspective.

Content validity is a form of validity that addresses the extent to which a measuring instrument provides sufficient coverage of the research questions guiding the study in a manner that provides a representative sample of the population of the subject matter of interest (Cooper & Schindler, 2003). Content validity is judgmental and often perceptive and unique to every researcher. It judges the means in which items are tested, in a manner such that the qualities of the items surveyed are consistently interpreted by each member of the sample.

Criterion-related validity describes an instrument's success in measuring for prediction or estimation of a current behavior or condition. Qualities of criterion-related validity are that the instrument is relevant (defined and recorded in terms perceived to be proper measures), free from bias (each criteria allows for equal opportunity to be selected), reliable (stable or reproducible) and available. Criterion-related validity attempts to measure concurrent (explanation of the present) as well as predictive (projection of the future) value (Cooper & Schindler, 2003).

Construct validity is achieved by comprehending the theoretical foundation basic to the obtained measurements. Thus, the theory and the measuring instrument being used must be considered jointly. Construct validity addresses the issue of variance that may show in the measuring instrument results. It therefore attempts to identify the underlying constructs measured in the instrument while determining how effective the instrument represents them (Cooper & Schindler, 2003).

Reliability

Reliability of an instrument deals with the accuracy and precision of the measurement process gained through the instrument. The instrument is reliable to the degree where it provides consistent results from the sample being measured. Reliability is necessary for validity, but does

not dictate the existence of validity alone. Stability, equivalence, and internal consistency are qualities of reliability used to evaluate the degree to which responses measured by an instrument are free of random or unstable errors (Cooper & Schindler, 2003).

The existence of stability, when considering reliability, can be tested for using the test-retest reliability check. This is conducted by repeating the measurement with the same instrument, approximating the original environment as narrowly as possible. For example, the same test should be administered twice to the same subjects over an interval of less than six months, with each independent test tested for correlation to the retest (Cooper & Schindler, 2003). This form of reliability test may be impractical for several reasons. For example, it may be difficult to locate and secure the cooperation of an identical set of respondents or the respondent's response upon the second completion of the instrument may be altered by completion of the instrument the first time or environmental changes (Futrell, 1994).

The problems with testing for reliability from a stability perspective may be overcome by testing for equivalence via the use of equivalent or parallel forms of a measurement instrument. This test of reliability measures the degree from which alternative forms of the same measure produce the same or similar results given simultaneously or with delay. The results of the equivalent tests are measured for correlation and variation among observers and samples of items.

The final approach for testing reliability measures the internal consistency or homogeneity of responses through underlying constructs of an instrument. Internal consistency can be measured using the split-half technique in which the results of the instrument are separated into randomly selected halves and correlated. If the correlation of the halves is high,

the instrument is deemed to have internal consistency, or similarity among the items. Thus, the ability to produce similar results using the same instrument when various samples are selected simultaneously provides homogeneous or internal consistency to the study (Cooper & Schindler, 2003).

Validation of the Instrument

The survey instrument used in this study was created and used by Al-Sehali (2000) in his dissertation study of "Factors That Affect Implementation of ERP in International Arab Gulf States and United States Companies with Special Emphasis on SAP Software." The survey was also later revised and used by Harrison (2004) in her dissertation study of "Motivations for ERP System Implementation in Public Versus Private Sector Organizations." The instrument is split into four sections which test for business results of implementing ERP, critical success factors of ERP implementation, ERP modules implemented ERP implementation methodology and concerns. The instrument was field tested by ERP professionals and modified for content, clarity, and appearance based on their recommendations.

Data Collection

The survey instrument was made available via the Internet, to the sample under study via surveymonkey.com - an independent online survey organization. The Americas SAP User's Group (ASUG) randomly selected 500 SAP implementations which have occurred in the past 3 years which formed the base of the sample under research in this study. All participants were by ASUG to inform them of the survey. Two follows were also sent by ASUG to encourage participation in the survey. The initial contact from ASUG to the sample was be made

approximately one week prior to ASUG's first contact instructing the user group sample on how

to take the survey. Approximately one week later, ASUG sent a final request for participation in

the survey.

Data Analysis

Data from the survey was coded and cleaned after downloading the data into Microsoft

Excel. The data was loaded into the Statistical Package for the Social Sciences (SPSS) for

Windows, version 14.0, and analyzed.

Method of Data Analysis

The analysis of variance (ANOVA) along with the mean and standard deviation was used

to compare the observed data for all variables. Responses were grouped initially by response to

success attribute questions. These groups were next tested for correlation to critical success

factors indicating a focus on change in technology, focus on change management (with people

affected by the change or culture change), and focus on adaptation to best business practices.

This data analysis formed the foundation for conclusions from this research.

Purpose of Study

The intent of the study was to discover correlation of success in ERP as provided through

a single factor focus (i.e. change in technology) or combination of factors focused on change in

technology, focus on change management (with people affected by the change or culture

change), and focus on adaptation to best business practices. The information from this study will

lead to success in future ERP implementations as well as subsequent organizational success as

gained through successful implementation of ERP. In addition, future research topics will be identified.

CHAPTER 4. DATA COLLECTION AND ANALYSIS

This chapter provides an analysis of the data gathered in this research study. The initial email from ASUG to the 500 members and subsequent follow-up email which included the 500 initial ASUG members plus another 100 members, resulted in a total of 239 responses, or 39.8% response rate (see Table 3).   Sixty-six of these responses were not used because their implementations had occurred within the past year. An additional forty-seven responses were not used due to incomplete survey responses. The number of valid responses that were used totaled 126 representing a response rate of 21%. Table 3 illustrates the distribution of the respondents to the questionnaire.

The first section of this chapter describes the demographic information from the respondents based on their responses to the survey. Characteristics include the location of where the respondent company is based, annual sales of the company, responsibility of the respondent, industry in which the company participates, implementation status of ERP in the company, and ERP modules implemented. This section also addresses how respondents were segregated into successful versus unsuccessful categories.

The second, third, fourth, and fifth sections of this chapter discuss the statistical analysis of the each research question. For the reader's convenience, the research questions, referred to by number in Chapter 1, are repeated:

1. Is a focus on the change in technology required by an ERP adoption observed in successful ERP implementations?

2. Is a focus on change management sensitive to the changing requirements of
   employees as required in an adoption of ERP versus employees' current
   practices using legacy systems, present in successful ERP implementations?

3. Is a focus on change to best business practices with which adoption of ERP
   systems promotes present in successful ERP implementations?

4. To what degree does the combined presence of focus on; a) the change in
   technology, b) change management, and c) change to best business practices,
   correlate to successful ERP implementations?

Table 3. Survey Response Rate

	N/n	% sample	% valid
Total Sample Size	600	100.0%	n/a
Total Responses	239	39.8%	n/a
Incomplete Responses	47	7.8%	n/a
Valid Responses to Survey*	126	21.0%	100.0%
Met At Least One Success Factor	64	10.7%	50.8%
Met No Success Factors	62	10.3%	49.2%
Met ROI Objective	41	6.8%	32.5%
Met All Objectives**	18	3.0%	14.3%

*Responses in which ERP was implemented more than 1 year prior to survey
**Met ROI and All Success Objectives

Respondent Demographic Information

The data for this research was collected from March to April 2007. ASUG members in

the 600 member sample (all of which were located in North and South America) were randomly

selected by ASUG and were contacted via email from ASUG. The researcher used

surveymonkey.com as the independent medium to survey, collect, and report the respondent's responses. Responses were grouped into two categories, successful (those responses in which the respondent indicated at least one success factor was present), versus unsuccessful (those responses in which the respondent indicated no success criteria had been met). The information form these two categories will be analyzed and compared to evaluate the research questions.

Information on the location of the company, organization type, annual sales of the company, position of the survey respondent, current implementation status of ERP within the company, size of the implementation team, management position making the decision to implement, other ERP vendors considered, implementation style, and ERP modules implemented, is presented in tables 4 – 13.

Location of the Companies

The location of the responding companies is presented in Table 4. Over 88% of the respondent organizations were based in the United States with the remaining 10% evenly distributed over Mexico, Canada, and outside North America. Successful versus non-successful organizations were nearly identical to these percentages with neither section significantly over or under the total response splits.

Organization Type

The type of organization in which ERP was implemented is presented in Table 5. The majority of the respondents were manufacturing companies (38.9% of the total) while government, food and beverage, and computer software and services ranked second, third, and fourth with 12.7%, 8.7% and 7.1% of the sample total, respectively. The percentages of success

versus no success categories showed similar representation to the total sample, however, 13%

fewer organizations were from the manufacturing area, and 10% more were from the government

in the no success category versus the success category.

Table 4. Country Where Respondent's Company is Based

	Success		No Success		Total Responses	
Country Based	*n*	%	*n*	%	*N*	%
1 = United States	56	87.5	56	90.3%	112	88.9%
2 = Canada	3	4.7	2	3.2%	5	4.0%
3 = Mexico	1	1.6	1	1.6%	2	1.6%
4 = Other (Open Ended)	4	6.3	3	4.8%	7	5.6%

Table 5. Organization Type Where ERP Was Implemented

	Success		No Success		Total Responses	
Organization Type	*n*	%	*n*	%	*N*	%
1 = Banking & Finance	0	0.0%	0	0.0%	0	0.0%
2 = Computer Software & Service	4	6.3%	5	8.1%	9	7.1%
3 = Education	3	4.7%	1	1.6%	4	3.2%
4 = Food & Beverage	7	10.9%	4	6.5%	11	8.7%
5 = Government	5	7.8%	11	17.7%	16	12.7%
6 = Manufacturing	29	45.3%	20	32.3%	49	38.9%
7 = Retail	0	0.0%	1	1.6%	1	0.8%
8 = Telecommunications	0	0.0%	2	3.2%	2	1.6%
9 = Transportation	0	0.0%	0	0.0%	0	0.0%
10 = Utilities	4	6.3%	4	6.5%	8	6.3%
11 = Wholesale / Distribution	3	4.7%	3	4.8%	6	4.8%
12 = Other (open ended)	9	14.1%	11	17.7%	20	15.9%

Annual Sales

The annual sales of the respondent organizations are presented in Table 6. The largest

number of organizations represented in the survey (31%) had annual sales between $1 and $5

billion dollars. The second (27%) and third (17.5%) largest categories of annual sales

representing surveyed organizations reported sales of over $5 billion and $500 million to $1

Billion, respectively. The responses for success and no success categories were similar in rank

and percent to the total response statistics with no significant deviation.

Table 6. Annual Sales of Respondent Organizations

	Success		No Success		Total Responses	
Annual Sales	n	%	n	%	N	%
1 = 0 to 10 Million	0	0.0%	1	1.6%	1	0.8%
2 = 10 Million to 100 million	3	4.7%	3	4.8%	6	4.8%
3 = 100 million to 250 million	5	7.8%	5	8.1%	10	7.9%
4 = 250 million to 500 million	5	7.8%	3	4.8%	8	6.3%
5 = 500 Million to 1 billion	11	17.2%	11	17.7%	22	17.5%
6 = 1 billion to 5 billion	17	26.6%	22	35.5%	39	31.0%
7 = over 5 billion	18	28.1%	16	25.8%	34	27.0%
Other	5	7.8%	1	1.6%	6	4.8%

Survey Respondent Position

The position of the respondent filling out the survey is presented in Table 7. The

majority of the survey respondents are from the information technology discipline (79%). The

majority of respondents appear to be in higher level positions with no significant difference in

the number of respondents in success versus no success responses.

Table 7. Survey Respondent Position

	Success		No Success		Total	
	n	%	*n*	%	*N*	%
Information Technology Manager	34	53.1%	32	51.6%	66	52.4%
System Analyst	16	25.0%	16	25.8%	32	25.4%
Senior Manager	8	12.5%	7	11.3%	15	11.9%
Chief Finance Officer	0	0.0%	1	1.6%	1	0.8%
Internet Specialist	0	0.0%	1	1.6%	1	0.8%
Other	6	9.4%	5	8.1%	11	8.7%
Total	64	100.0%	62	100.0%	126	100.0%

Implementation Status

The implementation status of the respondent organizations is presented in Table 8. As mentioned earlier, organizations that indicated their implementation had taken place less than one year from the time of the survey were removed from valid responses in the sample. The reason for their removal is due to the fact that organizations need at least one year of ERP operation results in order to reasonably determine if ROI and success objectives have been met.

Over 48% of the respondent organizations reported implementing ERP more than 5 years prior to the survey, while 25.4% implemented ERP within 1 to 2 years prior to the survey. A significant difference was observed in the success versus no success categories with more than twice as many no success 1 to 2 years implementation were reported for no success (22 or 35.5%) than were in the success 1 to 2 years implementation category (10 or 15.6%). In addition, more than twice as many in the success category that implemented over 5 years prior were observed (41 or 64.1%) than in the no success category (20 or 32.3%).

Table 8. ERP Implementation Status of Respondent Organization

	Success		No Success		Total Responses	
Implementation Status	*n*	*%*	*n*	*%*	*N*	*%*
1 = Implemented 1 year of less	0	0.0%	0	0.0%	0	0.0%
2 = Implemented 1 to 2 years	10	15.6%	22	35.5%	32	25.4%
3 = Implemented 2 - 3 years	4	6.3%	6	9.7%	10	7.9%
4 = Implemented 3 - 4 years	7	10.9%	4	6.5%	11	8.7%
5 = Implemented 4 - 5 years	2	3.1%	10	16.1%	12	9.5%
6 = Implemented over 5 years	41	64.1%	20	32.3%	61	48.4%

Size of Implementation Team

The respondent's ERP implementation team size for each surveyed organization is presented in Table 9. The highest frequency of implementation teams were over 20 members large which also held true for success (73.4%) versus no success (79%) categories. Implementation teams with 10 to 20 members were the second highest frequency for both success (20.3%) and no success (14.5%) categories.

Table 9. Implementation Team Size

	Success		No Success		Total Responses	
Size of Implementation Team	*n*	*%*	*n*	*%*	*N*	*%*
1 = Less than 10	4	6.3%	3	4.8%	7	5.6%
2 = 10 to 20	13	20.3%	9	14.5%	22	17.5%
3 = More than 20	47	73.4%	49	79.0%	96	76.2%
Other	0	0.0%	1	1.6%	1	0.8%

Decision To Implement

The level of management within the respondent organization responsible for the decision to implement is presented in Table 10. Top Management was responsible for the decision to employ ERP in 54% of the sample followed Business Process Leaders / Business Unit Managers with 23% of the sample. The results of the success and no success categories were very similar to the overall sample results.

Table 10. Level of Management Making Decision to Implement

	Success		No Success		Total Responses	
Decision to Implement	*n*	*%*	*n*	*%*	*N*	*%*
1 = IT Dept	11	17.2%	9	14.5%	20	15.9%
2 = Business Process Leaders / Unit Managers	17	26.6%	12	19.4%	29	23.0%
3 = Top Management	32	50.0%	36	58.1%	68	54.0%
4 = Outside Consultants	3	4.7%	2	3.2%	5	4.0%
5 = Other	1	1.6%	3	4.8%	4	3.2%

Other ERP Vendors Considered

The number of organizations that considered other ERP vendors is shown in Table 11. A total of 27.8% (35) of the total 126 responses considered valid for the study did not consider any other ERP vendor for their implementation (25% or 16 of the success responses, 30.6% or 19 of the no success responses). Over 40% of all respondents looked at Oracle (SAP's top competition) and 33% looked at PeopleSoft (now a part of Oracle). In further analysis of the success versus no success category, the success respondent organizations looked at more ERP options 23.6% more of the time than the no success category.

Table 11. ERP Vendors Considered In Addition to SAP

	Success		No Success		Total Responses	
Consider ERP Other than SAP	*n*	*%*	*n*	*%*	*N*	*%*
No	16	25.0%	19	30.6%	35	27.8%
Yes, Oracle	27	42.2%	29	46.8%	56	44.4%
Yes, PeopleSoft	26	40.6%	16	25.8%	42	33.3%
Yes, JD Edwards	21	32.8%	10	16.1%	31	24.6%
Yes, Baan	13	20.3%	8	12.9%	21	16.7%
Yes, Other	10	15.6%	13	21.0%	23	18.3%

Implementation Style

The implementation style of the sample organizations used to implement ERP is shown in Table 12. Sample organizations chose the Phased Implementation Style 51.6% of the time while the Plunge Implementation Style was used 31% of the time. Success versus no success organizations were very similar in implementation style used. There was less than a 3% overall deviation for each category to the total sample.

Table 12. ERP Implementation Style Used By Sample Organizations

	Success		No Success		Total Responses	
Implementation Style	*n*	*%*	*n*	*%*	*N*	*%*
1 = Phased	32	50.0%	33	53.2%	65	51.6%
2 = Pilot	5	7.8%	7	11.3%	12	9.5%
3 = Parallel	5	7.8%	0	0.0%	5	4.0%
4 = Plunge	21	32.8%	18	29.0%	39	31.0%
5 = Don't Know	1	1.6%	4	6.5%	5	4.0%

Modules Implemented

The modules implemented by the respondent companies are shown in Table 13. Of the 24 module types questioned, over 90% of all organizations sampled implemented the general ledger, accounts payable, and finance module. The success category companies implemented the general ledger, accounts payable, and finance modules 98.4%, 98.4%, and 96.9% of the time, respectively, while the no success category companies showed 88.7%, 87.1%, and 87.1% implementation of the aforementioned modules, respectively. Of the entire 24 modules questioned, the success category implemented all modules with the exception of 3, more of the time than did the no success organizations. The three categories in which no success outweighed success were Employee Self Service, Industry Solution, and Training and Events (no success weights 50%, 61.6%, and 48.4%, respectively, while success weights were 42.2%, 34.4%, and 35.9%, respectively).

Respondent Demographic Information Summary

The previous tables and study of the demographic information for all valid responses included in the survey show no bias in the valid responses from an overall standpoint and from a success versus no success standpoint. Notable demographic observations include:

1. The majority of organization types in the survey were manufacturing organizations.

2. The annual sales of the majority of the organizations were over $1 Billion.

3. While 40% of the overall organizations with valid responses implemented greater than 1 but less than 4 years, 36% of the success responses indicated over 1 and less than 4 years of implementation (and 64% over 4 years) versus 52% of the no success

responses indicating over 1 and less than 4 years of implementation (and 48% over

years).

4. Twenty out of 24 ERP modules were implemented in more instances in responses

indicating success versus no success.

Table 13. ERP Modules Implemented By Sample Organizations

	Success		No Success		Total	
	n	*%*	*n*	*%*	*N*	*%*
General Ledger	63	98.4%	55	88.7%	118	93.7%
Accounts Payable	63	98.4%	54	87.1%	117	92.9%
Finance	62	96.9%	54	87.1%	116	92.1%
Materials Management	59	92.2%	53	85.5%	112	88.9%
Accounts Receivable	59	92.2%	50	80.6%	109	86.5%
Cost Control	52	81.3%	50	80.6%	102	81.0%
Inventory Management	54	84.4%	46	74.2%	100	79.4%
Fixed Assets	49	76.6%	45	72.6%	94	74.6%
Budgeting	48	75.0%	45	72.6%	93	73.8%
Sales and Distribution	50	78.1%	41	66.1%	91	72.2%
Manufacturing and Logistics	50	78.1%	38	61.3%	88	69.8%
Human Resources	42	65.6%	40	64.5%	82	65.1%
Personnel	42	65.6%	39	62.9%	81	64.3%
Payroll	39	60.9%	37	59.7%	76	60.3%
Production Planning	44	68.8%	27	43.5%	71	56.3%
Warehouse Management	40	62.5%	31	50.0%	71	56.3%
Plant Maintenance	33	51.6%	32	51.6%	65	51.6%
Treasury Management	37	57.8%	27	43.5%	64	50.8%
Customer Service Management	36	56.3%	24	38.7%	60	47.6%
Project Management	32	50.0%	28	45.2%	60	47.6%
Employee Self Service	27	42.2%	31	50.0%	58	46.0%
Industry Solution (i.e. healthcare, utility, etc.)	22	34.4%	32	51.6%	54	42.9%
Training and Events	23	35.9%	30	48.4%	53	42.1%
Quality Management	27	42.2%	22	35.5%	49	38.9%

Success Versus No Success

As previously shown in Table 3, of the 239 total responses, 126 responses were usable for this research purpose. The 126 valid responses were examined for ERP operations which were deemed successful by their respondent's responses, versus those deemed not successful. In the survey, there are nine criteria in which achieving success in ERP systems were measured. Respondents indicating the presence of one of more of these factors were considered to have achieved success in adoption of their ERP system. The nine criteria measured as a part of the survey are:

1. Realized expected Return on investment
2. Realized ROI > 5%
3. Increased productivity => 2%
4. Reduced operational cost by 5%
5. Experienced reduction in scheduling and planning cycle > 50%
6. Experienced reduction in delivery times => 10%
7. Realized reduction in production time => 10%
8. Reduced inventory stock =>10%
9. Reduced late deliveries => 25%

These nine criteria were derived from the quantitative success factors cited in the "Attributes For Success" section of Chapter 2 Literature Review.

As shown in Table 3 previously, 64 of the 173 valid responses met at least one or more of the ERP surveyed success factors, leaving the remaining 62 of which responses indicated that no success factor was achieved.

Analysis of Research Questions

Research questions were analyzed based on the data received from the surveys. Each observation in the survey contained a response to attribute questions, as well as a coded

indication of whether the respondent indicated his/her organization's implementation was a

success (one or more success variables present) or not a success (no success in which no success

variables were present), as determined from prior analysis described earlier. The data from these

attribute responses was examined and summarized. Analysis of the data was conducted using

the Statistical Package for the Social Sciences (SPSS) for Windows and included the following

tests: the frequency of attributes for success versus no success implementations, correlation of

attributes to success and no success, and significance of difference for each attribute as it relates

to success versus no success observations.

In an effort to determine the tests most suitable for use, the data was first tested to

evaluate the normality assumption. A visual observation of data graphed in a histogram, and the

Kolmogorov-Smirnov test was conducted to evaluate the normality assumption. Based on these

two tests, the normality assumption failed for all attributes in all categories. As a result, three

non-parametric tests were selected; – the Spearman Rank Correlation for correlation testing

purposes, the Kruskal-Wallis test, and the Mann Whitley test for test of significant differences.

Research Question 1

Is a focus on the change in technology required by an ERP adoption observed in successful ERP
implementations?

The null hypothesis and alternate hypothesis for research question 1 are as follows:

Ho: Focus on technology required by an ERP adoption is not necessary for a
successful ERP implementation.

Ha: Focus on technology required by an ERP adoption is necessary for a successful
ERP implementation.

The survey questions used to analyze research question 1 are as follows:

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

i. The project had skilled consultants.
k. The ERP vendor was involved in our project.
m. The ERP software was modified to meet our needs.
r. Appropriate business and IT legacy systems were used.
u. The project champion was knowledgeable about ERP and the implementation.
x. The ERP software selection was appropriate for our business needs.
z. Historical data was analyzed and converted in an efficient logical manner.
aa. System architecture was well defined prior to implementation.

Please answer the questions below regarding your implementation.

g. Was your organization technologically prepared to implement?
i. Has ERP implementation necessitated the requirement of a new skill set among employees in terms of computer proficiency?

Table 14 shows the frequency of focus on change in technology attributes for success versus no success implementations.

Nine of ten attributes showed higher frequency in observations where success was observed as opposed to observations where success was not observed. The only observation which showed a higher frequency in no success observation was "ERP software modified to meet needs."   This attribute showed a .8% higher frequency for no success implementations versus success implementations. All other attributes show a significantly higher frequency in the success ERP implementations of at least 8% higher with some attributes being as much as 40% higher.

Table 14. Frequency of Change in Technology Focus Attributes

Frequency of Non-Successful Implementations Focusing on a Change in Technology

	Yes		Somewhat		No	
	n	*%*	*n*	*%*	*n*	*%*
Skilled Consultants	24	38.7%	32	51.6%	6	9.7%
ERP Vendor Involved	23	37.1%	26	41.9%	13	21.0%
ERP Software modified to meet needs	17	27.4%	30	48.4%	15	24.2%
Appropriate business and IT legacy systems used	26	41.9%	29	46.8%	7	11.3%
Project champion was knowledgeable about ERP and implementation	22	35.5%	25	40.3%	15	24.2%
ERP software was tested and "troubleshooted"	28	45.2%	29	46.8%	5	8.1%
ERP software selection was appropriate for business	39	62.9%	20	32.3%	3	4.8%
Historical data was analyzed and converted efficiently and logically	26	41.9%	24	38.7%	12	19.4%
System architecture well defined prior to implementation	26	41.9%	24	38.7%	12	19.4%
Technology was prepared to implement	36	58.1%	21	33.9%	5	8.1%

Frequency of Successful Implementations Focusing on Change in Technology

	Yes		Somewhat		No	
	n	*%*	*n*	*%*	*n*	*%*
Skilled Consultants	34	53.1%	26	40.6%	4	6.3%
ERP Vendor Involved	36	56.3%	19	29.7%	9	14.1%
ERP Software modified to meet needs	17	26.6%	27	42.2%	20	31.3%
Appropriate business and IT legacy systems used	45	70.3%	18	28.1%	1	1.6%
Project champion was knowledgeable about ERP and implementation	36	56.3%	20	31.3%	8	12.5%
ERP software was tested and "troubleshooted"	52	81.3%	12	18.8%	0	0.0%
ERP software selection was appropriate for business	53	82.8%	11	17.2%	0	0.0%
Historical data was analyzed and converted efficiently and logically	32	50.0%	24	37.5%	8	12.5%
System architecture well defined prior to implementation	42	65.6%	18	28.1%	4	6.3%
Technology was prepared to implement	45	70.3%	18	28.1%	1	1.6%

As previously stated, an alternate non-parametric test – the Spearman Rank Correlation, was used to analyze the change in technology focus attributes for correlation by attribute to success in ERP implementation. The Spearman Rank Correlation is an analysis tool used to

show whether a correlation between two variables exists. If a correlation exists, the Sig. (2-

tailed) *p* test value is less than .05. Another feature of the Spearman Correlation Rank analysis

tool is the correlation coefficient. If the *p*-test value is less than .05 indicating a correlation

exists, the correlation coefficient shows the strength of the correlation. The closer the correlation

coefficient is to 1, the greater the correlation strength. Table 15 shows the results of the

Spearman Rank Correlation.

Table 15. Spearman's Correlation Rank for Focus on Change in Technology

	Spearman's Correlation Coefficient	Sig. (2-tailed)
Skilled Consultants	0.146	0.103
ERP vendor involved	0.120	0.181
ERP software modified to meet needs	0.054	0.550
Appropriate business and IT legacy systems used	0.210	0.019
Project champion was knowledgeable about ERP and Implementation	0.133	0.138
ERP software was tested and "troubleshooted"	0.378	0.000
ERP software selection was appropriate for business	0.229	0.010
Customization of software was minimized	0.005	0.953
Historical data was analyzed and converted efficiently and logically	0.077	0.394
System architecture well defined prior to implementation	0.142	0.115
Aggressive schedule and timeline used for implementation	0.169	0.060
Technologically prepared to implement?	0.131	0.146
ERP necessitated requirement of new skill set for computer proficiency?	0.071	0.432

Sig. (2-tailed) *p* test < .05 indicates a significant correlation

The Spearman Correlation shows 3 of the 10 focus attributes indicate a correlation exist

between the attribute and a successful ERP implementation. These three focus attributes are, 1)

Appropriate business and IT legacy systems used, 2) ERP software was tested and

"troubleshooted," and 3) ERP software selection was appropriate for business. However, further examination of the data indicates that each of the focus attributes showing a correlation, shows a weak strength of correlation. This is observed in the correlation coefficient for each variable. For each of the three correlated variables, the closer the correlation coefficient is to 1, the correlation coefficient, the stronger the strength of the correlation.

Considering the frequency of attributes present in successful ERP implementations and the results of the Spearman Correlation Rank were conflicting, The Mann Whitley test was conducted and considered appropriate to determine if a significant difference in the distribution of observations indication success in ERP as correlated to the focus attributes. The Mann-Whitney test examines the difference in the distributions of success and no success observations. The results of the Mann Whitley test are shown in Table 16. The Mann Whitley tests for significance shows 3 of the 10 attributes have Asymp. Sig. (2-tailed) values less than .05, which indicate a significant difference in the distribution of change in technology attributes for success versus no success observations. The three attributes are: 1) Appropriate business and IT legacy systems used, 2) ERP software was tested and "troubleshooted," and 3) ERP software selection was appropriate for business. These three attributes are the same attributes that the Spearman Correlation Rank indicated a correlation existed.

Further examination of the Mann Whitley test indicates these three attributes show direction to no success implementations as witnessed through the higher mean rank for each attribute for no success versus lower mean rank for success.

Table 16. Mann Whitley Test for Significance in Technology Change Attributes

	Mean	Sig. Test	Mean Rank No Success	Success
Skilled Consultants	1.62	0.103	68.34	58.81
ERP vendor involved	1.66	0.180	67.03	59.03
ERP software modified to meet needs	2.01	0.548	61.65	65.29
Appropriate business and IT legacy systems used	1.40	0.019	69.86	56.46
Project champion was knowledgeable about ERP and Implementation	1.62	0.137	67.57	58.64
ERP software was tested and "troubleshooted"	1.39	0.00	74.70	51.84
ERP software selection was appropriate for business	1.27	0.011	69.54	56.77
Customization of software was minimized	1.68	0.953	63.18	59.81
Historical data was analyzed and converted efficiently and logically	1.64	0.391	65.63	60.49
System architecture well defined prior to implementation	1.49	0.114	67.62	58.59
Aggressive schedule and timeline used for implementation	1.30	0.060	58.25	59.81
Technologically prepared to implement	1.39	0.146	67.03	59.16
ERP necessitated new skill set for computer proficiency	1.29	0.429	64.43	60.63

Sig. (2-tailed) *p* test < .05 indicates a significant correlation

Based on the results of the Spearman Correlation Rank, and the Mann Whitley test for

change in technology focus attributes, there is insufficient evidence to conclude change in

technology focus attributes are necessary for a successful ERP implementation. Therefore, the

null hypothesis is not rejected. While the frequency of these attributes is evident in more

successful implementations than non-successful, this conclusion is supported by the 70% lack of

correlated attributes, the weakness in the attributes (30% of the total) to successful ERP

implementations in the Spearman Correlation Rank, and the inconsistency of significant

differences of attributes supporting non-successful ERP implementations.

Research Question 2

Is a focus on change management sensitive to the changing requirements of employees as required in an adoption of ERP versus employees' current practices using legacy systems, present in successful ERP implementations?

The null hypothesis and alternate hypothesis for research question 2 are as follows:

> Ho: Focus on change management required by an ERP adoption is not necessary for a successful ERP implementation.

> Ha: Focus on change management required by an ERP adoption is necessary for a successful ERP implementation.

The survey questions used to analyze research question 2 are as follows:

Please indicate the extent to which the statements below are true for your organization's implementation.
   a. The implementation had top management (executive level) support.
   e. End-users were involved during the implementation.
   f. The organization was prepared to manage change.
   n. There was effective end-user training.
   o. The project team was diverse and represented major areas of the organization.
   p. Employees were informed of the project and the project status during and prior to implementation.
   ab. Resources were dedicated to the project as needed.
   ad. Focus was dedicated to resolving issues during the project as needed.

Please answer the questions below regarding your implementation.
   a. Was the implementation project adequately staffed to meet the project deadlines?
   b. Was the implementation project adequately funded?
   e. Was your organization prepared for the internal/employees' reactions to the implementation?

f. Was your organization prepared for supplier / customer's reaction to the implementation?

k. Was employee morale positively changed by ERP implementation?

Tables 17a and 17b show the frequency of focus on change management attributes for success versus no success implementations. All thirteen change management attributes showed higher frequency in observations where success was observed as opposed to observations where success was not observed.

Table 17a. Frequency of No Success Change Management Focus Attributes

	Yes		Somewhat		No	
	n	*%*	*n*	*%*	*n*	*%*
Top management support	23	37.1%	29	46.8%	10	16.1%
End user involved in implementation	28	45.2%	29	46.8%	5	8.1%
Organization prepared to manage change	14	22.6%	30	48.4%	18	29.0%
Effective user training	16	25.8%	35	56.5%	11	17.7%
Project team diverse and represented major areas	39	62.9%	19	30.6%	4	6.5%
Employees informed of project during and prior to implementation	35	56.5%	24	38.7%	3	4.8%
Resources dedicated to project as needed	35	56.5%	18	29.0%	9	14.5%
Focus dedicated to resolution of issues during project	38	61.3%	19	30.6%	5	8.1%
Implementation adequately staffed	24	38.7%	22	35.5%	16	25.8%
Implementation adequately funded	41	66.1%	16	25.8%	5	8.1%
Prepared for internal employees' reactions to implementation	15	24.2%	33	53.2%	14	22.6%
Prepared for supplier / customer's reaction to implementation	18	29.0%	33	53.2%	11	17.7%
Employee morale positively changed by ERP implementation	7	11.3%	23	37.1%	32	51.6%

As previously stated, an alternate non-parametric test – the Spearman Rank Correlation, was used to analyze the change management focus attributes for correlation by attribute to success in ERP implementation. In order to analyze the data using the Spearman Rank Correlation, the data was recoded for yes versus no responses, where no responses were recoded

to include no or somewhat from the actual data observed. Table 18 shows the results of the

Spearman Rank Correlation.

Table 17b. Frequency of Success Change Management Focus Attributes

	Yes		Somewhat		No	
	n	*%*	*n*	*%*	*n*	*%*
Top management support	56	87.5%	8	12.5%	0	0.0%
End user involved in implementation	44	68.8%	18	28.1%	2	3.1%
Organization prepared to manage change	25	39.1%	30	46.9%	9	14.1%
Effective user training	31	48.4%	28	43.8%	5	7.8%
Project team diverse and represented major areas	54	84.4%	10	15.6%	0	0.0%
Employees informed of project during and prior to implementation	50	78.1%	14	21.9%	0	0.0%
Resources dedicated to project as needed	47	73.4%	15	23.4%	2	3.1%
Focus dedicated to resolution of issues during project	46	71.9%	17	26.6%	1	1.6%
Implementation adequately staffed	42	65.6%	18	28.1%	4	6.3%
Implementation adequately funded	51	79.7%	11	17.2%	2	3.1%
Prepared for internal employees' reactions to implementation	25	39.1%	31	48.4%	8	12.5%
Prepared for supplier / customer's reaction to implementation	36	56.3%	19	29.7%	9	14.1%
Employee morale positively changed by ERP implementation	13	20.3%	36	56.3%	15	23.4%

The Spearman Correlation shows eight of the thirteen focus attributes indicate a

correlation exist between the attribute and a successful ERP implementation, and two of the

remaining five attributes show a near correlation (<=.017). The eight focus attributes showing

correlation are, 1) End user involved in implementation, 2) Organization prepared to manage

change, 3) Project team diverse and represent major areas, 4) Employees informed of project

during and prior to implementation, 5) Resources dedicated to project as needed, 6)

Implementation adequately staffed, 7) Prepared for supplier / customer's reaction to

implementation, and 8) Employee morale positively changed by ERP implementation.

Table 18. Spearman's Correlation Rank for Focus on Change Management

	Spearman's Correlation Coefficient	Sig. (2-tailed)
Top Management Support	0.154	0.085
End User involved in implementation	0.211	0.018
Organization Prepared to Manage Change	0.218	0.014
Effective user training	0.164	0.067
Project team diverse and represent major areas	0.251	0.005
Employees informed of project during and prior to Implementation	0.221	0.014
Resources dedicated to project as needed	0.189	0.035
Focus dedicated to resolution of issues during project	0.114	0.204
Implementation Adequately Staffed?	0.296	0.001
Implementation adequately funded?	0.144	0.109
Prepared for internal employees' reactions to implementation?	0.172	0.056
Prepared for supplier / customer's reaction to implementation?	0.207	0.022
Employee morale positively changed by ERP implementation?	0.255	0.004

Sig. (2-tailed) p test < .05 indicates a significant correlation

While the eight attributes show a correlation to the successful ERP implementations, it should be noted the correlation is weak for each as the correlation coefficient observed (the closer to 1 the correlation coefficient, the stronger the strength of the correlation).

"The Kruskal-Wallis test was conducted to test the distribution of the presence of an attribute in the observation with possible responses of yes, somewhat, and no." "The Kruskal-Wallis test measures the difference in the distributions of the yes, somewhat, and no responses for each attribute tested in which a successful ERP implementation was observed." This test was selected and is appropriate due to the range of responses ("yes", "somewhat"," no") versus two extremes ("yes" and "no"). Since the Spearman Correlation Rank required recoding for no responses (to include "no" and "somewhat" responses observed), the Kruskal-Wallis test was used to confirm the results of the Spearman Correlation Rank. The test was run for observations indicating success versus no success in ERP implementation as correlated to the focus attributes. The results of the Kruskal-Wallis test are shown in Table 19. The Kruskal-Wallis test for significance shows seven of the thirteen attributes have Asymp. Sig. (2-tailed) values less than or equal to .05, which indicate a significant difference in the distribution of change management attributes for success versus no success observations. The seven attributes are: 1) End User involved in implementation, 2) Organization prepared to manage change, 3) Project team diverse and rep major areas, 4) Employees informed of project during and prior to Implementation, 5) Implementation Adequately Staffed, 6) Prepared for supplier / customer's reaction to implementation, and 7) Employee morale positively changed by ERP implementation. These seven attributes also show significance in the Spearman Correlation Rank indicating a correlation existed between the attribute and success in ERP Implementations. Further examination of the

Kruskal-Wallis test indicates these seven attributes show a stronger tendency the more the

attribute was observed as shown through the higher mean rank for each attribute (i.e. higher

mean rank for "yes", lower for "somewhat", and lowest for "no.")

Table 19. Kruskal-Wallis Test for Change Management Attributes

| | Kruskal-Wallis Test | | |
| | | Mean Rank | |
	Asymp. Sig.	Yes	Somewhat	No
Top Management Support	0.186	65.75	54.41	31.50
End User involved in implementation	0.050	70.00	55.63	52.50
Org Prepared to Manage Change	0.049	71.88	63.00	52.50
Effective user training	0.084	72.59	59.50	55.73
Project team diverse and rep major areas	0.012	67.51	53.05	31.50
Employees informed of project during and prior to Implementation	0.037	66.57	53.66	31.00
Resources dedicated to project as needed	0.063	66.82	59.41	43.50
Focus dedicated to resolution of issues during project	0.275	65.23	60.51	43.50
Implementation Adequately Staffed?	0.003	70.77	59.13	44.16
Implementation adequately funded?	0.274	65.65	56.46	51.83
Prepared for internal employees' reactions to implementation?	0.161	70.06	61.27	54.81
Prepared for supplier / customers' reaction to implementation?	0.008	71.00	52.47	62.56
Employee morale positively changed by ERP implementation?	0.012	69.88	67.53	50.97

Sig. (2-tailed) p test $< .05$ indicates a significant correlation

Based on the results of the Spearman Correlation Rank and the Kruskal-Wallis test for change management focus attributes, there is sufficient evidence to conclude change management focus attributes are necessary for a successful ERP implementation, as 62% of the variables in the Spearman Correlation Rank showed significance, and 54% of the Kruskal-Wallis Test. Therefore, the null hypothesis is rejected. These findings are further supported by the frequency analysis which shows all attributes are evident in more successful implementations than non-successful.

Research Question 3

Is a focus on change to best business practices with which adoption of ERP systems promotes present in successful ERP implementations?

The null hypothesis and alternate hypothesis for research question 3 are as follows:

Ho: Focus on change to best business practices required by an ERP adoption is not necessary for a successful ERP implementation.

Ha: Focus on change to best business practices required by an ERP adoption is necessary for a successful ERP implementation

The survey questions used to analyze research question 3 are as follows:

Please indicate the extent to which the statements below are true for your organization's implementation.
b. The project team was knowledgeable about ERP and business processes.
l. Our organization mapped and reengineered our business processes to match the ERP processes.
q. Our organization adopted best business practices during the ERP implementation.

Because of implementing ERP software, my organization has:
i. redesigned business processes to mirror best business practices.
j. improved customer relationship or supply chain management.

Table 20. Frequency of Best Business Practices Focus Attributes

Frequency of Non-Successful Implementations Focusing on Best Business Practices

	Yes		Somewhat		No	
	n	*%*	*n*	*%*	*n*	*%*
Project Team Knowledgeable RE ERP & Bus Process	23	37.1%	29	46.8%	10	16.1%
Org mapped and reengineered business processes to ERP	13	21.0%	37	59.7%	12	19.4%
Organization adopted best business practices	18	29.0%	28	45.2%	16	25.8%

	Expected Realized		Expected Not Realized		Not Expected But Realized		Not Expected Not Realized	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Redesigned business process to mirror best business practices	16	25.8%	41	66.1%	0	0.0%	5	8.1%
Software easily adaptable to business changes	8	12.9%	43	69.4%	1	1.6%	10	

Frequency of Successful Implementations Focusing on Best Business Practices

	Yes		Somewhat		No	
	n	*%*	*n*	*%*	*n*	*%*
Project Team Knowledgeable RE ERP & Bus Process	27	42.2%	31	48.4%	6	9.4%
Org mapped and reengineered business processes to ERP	26	40.6%	26	40.6%	12	18.8%
Organization adopted best business practices	35	54.7%	28	43.8%	1	1.6%

	Expected Realized		Expected Not Realized		Not Expected But Realized		Not Expected Not Realized	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Redesigned business process to mirror best business practices	41	64.1%	17	26.6%	3	4.7%	3	4.7%
Software easily adaptable to business changes	33	51.6%	21	32.8%	2	3.1%	8	

Table 20 shows the frequency of focus on best business practices attributes for success versus no success implementations. All five attributes showed higher frequency in observations where success was observed as opposed to observations where success was not observed.

A non-parametric test – the Spearman Rank Correlation, was used to analyze the best business practices focus attributes for correlation by attribute to success in ERP implementation. Table 21 shows the results of the Spearman Rank Correlation.

Table 21. Spearman's Correlation Rank for Focus on Best business practices

	Spearman's Correlation Coefficient	Sig. (2-tailed)
Project Team Knowledgeable RE ERP & Bus Process	0.081	0.367
Org mapped and reengineered business processes to ERP	0.148	0.101
Organization adopted best business practices	0.081	0.370
Software easily adaptable to business changes	0.072	0.451
redesigned business process to mirror best business practices	0.047	0.622

Sig. (2-tailed) p test $< .05$ indicates a significant correlation

The Spearman Correlation shows insufficient evidence exists for any of the five attributes to indicate a correlation exist between the attribute and a successful ERP implementation.

The Mann Whitley test was conducted to determine if a significant difference in the distribution of observations indication success in ERP as correlated to the focus attributes. The results of the Mann Whitley test are shown in Table 22. The Mann Whitley test for significance shows that none of the 5 attributes have Asymp. Sig. (2-tailed) values less than .05, which indicate a significant difference in the distribution of best business practices attributes for success versus no success observations.

Based on the results of the Spearman Correlation Rank and the Mann Whitley test for best business practices focus attributes, there is insufficient evidence to conclude best business practices focus attributes are necessary for a successful ERP implementation. Therefore, the null hypothesis is not rejected. While the frequency of these attributes is evident in more successful implementations than non-successful, this conclusion is supported by the results of the Spearman Correlation Rank and Whitney Mann tests.

Table 22. Mann-Whitley Test for Significance in Technology Change Attributes

| | | | Mean Rank | |
	Mean	Sig. Test	No Success	Success
Project Team Knowledgeable in ERP & Business Process	1.73	0.365	66.23	60.86
Organization mapped / reengineered business processes to ERP	1.86	0.100	67.99	58.24
Organization adopted best business practices	1.80	0.368	65.77	60.36
Software easily adaptable to business changes	1.51	0.448	59.55	55.05
Redesigned business process to mirror best business practices	0.51	0.620	58.09	55.26

Sig. (2-tailed) p test $< .05$ indicates a significant correlation

Research Question 4

To what degree does the combined presence of focus on: a) the change in technology, b) change management, and c) change to best business practices, correlate to successful ERP implementations?

The null hypothesis and alternate hypothesis for research question 4 are as follows:

Ho: Focus on a combined change of best business practices, change management, and technology change required by an ERP adoption is not necessary for a successful ERP implementation.

Ha: Focus on a combined change of best business practices, change management, and technology change required by an ERP adoption is necessary for a successful ERP implementation.

The frequency of combined categorical attribute factors is shown in Table 23. Factors were tested for conditions where all technology change attributes were present, all change management attributes were present, all best business practice attributes were present, a combination of all three categories, and three combinations of two categories is shown for all observances, those observances where success was indicated, and those observances were no success was indicated.

Table 23. Frequency of Combined Categorical Attribute Factors

	All Observations		Success		No Success	
	N	%	n	%	n	%
All Change Management Factors Present	52	41%	34	53%	18	29%
All Technology Change Factors Present	49	39%	25	39%	24	39%
All Best Business Practices Factors Present	50	40%	32	50%	18	29%
All Change Management and All Technology Change Factors	28	22%	16	25%	12	19%
All Change Management and All Best Business Practices	27	21%	21	33%	6	10%
All Technology Change and All Best Business Practices	26	21%	16	25%	10	16%
All Factors Present	15	12%	10	16%	5	8%

For each condition cited above, success observances outweighed no success observances. The stronger observances were for all factors present and for all observances where all conditions other than a change in technology were present.

The Spearman Correlation Rank and the Mann-Whitney test were conducted for further substantiation of the frequency results of combined categorical attribute factors. These tests are shown in Tables 24 and 25, respectively.

Table 24. Spearman Correlation Rank Test on Combined Attribute Factors

	Spearman Correlation Rank	
		Correlation
	Sig. (2-tailed)	
		Coefficient
All Change Management Factors Present	0.006	0.245
All Technology Change Factors Present	0.968	0.004
All Best Business Practices Factors Present	0.016	0.214
All Change Management and All Technology Change Factors	0.193	0.117
All Change Management and All Best Business Practices	0.001	0.068
All Technology Change and All Best Business Practices	0.450	0.282
All Factors Present	0.222	0.110

Sig. (2-tailed) p test $< .05$ indicates a significant correlation

The Spearman Correlation Rank showed significance for all change management attributes, all best practices attributes, and the combined all change management and all best practices attributes. In addition, the Mann-Whitney test showed significance for the same groups. The mean ranks for all change management factors of 70.97 and 55.79 for success versus no success, respectively, for all best business practices factors of 70.00 and 56.79 for success versus no success, respectively, and for all change management and all best business

practices combined of 70.67 and 56.10 for success versus no success, respectively, indicated in

each case as more of the combined two attributes are present, the greater the chances for success

in ERP implementation.

Table 25. Mann-Whitney Test on Combined Attribute Factors

| | Mann Whitley Test | | |
| | | Mean Rank | |
	Sig. (2-tailed)	Success	No Success
All Change Management Factors Present	0.006	70.97	55.79
All Technology Change Factors Present	0.968	63.61	63.39
All Best Business Practices Factors Present	0.017	70.00	56.79
All Change Management and All Technology Change Factors	0.448	65.84	61.08
All Change Management and All Best Business Practices	0.002	61.69	65.25
All Technology Change and All Best Business Practices	0.220	70.67	56.10
All Factors Present	0.192	66.25	60.66

Sig. (2-tailed) p test $< .05$ indicates a significant correlation

An analysis of the qualitative questions regarding problems encountered with ERP

implementations shows 15 of the 126 valid observations made comments regarding problems

experienced with change management. Of the 15 comments, 9 came from ERP implementations

which indicated no success attributes. In addition, the qualitative question regarding

recommendations of the respondent if they had to implement ERP over again indicated 9

respondents recommending better change management. Six of the 9 qualitative questions

regarding recommendations for future ERP implementations indicated no success attributes.

Considering the results of the frequency, Spearman Correlation Rank, and Mann-Whitley

test, there is insufficient evidence to conclude a combination of all three focus factors leads to

more successful ERP implementations. However, there is sufficient evidence to conclude a

combination of two focus factors (change management and best business practices) leads to more

successful ERP implementations. Therefore, a modified null and alternate hypothesis is created:

Ho: Focus on a combined change of best business practices, and change management
required by an ERP adoption is not necessary for a successful ERP implementation.

Ha: Focus on a combined change of best business practices, and change management
required by an ERP adoption is necessary for a successful ERP implementation.

Considering the significant evidence to support a combined focus on change in best

business practices and change management in ERP implementations do lead to more successful

ERP adoptions, the original and modified null hypotheses are rejected and the modified alternate

hypothesis is accepted.

CHAPTER 5. RESULTS, CONCLUSIONS, 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 research. A summary and discussion of the findings related to the four individual research questions is the focus of the fourth section. The fifth section focus on implications and recommendations for practice, while the sixth exaction addresses recommendations for future research in the field as derived from this study.

Statement of the Problem

The intent of this research was to identify correlation between successful implementation of ERP and the presence and/or absence of three target areas of implementation focus – a change in technology, change management of efforts within the work force, and/or change to best business practices. While many theories and approaches to ERP implementation have proven both success and unsuccessful results, and the identification of the many critical success factors that underlie these approaches have been the objective of other scholar's research efforts, the intent of this research was to test the identified critical success factors with successful ERP implementations.

Methodology

Population

The population for this study consisted of those individuals who were a part of a project to implement Enterprise Resource Planning (ERP) at their organization, where the implementation has been complete for more than one year. Participants for the research were randomly selected by the America's SAP User Group (ASUG) which consists of organizations implementing an SAP ERP version at their organization. The ASUG are located throughout North and South America. A sample of 600 organizations were selected randomly by ASUG and surveyed for the research.

The survey instrument (Appendix A) and cover letter (Appendix B) were electronically mailed by ASUG to the 600 ASUG member sample on March 16, 2007, with a follow-up email sent on March 26, 2007. The first email generated a response of 123 surveys while the follow-up email generated 116 surveys. Of the total 239 surveys submitted as generated from the ASUG emails, 47 were incomplete and unusable and 66 were submitted by organizations implementing ERP within less than one year which were also unusable. This left 126 valid responses (21% of the sample size) to the survey and formed the basis of the research results. Considering 21% (over 1/5) of the sample responded with usable information, the results of analysis of the sample are deemed to represent the population.

Instrumentation

Data was collected via a survey instrument used by a survey previously developed and used in two prior publications (Al-Sehali, 2000; Harrison, 2004). The two instruments used in these dissertations were combined and modified to facilitate the needs of this research.

The instrument was separated into four sections which include demographic information, expected results and benefits, implementation critical factors for success, modules implemented, and implementation concerns. The demographic information section was used to insure non-bias in the survey results by examining the positions of the survey respondents, type of organizations in which ERP was implemented, size of implementation team, years implemented, and various other demographic variables which, when analyzed and compared, conclude lack of bias in the research findings.

The other sections of the survey were used for the core research data and basis for these research findings.

Data Analysis

The Statistical Package for the Social Sciences for Windows (SPSS) was used to analyze the data received from the surveys. Question 1 was used to determine whether the organization's ERP efforts were successful or unsuccessful as compared to specific success criteria. This question was analyzed for descriptive statistics (including frequency of responses), and segregated into two groups – successful ERP implementations and unsuccessful ERP implementations.

Question 2 of the survey was used to determine the success criteria which correlated to successful ERP implementations versus unsuccessful ERP implementations as grouped by the

three focus elements in the research; focus on change in technology, focus on change

management, and focus on best business practices. It is through the findings of this correlation

between success criteria and focus elements that the findings to the research questions originated.

A variety of analytical tests were administered to research the data. The Spearman Rank

Correlation, Mann Whitley Test, and Kruskal-Wallis Test were all used to analyze the data for

correlation to the successful and unsuccessful ERP implementation responses.

Question 3 provided an additional basis for correlation and test for bias by examining the

ERP modules implemented in each organization. This information was analyzed using

descriptive statistics (including frequency of responses) for successful and unsuccessful

observations.

Question 4 provided demographic information regarding the responses. This information

was analyzed using descriptive statistics (including frequency of responses) to observe for

similarities and unusually larger frequencies in demographic information in order to insure lack

of bias present in the research.

Summary of the Findings

A summary of the findings of the research in response to the four research questions

follows.

Research Question 1

Is a focus on the change in technology required by an ERP adoption observed in

successful ERP implementations?

Analyzing the descriptive statistics analysis of frequencies, the study of this research question shows a higher frequency in observations where success was observed (90%) as compared to those observations in which success was not observed (10%) in ERP implementations. The only attribute that showed a higher frequency for unsuccessful ERP implementations was "ERP software modified to meet needs," which yielded a .8% higher frequency for unsuccessful implementations. This sole factor's reason for existence could stem from several causes. One explanation could be the successful company's employment of best practices attributes which favor little customization of ERP software.   Another explanation could be SAP's continuing efforts to make their ERP systems as flexible as possible, requiring little customization of the existing software.

The Spearman Rank Correlation showed a 30% focus toward successful ERP implementations versus 70% unsuccessful. These three focus attributes are, 1) Appropriate business and IT legacy systems used, 2) ERP software was tested and "troubleshooted," and 3) ERP software selection was appropriate for business. Further analysis of the Spearman Rank results shows a weak correlation for all three of these elements to successful ERP implementations.

While the descriptive statistics analysis of frequency for attributes showed successful ERP implementations employed 9 of 10 technology attributes present more often than in no success implementations, conflicting results are witnessed in the Spearman Correlation Rank test for correlation and the Mann Whitley test. Neither the Mann Whitley nor the Spearman Correlation Rank results supported the findings of the analysis of frequency. Due to the

conflicting results, it can be concluded a lack of evidence exists to show correlation of technology success attributes to successful ERP implementations.

Research Question 2

Is a focus on change management sensitive to the changing requirements of employees as required in an adoption of ERP versus employees' current practices using legacy systems, present in successful ERP implementations?

The study of descriptive statistics for this research question showed a higher frequency in observations for all attributes related to focus on change management and successful ERP implementations.

In addition to the analysis of descriptive statistics, the Spearman Rank Correlations and the Kruskal-Wallis test were conducted. The Spearman Rank Correlation showed a weak correlation existed for 8 of 13 attributes showed correlation to successful ERP implementations. The five attributes not showing correlation were top management support, effective user training, focus dedicated to resolution of issues during the project, implementation adequately funded, and prepared for internal employees reactions to implementation.

There are several possible explanations for these 5 attributes showing lack of correlation. First, as noted in the Literature Review, ERP implementations are expensive and often run over budget. When ERP implementations run over budget, cuts are often made in training. This would explain two of the attributes failing to correlate – implementation adequately funded and effective user training. In addition, top management often drives accountability for successful ERP implementation down the ranks to middle management and employees directly involved

with the ERP data collection process. This could be perceived as a lack of top management

support and explains a third attribute not showing correlation to ERP implementation success.

The remaining two attributes (focus dedicated to resolution of issues during the project, and

prepared for internal employees' reactions to implementation) could be explained from

demographic data shown in the research. When questioned as to the implementation style

employed for the ERP implementation, the Plunge method was cited as the second most popular

implementation style for successful ERP implementations and used for approximately 33% of

the successful implementations. The Plunge method employs a strategy where ERP systems are

implemented while previously employed systems are abruptly shut down. This method is the

least time consuming method of the four, while implementing ERP without regard for results

from previous systems. Therefore, the Plunge method could be construed by employees as a

method with no sensitivity to resolution of their issues during the project, and put the

organization in a situation where few preparations exist for internal employees' reactions to the

ERP implementation.

     Considering the 62% correlation rate of change management attributes to successful ERP

implementations observed in the Kruskal-Wallis test, the 54% correlation shown in the

Spearman Rank correlation, and the 100% observation in the descriptive statistics analysis of

frequencies, there is significant evidence to conclude a focus on change management of

employees impacted by ERP implementations is present in successful ERP implementations.

Research Question 3

     Is a focus on change to best business practices with which adoption of ERP systems

promotes present in successful ERP implementations?

In analyzing the descriptive statistics analysis of frequencies, the study of this research question shows all five attributes tested showed a higher frequency in observations where success was observed in ERP implementations. This suggests that the presence of focus on best business practices occurs more often in successful ERP implementations than in no success ERP implementations.

The Spearman Correlations Rank and the Mann Whitley test were both used to further analyze the data for any correlation that would exist between the 5 attributes and successful ERP implementations. Both the Spearman Correlation Rank and the Mann Whitley test showed no correlation to be present in any of the 5 attributes as tested for correlation to successful ERP implementation.

Due to the conflict in results of the analysis of frequency versus the Spearman Correlation Rank and the Mann Whitley test, it can be concluded a lack of evidence exists to show correlation of best practice attributes to successful ERP implementations.

Research Question 4

To what degree does the combined presence of focus on: a) the change in technology, b) change management, and c) change to best business practices, correlate to successful ERP implementations?

In analyzing data for conclusions to research question 4, the descriptive statistics analysis of frequencies for presence of all attribute factors in each category (focus on change management, focus on change in technology, and focus on best business practices), as well as the

presence of attribute factors in combined categories (focus on change management and change in technology, focus on change management and best business practices, and focus on change in technology and best business practices) were analyzed for success ERP implementations versus no success ERP implementations. For each category and the combined categories, the presence of all attribute factors was observed in successful ERP implementations versus no success ERP implementations.

To confirm these results and test for correlation of success ERP implementations, the Spearman Correlation Rank and the Mann-Whitney test were used to further analyze the data. The Spearman Correlation Rank showed significance for tests on observances in which all change management attributes were present, all best practices attributes were present, and the combination of all change management and all best business practice attributes were present. The Mann-Whitney test showed identical results to the results of the Spearman Correlation Rank for all instances where successful ERP implementations were observed.

Examination of responses to qualitative questions in the survey show in 15 (of 126) valid observations report problems experienced with change management. Nine of the 15 observations were from no success ERP implementations.

While insufficient evidence exists to confirm a correlation between the combined existence of all attribute factors in all three categories understudy (focus on change in technology, focus on change management, and focus on best business practices) exists with successful ERP implementations, there is sufficient evidence to conclude a correlation exists between successful ERP implementations and combined focus on change in best business practices and change management in ERP implementations.

Conclusions

Based on the findings of this research, the following conclusions were formulated in regard to ERP implementations using SAP in North and South America:

The first conclusion of the research is while correlations did not exist for 2 of 3 individual focus attribute groups (focus on technology and focus on best business practices), nor for 3 of 4 combinations of focus attribute groups (technology and best business practices, technology and change management, and technology, best business practices, and change management), all but one attribute was present in more successful ERP implementation observations, than in no success ERP implementations. This conclusion supports the creditability of the critical success factors of which each focus group was comprised, as well as the fact that presences of these critical success factors and/or focus attributes makes an organization implementing ERP more likely to succeed than to not succeed.

When SAP ERP systems are implemented, 50.8% of implementations show successful results when success is measured in terms of achieving at least one success attribute which include realizing target return on investment, realizing return on investment greater than 5%, increasing productivity by at least 2%, reducing operational cost by at least 5%, reduce scheduling and planning of more than 50%, reduction in delivery time by at least 10%, reduction in production time by at least 10%, reduction in inventory by at least 10%, or reduction in late deliveries by at least 25%. The research also shows that ERP implementations using SAP meet their return on investment objective 32.5% of the time, and reach all previously mentioned success attributes 14.3% of the time.

When implementing ERP, a focus on change management within the organizations as well as outside of the organization, is significantly related to a successful ERP implementation. Emphasis on how the new ERP system impacts employees, suppliers, and customers, as well as emphasis on transitioning the old system to the new are critical to the success of the project.

ERP is a challenging undertaking for any organization that provides questions and issues that are unplanned for and unresolved during implementation. The unplanned and unresolved can be interpreted as lack of support from upper management (i.e. lack of proper funding / resources) as well as the lack of sensitivity to immediate resolution of issues brought about during ERP implementation.

While successful ERP implementations show no significant relationship to a focus on best business practices to success, and while a focus on change management shows a significant, yet marginal correlation to successful ERP implementation, the combination of a focus on change management and best business practices creates a synergistic significant relationship to successful ERP implementations. This conclusion suggests that while most ERP implementations will succeed with a focus on change management and a lack of focus on best business practices, the presence of a focus on both change management and best business practices yields significant success compared to a simple focus on change management.

Lastly, it was concluded that SAP ERP implementations in North and South America show little to no correlation to focus on change in technology. Considering the fact that ERP is an intensive information system based initiative, this finding is surprising. However, considering the fact that while all implementations have diverse demographic factors (i.e. different modules implemented, different business / industry in which implementations took place, etc.) which may

have more diverse or different change management and best business practices, SAP may have perfected the technological side of ERP implementations to the degree that firms do not have to be as concerned with changes in technology as they do with focusing on change management and best business practices.

Recommendations for Practice

The intent of this research was to identify correlation between successful implementation of ERP and the presence and/or absence of three target areas of implementation focus – a change in technology, focus on change management, and / or a change to best business practices. Based on the conclusions and findings, the researcher suggests the following recommendations to organizations implementing SAP ERP in North and South America:

1) It is recommended that organizations considering ERP system implementations consider the success versus no success rate of success as gained from employing ERP before they commit to the ERP initiative. It is recommended that they consider the demonstrated rate of success strongly as the commitment, attention, discipline, and change required for successful implementations is significant.

2) It is recommended that all organizations implementing ERP consider all critical success factors, success attributes, and groups of success attributes when planning for ERP implementations.

3) It is recommended that all organizations implementing ERP consider and adopt change management practices and the associated success factors which comprise change management, as an integral part of planning and implementing ERP in their organizations.

4) It is recommended that top management be informed of the commitment to an ERP implementation (including the amount of resources necessary for successful ERP implementations, the critical success factors necessary for ERP implementations, and the demonstrated results of failures (i.e. running over budget) in order to prepare and make contingency plans for the possible impact of ERP implementations.

5) It is recommended that all organizations implementing ERP study and adopt the best business practices associated with the adoption of ERP, as well as adopt change management practices for pre-implementation, implementation, and post-implementation management of effects from ERP adoption.

6) It is recommended that organizations educate users, management, suppliers, and customers that while ERP does incorporate an adoption of new technology and focuses to some degree on and information system based approach, a focus on change management and best business practices is much more critical to success, than focusing on the change in technology.

<div align="center">Recommendations for Future Research</div>

While this study provides comprehensive research to the presence of three significant categories of focus for successful ERP implementations, it raises additional questions for further research. Recommendations for further research include the following:

1) Conduct a study of Oracle and other ERP implementations to compare to the SAP results. Test for similar findings noting the similarities and differences between different ERP vendor offerings as correlated to successful ERP implementations.

2) Conduct a study focusing on support of top management identifying top management support attributes, and correlated each to ERP success. Strive to validate and further understand why no correlation in support of top management existed for successful ERP implementations.

3) Conduct a study to understand and validate why a focus in change in technology showed no significance. Compare the various ERP vendors to test for differences in the focus on technology attribute for organizations favoring particular vendors from a technology standpoint.

4) Conduct a qualitative study of various organizations adopting ERP interviewing front line employees, middle managers, and upper managers, to understand their goals (success measures) for ERP in their respective organizations. Include a correlation of critical success factors to those goals, and contrast measurement of success at upper, middle, and front line positions.

5) Conduct a study to validate and further understand the success measures specific to organizations measuring ERP success.

6) Conduct a study to further define best business practices of organizations within different industry types for both service and manufacturing organizations.

7) Conduct a study of correlation of individual ERP modules and the combination of ERP modules to ERP success measures.

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APPENDIX A

RESEARCH QUESTIONAIRE

Research Questionnaire
Enterprise Resource Planning (ERP) Implementation
Dissertation Study

Contact Information:
W. Stewart Thomas
13291 Wesleyan Drive
Laurinburg, NC 28352
wst@carolina.net

Part 1: Expected Results and Benefits

1.01.   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. reduced operational costs by at least 5%.				
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 greater than 5%.				
h. software that is easily adaptable to business changes.				
i. redesigned business processes to mirror best business practices.				
j. improved customer relationship or supply chain management.				
k. experienced reduction in our scheduling and planning cycle of more than 50%				
l. experienced reduction of delivery times by at least 10%				

m. realized reduction in production times by at least 10%			
n. reduced inventory stock levels by at least 10%			
o. reduced late deliveries by at least 25%			
p. increased productivity by at least 2%			

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.			
o. The project team was diverse and represented major areas of the organization.			
p. Employees were informed of the project and the project status during and prior to implementation.			
q. Our organization adopted best business practices during the ERP implementation.			
r. Appropriate business and IT legacy systems were used.			
s. A business plan and vision was created and followed for the ERP implementation.			
t. Performance was monitored and evaluated before, during, and after the implementation.			
u. The project champion was knowledgeable about ERP and the implementation.			
v. The ERP software was tested and "troubleshooted"			
w. The scope of the ERP project was well defined and adhered to.			
x. The ERP software selection was appropriate for our business needs.			

y. Customization of software was minimized during the project.			
z. Historical data was analyzed and converted in an efficient logical manner.			
aa. System architecture was well defined prior to implementation.			
ab. Resources were dedicated to the project as needed.			
ac. An aggressive schedule and timeline was used for the implementation.			
ad. Focus was dedicated to resolving issues during the project as needed.			

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 supplier / customer'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 B

LETTER TO SURVEY RESPONDENTS

William Stewart Thomas, CPA, CITP
XXXXXXXXXX
XXXXXXXX, North Carolina 28352
XXX-XXX-XXXX

March 16, 2007

Dear ASUG Member,

I am a doctoral student at Capella University in Minneapolis, Minnesota. My dissertation topic is on, "Achieving Success Through Adoption of Enterprise Resource Planning – A Quantitative Analysis." The focus will be on the correlation of success with companies that emphasize change in technology, versus companies that emphasize change in technology, change management, and change in best business practices.

Below is a link to a confidential survey. The information from this survey will be used for tabulating results only. The survey takes, on average, approximately 20 minutes to complete. If provided, your company's name, or any other personal information, will not be revealed. If you would like to contact me I can be reached at XXXXXXXXXXXXXXXXXXXXXXXXXXX. My phone number is XXX_XXX_XXXX and my email address is XXXXXX.net.

The link to the survey is: http://www.surveymonkey.com/s.asp?u=XXXXXXXXXX

The results of the survey and research will be made available to you, via ASUG, as compiled and written. If possible, please complete this survey by (date approved with ASUG). Thank you in advance for your time.

Best regards,

W. Stewart Thomas, CPA.CITP

APPENDIX C

PROBLEMS REPORTED WITH ERP IMPLEMENTATION

The following qualitative responses were given to question 4.05 What problems did you

encounter, if any?

Observation	Problem #	Problem Reported
1	1	Effective communication with Integration Partner
1	2	Unfamiliar with technology, configuration and customization processes
2	1	Converting data (inventory count) was given to an outside firm that fouled it up.
2	2	Warehouse locations were not efficiently setup
2	3	Effective inventory costing/usage was not initially designed.
2	4	Some manual processes/paperwork could not be automated
3	1	scope creep w/SRM
3	2	customization
4	1	Reaching all team members (globally) in a timely manner.
4	2	Removing old stereotypes on how it should be.
4	3	Network infrastructure in Asia-Pacific region.
4	4	Cleansing of data prior to migration.
4	5	Training effort was underestimated.
6	1	too many junior consultants not enough knowledgeable consultants
6	2	PMO didn't understand business needs especially in HR/PR/BN arena
6	3	consultants ignored business requirements documents and configured based on their past knowledge instead of what we really needed
6	4	enterprise structure used doesn't support work flow
6	5	too much emphasis on meeting dates instead of accuracy of design and configuration
9	1	lack of solid technical consulting
9	2	resistance from end users
9	3	customization
9	4	IT reporting structure
9	5	migration from old proprietary systems
10	1	Resistance to change
10	2	Lack of tech skills in house
10	3	Budget issues
10	4	Turn over of consultants
10	5	University culture
11	1	Employees not consulted
11	2	Business Practices not Standard but Fixed by Law

11	3	ERP not adapted to Existing Practices
12	1	data conversion
12	2	scope creep
12	3	change management
12	4	knowledge transfer
13	1	SAP version release fell behind schedule reducing time for critical activities such as testing and training
13	2	Replacement of dozens of system and merging to create a single customer centric solution was very complex
13	3	Top leadership changes of three individuals changed the city's focus from the project to other major organizational challenges, loss of one of the two executive sponsors
13	4	Senior management was on board from the beginning; however mid level managers did not engage or support this change
13	5	Training offered was generic and more focused on the system rather than business rules and processes staff would need to complete their new activities
15	1	determining which countries had enough population to make full implementation cost effective
15	2	convincing legacy system stakeholders to give up some custom functionality for a global solution
15	3	still implementing new countries, by the way
16	1	Legacy system owner concerns
16	2	Training
16	3	Post-production staffing
16	4	Process change follow-through
18	1	Best practices not followed
18	2	Lack of support in mid-management
18	3	Reluctance to customize
18	4	Scope reduced due to time constraints
18	5	Reluctance to change
20	1	Lack of management decision
20	2	No manager lead on project team
20	3	Communication
20	4	Not the right resources on team
21	1	Some interface issues with legacy systems
22	1	No process improvement
22	2	Lack of vision
22	3	No strategy on reporting post imp.
22	4	Replication of legacy environment
23	1	Inexperienced consultants in the MM area
23	2	Training materials were lengthy and hard to understand
23	3	Inadequate understanding of the departments inventory processes & requirements
23	4	Accounting centric team didn't think enough about Procurement related issues
24	1	Data Conversion Resourcing
24	2	QM Additional Scope
24	3	General Change Management
24	4	Sustainable training, super user support
25	1	Change resistance

27	1	Bad training consultants
27	2	Training documentation by transaction instead of overall process
27	3	Data conversion responsibilities split - extract, convert, load - no 1 person responsible
27	4	No additional blueprinting for additional rollouts - requirements missed
27	5	Project team too political, instead of doing the 'right' thing
28	1	HR/Payroll module of SAP took much longer to implement than anticipated
28	2	Consultants were not knowledgeable about higher ed side of our business
28	3	Acquired two new hospitals during ERP implementation - added to scope
29	1	Lack of proper skills in 1984-5
29	2	Change management
29	3	Backfilling positions
30	1	During first wave; business processes were re-engineered to match the ERP software (PM, MM), during the Finance implementation, a different project team changed the software to match current processes
30	2	During FI implementation, project team failed to realize the change management impact, despite sitting through several 'Hammer-type' sessions. (Yeah, but that isn't us, our processes aren't changing!
30	3	During the first implementation we had skilled and experienced consultants, during the second we thought we could do it ourselves, but changed most of the project team. Hmmmmm
30	4	The SMT was openly against standardized processes - and said so in front of the CEO at an all hands meeting.
30	5	We build hundreds of interfaces during the FI implementation
32	1	Team did not fully comprehend business needs in some areas and had to redesign after go-live
32	2	Too much systems access initially given
32	3	Lack of documented processes for transactions between SAP/nonSAP transactions
32	4	Implemented midyear - lack of plan to show full year results and details
32	5	Insufficient audit support for data transferred from old to new system
33	1	Contention between IT and business
33	2	too much customization
33	3	poor design
33	4	super user proficiency low
34	1	Integration partner had significant difficulty in finding competent consultants for the project
34	2	Project was inappropriately estimated and significantly under funded
34	3	Problems with ability to refresh current dev/qas systems proved to be major problem for project (using single instance with multiple clients)
34	4	Master data is not centrally managed, and the complexity of the system integration causes rework, customization and delays
34	5	Company approach of rebuilding prior business practices in the new system (rather than adapting business processes) results in higher level of customization
36	1	Too much customization
36	2	Change management
36	3	Scope creep
36	4	Available people with appropriate skill sets
36	5	Expense

37	1	Business Owner Reluctance to Support Changes
37	2	Product Not ready for government implementation
37	3	Consultants not 'government proficient'
37	4	Non Governmental Account Code Structure
37	5	Integration Issues between ERP functions (HR, FI, Procurement)
39	1	Lack of basic MRP knowledge
39	2	Resistance to Change current practices
39	3	SAP missing some key automotive functionality
39	4	Lack of PC/System skills in end users
41	1	top management support
41	2	resistance to change
41	3	enablement of legacy processes
43	1	Business Process Not Documented
43	2	training not linked to Business Processes
44	1	fundamental differences in point of view as to which sub-modules / processes to implement
44	2	reporting requirements were ill defined and not implemented well
44	3	hard sell for business to relinquish many legacy processes
45	1	Corporate Financial Performance delayed some phases
46	1	Poor training consultants
46	2	Inadequate training
46	3	Process inadequately defined
46	4	Some processing not defined
46	5	Not enough ERP training/knowledge in management
47	1	Data Cleansing
47	2	Data Standards
47	3	Resistance to change
47	4	Refusal to change business processes
48	1	misinformation
48	2	changes after configuration completed
50	1	CRM capabilities not working/not deployed yet
50	2	Business support is in verbage but not practice
50	3	No true commitment to move to best practices
50	4	Scope and ownership not clearly defined and adhered to
54	1	Lack of business involvement/buy-in
54	2	Change Management
54	3	Adherence to Scope
55	1	Budget
55	2	Timeline for development, testing and training
55	3	Change management
55	4	Business buy-in
56	1	data conversion
56	2	change mgmt
56	3	time required to learn SW
56	4	lack of cross-plant consistency
57	1	Used consultants we did not need
57	2	Technical training was done too soon
57	3	Developed user documentation that was never used

57	4	Paid for hardware/software services that were not effective
57	5	Paid too much for programmers
59	1	culture shift from 100% custom code to a packaged application
59	2	Priorities of focus shifted constantly
59	3	Implementation timelines were too long
59	4	Business experienced organizational re-alignment twice during implementation
59	5	Getting enough time to do adequate training
60	1	Time constraint
60	2	Scope constraint
60	3	Technical (printers)
60	4	Lack of Knowledge (compared to today)
61	1	SAP AFS very buggy
61	2	Timeline not respected
61	3	Budget not respected
61	4	Too many problems during implementation
64	1	Legacy Data Conversions
64	2	Inadequate Functionality - A&D Industry Specific
64	3	Inadequate Testing - Authorizations
64	4	Inadequate Reports
65	1	Too much customization
65	2	No detailed project plan
65	3	No clearly defined scope
65	4	No plan to change business processes
65	5	No support from business mangers
67	1	Failure to challenge some of the implementation decisions 'forced' by external consultants.
67	2	User representation on Project Team should have been better screened (primarily Work Mgmt). They were not knowledgeable enough to drive the implementation.
69	1	Change Management was underestimated in the beginning!
69	2	Training was underestimated in the beginning!
69	3	End user was unsatisfied with 'unfriendly' SAP end-user interface!
69	4	Many statutory and legal exceptions by legal-entity, country and region necessary to adapt global business processes!
70	1	Change Management budget was cut
70	2	Custom solutions were replace with standard ERP functions without explanation
70	3	911 cut budget
70	4	Internal resources had limited knowledge of ERP before implementation
70	5	Overlapping phases did not allow time to make adjustments for lessons learned
71	1	Didn't reengineer enough business processes
71	2	Customized unnecessarily; didn't customize when really needed
71	3	Improper staffing
71	4	Poor training
71	5	Lack of change management
72	1	Staffing - It was difficult to find existing staff with necessary functional + technical skill sets.
72	2	Internal culture clash - The implementation team moved at the speed of business, on the cutting edge of technology, but the rest of the organization

		moved at the typical speed of government.
72	3	End user skill sets changed dramatically. A significant number of employees chose to retire instead of learning to use the computer system.
72	4	ERP staff burnout, both during implementation and after go-live.
72	5	End users in denial. Although we conducted a major Change Management initiative, not all departments chose to actively participate. Those that didn't have had the most problems with the system.
73	1	Complexities of ERP systems
73	2	Extended timeline to implement
73	3	Extended demand on employee resources in order to implement
73	4	Expense on implementation
73	5	Difficulties in re-engineering business processes to match ERP system
74	1	Lack of global business process owners
74	2	lack of global data strategy
74	3	Consultant level of expertise was typically less than advertised
74	4	Not enough change in our business processes to fit ERP
74	5	Inadequate governance over software modifications
75	1	lack of change management
75	2	lack of business commitment
75	3	lack of proper process mapping
75	4	lack of proper data management
76	1	Some areas did not have full management commitment to ERP
76	2	Some areas did not have timely response to issues that arose
76	3	Project team training did not occur early enough in the project to allow full exploitation of ERP capabilities during blueprinting
76	4	Some teams did not have the best people assigned
76	5	some areas continued to rely too heavily on consultants to understand their module, and did not develop internal expertise needed
77	1	7 different plants, 3 different CMMS Systems to integrate into one ERP system
77	2	Many different business process models needed to be integrated into a common solution
77	3	We only had 10 months to learn the ERP system, design our processes, build, test, train and implement our first rollout.
77	4	This was a Y2K solutions
78	1	Change Management
78	2	Willingness to change.
78	3	Replicating old system in SAP.
79	1	Lack of Program Knowledge
79	2	Learning to use the system
80	1	poor project management
80	2	unqualified consultants
80	3	made software fit our legacy biz
82	1	Staffing issues
82	2	Time/Schedule
82	3	Burn out
82	4	Staff support after implementation
82	5	Management understanding of the overall need to increase staff computer skill sets.
83	1	Poor definition of infrastructure requirements

83	2	Timeline too short for RE module
83	3	Competing projects in IT
83	4	Lack of business process documentation
83	5	Lack of knowledge with some consultants
84	1	Payroll Parallel not adequate
84	2	Security Effort Under Estimated
84	3	Teams Understaffed
85	1	SAP consultants were of no use and were let go; leaned on other (IBM) consultants
85	2	building security roles from scratch; assumed they would be SAP delivered (3.1G)
85	3	We did not fund or staff for 'Change Mgmt'
85	4	Implementation was to replace Y2K systems, not for business reasons - affected scope and priority
85	5	We did not see going in that it would require a new support team after go live
86	1	Lack of consulting leadership
86	2	Lack of ERP project experience
86	3	ASAP methodology was not followed
86	4	Inadequate planning & control
86	5	'Best practice' is nebulous concept
87	1	Project Manager Failure
87	2	Consultants did not keep work on schedule
87	3	vendor under-bid and underestimated time to implement
87	4	Vendor entered into a not to exceed contract and quit after they ran out of money
87	5	Consultants failed to accurately estimate their work.
88	1	14 month project was focused on implementing the current release available at project start and within 1 year we were faced with an upgrade. Not really a problem - disappointing to gather the team
89	1	Unknown 3rd party software requirements
89	2	Internal resources lack knowledge of implementing ERP
89	3	Organizational Structure was undergoing re-design
89	4	Inadequate testing and user involvement
89	5	Lack of effective change management and training
91	1	User Acceptance
91	2	Job responsibilities
93	1	many consultants 1st implementation
93	2	timetable too aggressive
93	3	too much customization not enough best practices
94	1	Change/ our users don't like it
94	2	Oversee resources - had to stay on top of them and keep asking questions. Also a problem with having to rework
94	3	finding good consultants that matched their skill set on their resume
95	1	Adequate dedication to the project
95	2	Problems with the integrator
95	3	Time
96	1	ISU billing problems and their impact on the citizens and staff
96	2	initial post go live SRM issues
96	3	magnitude of data cleansing and conversion process

96	4	having enough resources and time for thorough testing while meeting predefined project deadlines
96	5	impact of consultant turnover
97	1	training
97	2	reporting
97	3	history not maintained
97	4	lack of power users
97	5	little follow up after go live
98	1	Decision making on the part of the business
98	2	Scope Creep
98	3	End User Training
98	4	Dedicated Resources
98	5	Ability of the organization to deliver postponed enhancements post implementation
99	1	Reduced Testing Cycles
99	2	ERP vs. company terminology differences
99	3	Conversion to legacy
99	4	Learning curves
99	5	education
100	1	Tight deadline
102	1	OCM in sites that did not see value in Global Template that was not tailored for them and their needs individually
102	2	Finding quality consultants when necessary
103	1	Anti-SAP mentality
103	2	Loosing sight of the Big Picture objective
103	3	Immature planning software
103	4	Overly complex solutions
103	5	Reluctance to change the incumbent process to be consistent with ERP system
104	1	Software did not meet specific functionality needs
104	2	Ran over budget costs by 50%
104	3	Leadership lost focus due to business conditions
106	1	Personnel turnover
106	2	master data
107	1	system response time
107	2	bad master data
107	3	poor security design
107	4	inadequate training
107	5	inexperienced consultants
108	1	Even with end user training plan, the change management was the most difficult part of the implementation.
108	2	Attempts to duplicate legacy system processes and reports in ERP system slowed project, required extensive customization and lost some benefits expected from ERP.
109	1	Governance, Risk and Controls not finalized
109	2	Business Warehouse Strategy not fully defined
109	3	Interface Design had technical and process problems
109	4	User training was not adequate
109	5	Project sponsorship changed with new CFO
112	1	Users didn't understand the software

112	2	consultants tried too hard to give us what we wanted, vs what we needed
112	3	didn't really understand shop processes well enough
112	4	no change management driving the needed changes to the users
112	5	not enough measures of success to look back and see if we are better off
113	1	Poor system response time
113	2	difficultly converting backlog
114	1	consultant turnover
114	2	scope exceeded resources
115	1	Not enough training
115	2	Ineffective change management
115	3	Too much customization
115	4	Not enough SAP knowledge on project
115	5	Not enough use of SAP on project
116	1	software gaps
116	2	skilled consultants
116	3	cumbersome methodology
116	4	change management
117	1	Finding the right fit for functional consultants
117	2	Executive leadership was supportive at selection, but then fell silent
117	3	Learning curve is much higher than anticipated for the end users
118	1	Lack of middle management support
118	2	Lack of adequate User Training
118	3	Lack of knowledge to obtain SAP reports initially, lagged behind project by 4-6 weeks.
118	4	Lack of User Training Guides
119	1	too long ago
120	1	Lack of 100% dedicated internal resources to project
120	2	Legacy data issues
120	3	Travel issues due to project location
121	1	Financial - Billing
121	2	User ability to adjust
121	3	Being overwhelmed
122	1	Knowledgeable consultants
122	2	Software bugs
122	3	Unrealistic timetables
122	4	need to change process to match the system
123	1	Evaluation of SAP options for R&D in comparison with a core legacy application - changed directions mid-stream
123	2	Even though they were knowledgable, we needed more direction from consultants
123	3	Scope was not clearly understood until well into the design and the go-live date was moved first by 3 months, then by another 12 months
123	4	The process team members from the business had no ERP or any systems/implementation experience
123	5	A lot of turn over on the project - especially in the technical and overseas development areas
125	1	Business didn't want to change processes.
125	2	Some business leaders were resistant to modifying reporting.
125	3	Consultants were not familiar enough with the software.

| 125 | 4 | The SAP release was quite buggy. |
| 125 | 5 | More change was required than originally anticipated. |

APPENDIX D

OBSERVATIONS FOR FUTURE ERP IMPLEMENTATIONS

The following responses were given to question 4.06 What would you do differently (regarding implementation)?

Response #	Response
	Less politics, more empowered team members Not trust consultants as much Increase timeline Increase post go-live staff Better document processes, configuration, decisions, etc. for post go-live support staff #1 - End user training (documentation, delivery, follow-up)
1	Not use off-shore programming resources
3	Set realistic timetables and TALK to more business users.
4	I would spend more time educating the implementation team on the software before I brought in the consultants. I would spend a lot more time ensuring I knew, down to the shop floor user, how the implementation would change their work. I would assign change management responsibility. I would work using process chains rather than transactions.
6	get more management agreement to standardize business processes, do not try to find custom solutions for each division.
10	Use an implementation consulting partner. Determine an Executive level sponsor for SAP other than I.T.
13	Improve/modify business processes tightly focused project scopre fire unqualified consultants involve more business area people
14	Get Consultants that understand manufacturing.
15	Do not change standard ERP
24	Not much. We have done many implementations over 10 years and 95% of our business is running on SAP.
29	Hire SAP savvy resources in advance Establish global owner of template
34	The implementing entity should have more than one person assigned to each module. That would spread the workload as well as the knowledge.
38	Gain understanding that changing business processes is REQUIRED, and that changing the software is NOT ALLOWED.
40	Better and enhanced Change Management More time for best practice and improvements
42	1) even greater end user participation 2) more focus/resources on HR/Payroll modules
43	Train users again
44	Get better management buy-in to change processes up front. Staff the internal team with stronger business/system analysts that could better represent the business.
45	Select a more capable implementer
46	Implement for a business need and have business support behind the implementation; fund and staff for change management; change business processes to match the software (this takes a change mgmt champion and takes more time to implement); plan for a support structure after go live; plan for training to continue on going after implementation
48	Have a larger Procurement presence in the project team to better represent crucial decisions that need to be made. They need to be experienced with the ERP product as well as with planning change management. It doesn't help to have someone with no knowledge of what the systems can do and what all current processes are as many broken processes were simply moved to the same broken process in the ERP system.
56	Increase focus on process standardization even more than we did. Focus even more on data governance and importance earlier than we did.

57 Train Implementation team up on ERP before starting the development and implementation stages of the project. We didn't know the product, and consultants did not know our business well enough to help each other out.

58 Get consensus on what the standard processes should be before we begin implementing, create and manage to a detailed project plan, and involve business mangers in the entire process.

59 Implement FI modules first, then MM, then SD. Others to follow. Big bang implementation could not be done in a public company, especially with SOX.

61 Define project organization better

62 Fully Staff teams with internal knowledgeable members. Interview consultants to ensure their level of expertise. Execute multiple payroll parallels.

64 Reconsider whether best of breed software functionality (such as CMMS) would be better to pursue. Advantages of integration are great, but we underestimated complexity of making customizations and changes to achieve adequate maintenance functionality from ERP. Lack of accessibility to notification data from work order in PM module is good example of awkward SAP structure that is perceived by many as not user friendly.

65 Faster....10 years to complete

66 1. Improve the consistency of documentation 2. Work with a simple project plan, don't over plan the work. 3. Allow more time to prepare and conduct training. 4. More business involvement in the verification of data that is uploaded in the new system. 5. Increase participation of and cooperation between the project team and the business, e.g., responding in time with the right information

67 Less customization, more change management and training

71 Get Middle Management sign-off on all process chains.

74 Hire more seasoned consultants, do a better job of blue printing, use more best practices and hire a change management consultant.

78 Make it more horizontal

87 Increase emphasis on change management and sustainability after go-live of highly training personnel

89 address all top 5 problems noted earlier

94 Work on getting Middle Management support. In some ways, this is more important than Upper Management support. Spend more time with Users as individuals. Spend more time on Training Documents and actual training.

99 Revamp legacy process to line up with ERP processes which can be dramatically different.

102 Need a defined reporting strategy

105 Expand the initial scope

108 More time to understand what the software was suppose to do. Training to have a better baseline business process and a better mapping of the future process.

109 More time, more people. Find more skilled ERP analysts...

112 Spend more time developing the short term and long term support model for post implementation.

113 Standardize the system/process for roll out corporately.

115 Allow more time for rework of blueprinting to ensure business processes are accruately captured

118 Ensure product was 'Government ready'

121 Better training and Change Management

125 Work harder to retain own staff when project completes. Take more time selecting consultants. Adopt more standard business processes. And avoid reworking system to match old BPs.

Space the timing of the phases more widely so that lessons learned could be better incorporated.   Retain the business and technical team together for 1 year to provide support and fix the items that had to be band aided during implementation

Better overall planning for entire company. Our implementation was focused on a specific portion of our business and remainder of business has not used the system very well and

127   continues to look for other solutions.

135   Gain more end user buy-in

I was not involved with the implementation here. Overall it went very well. As with all, did not want to reinvent the wheel so a lot of legacy data was used and poor (e.g. BOMs and

136   Routings)

Shop multiple implementation service providers. Dig deeper in reference checks to identify conflicts of interest. Require SAP and ASUG to provide information BEFORE signing the contract. Get references for each of the consultants; ensure that each consultant has

137   project experience not just staff augmentation.

Postpone setting hard go-live dates until we had a detailed understanding of scope and

138   could answer key design questions.

141   Engage more experienced team members and consultants

142   top management strategy. One Enterprise vs holding company ... need direction.

Try to get an honest answer on expected time and cost. Try to locate independent consultants, with recommendations from other companies, rather than use vendor

147   consultants or big name firms.

Implement a better change management strategy. Provide more time for training closer to

149   the go-live date.

Insist on dedicated configuration experts as part of the post-production project team. Insist

153   on dedicated ERP training as part of the post-production project team.

154   Allow more time for Legacy interaction;

157   Better 'real life ' training for technicians

159   Choose an ERP based on requirements instead of allowing to be dictated by IT

More emphasis on role creation and management and systems access; Stronger finance and business process owner representation and training   Fix process issues before implementation Address 'small' issues during configuration and implementation - they are

160   the ones that cause the most problems after go-live

1. Implement all 'plants' at the beginning of a fiscal year.   2. Convert beginning year

165   general ledger balances only - no other data.

Include plans for a number of phases after the initial go-live where you bring in additional

166   functionality and bring in more business processes under the umbrella of the ERP software.

1. More focus on Change Mgt (people side of ERP) 2. Make sure leadership understands

168   what/how an ERP implementation impacts the business

169   Hand pick key business owners

Allocate at least one manager on the team to make critical decisions that needed to be made on the spot. Allow for more time for the implementation and allocate more team

170   members to be on the team

Not much. Would try to ensure more knowledgeable user representation of every sub-team. Some operations area team members did not know enough about current practices to challenge external consultants on steps they recommended that were apparently motivated

175   by making their jobs easier.

I would consider educating the business about the standard functionality of SAP and the

176   value achieved from a standard implementation where possible.

Provide ERP training to IT staff. Insist on more knowledge transfer from the Consultants

178   during the project development and not wait until unit testing and roll-out phases.

implement with the knowledge that it will all change and implement in a way that makes

184   changing easier and faster

Make quicker decisions about replacing both consulting and internal project resources. It's

185   better to have no resource than the wrong resource.

188   more depth in the application

189   Shorter time line for phased approach! - More big bang implementations by regions instead country by country as in the beginning ... now we more and more focus on regions by bundling countries and functionality!

193   Re-define our Business Processes

194   Project team would be made up of management and professional level staff. End Users would be involved for end to end business process documentation and testing. Allow more time, but not too much more. Look at 2nd tier vendors. SAP is highly complicated. Address change management in core functions such as HR, Finance and Procurement.

195   Over emphasize the need for proper reports and reporting tools. Over estimate the time and resources needed to implement reporting.

198   Legitimate business commitment Force realignment of business processes

205   More documenting of process.

213   Test more horizontal scenarios allow data to process completely (or as close as possible to it) before going live More resources and more dedicated resources, less turnover Better go live Planning, training, communication and feedback

216   collect data differently. ask questions in different ways and repeat information.

217   Have resources that were dedicated 100% to the project, and not expect employees to have dual roles.

221   Have, IT get the business involved much sooner

223   Earlier business involvement. More super users and more internal resources dedicated to the project. Would have been nice to have a very detailed scope document to guide each department through the changes. Clearer expectations and recognition to the resources pulled from permanent positions to participate in the project.   We are in the middle of the implementation - it will be easier to provide more info once the implementation is over.

227   Choose a more experienced consulting partner and reduce the number of legacy interfaces.

228   reduce customization and eliminate as many legacy applications as possible

230   have 1 person as primary County project manager over ISU implementation. Everyone worked very hard at testing their individual pieces, but it would have been very helpful to have 1 knowledgeable person on the County side overseeing the big picture. I believe there was too much emphasis placed on meeting the preset go live date for this module causing major post go live issues that could have been alleviated by additional integration and parallel testing.   Although everyone worked very hard on this very large project, there were a few problems (such as overlap of BP #s between SRM and CRM that could have been avoided with additional communication between the implementation teams of each of these modules.

231   different consulting partner / arrangement... fix landscape vision early more experienced technical resources more realistic planning true critical path analysis realization of impact of ramp-up software

233   phased approach, more up front training, better understand processes and do more process design, more technical resources from staff

235   Let the business lead, improve change management. Spend more time on user interface, analysis capabilities.

236   Implement at same time as original implementation of SAP.

238   More education of team members. Better selection of implementation partner representatives.

APPENDIX E

RECOMMENDATIONS FUTURE ERP IMPLEMENTATIONS

The following are responses to question 4.07 What advice do you have for others who are

considering an ERP system implementation?

Response #	Response
1	Must have power user system in place Have SAP-experienced employees so that consultants don't run everything Have adequate time for documentation Use end users for testing Have a mock go-live, even if it's 1 week, to run 'parallel' in a test client to discover data and process issues
3	Know that software is not a solution in and of itself - it should just help you to do what you do anyway - just better.
4	Spend more time on educating your implementation team on how the software functions. You need to understand your business process, in detail, from top to the bottom. Ensure you understand the decision points in the processes. Be prepared to make changes to your business processes rather than change the software. While businesses may be different they are not unique and the major ERP systems (especially SAP) are geared to work using best practices. If you think you need to change the software, most likely you are not following the best business practices. Ensure you develop measures of success other than ROI. You need operational measurements, what are they today, what do you expect them to be and WHY.
6	Strong management commitment required at all levels, with a willingness to change.
10	Expect higher implementation costs than you plan for and more time. Make sure to have Executive sponsorship and communicated throughout the organization.
13	Customer references - ask about lessons learned, realize they can happen to you.
14	Hold on to your ground. Consultants are more like sales people. They will promise a lot and deliver less, and after you GO LIVE on the system, they are no where to be found.
15	Assign the nest people if each area to have champions.
24	1)Must have good management support at each site 2)Must adequately staff the project and each site/department must contribute super users 3)Change your processes and not the ERP system 4)Training is important but practice is more critical. Do whatever it takes to allow the users to be trained and to practice. 5)Minimize interfaces and look to the ERP system first for new functional requirements instead of looking for another system
29	Keep the scope and focus. Have the highest level in the organization engaged
34	1) Staff the implementation with a dedicated (no other job duties) team in an off-site location so they can focus on the implementation. 2) Talk to other entities who have been through an implementation. Their 'lessons learned' can save your organization a lot of pain. 3) Keep the system as vanilla as possible.
35	It is important to involve the end users in the implementation earlier rather than later and to get their input on changes in the business processes.
38	Don't listen to the first consultant that gives a good sales pitch, especially if they are from the software vendor.
40	Start earlier with Change Management Take more time for best practice analysis
42	1) don't let the consultants configure - make sure implementation is knowledge transfer

process 2) make sure software vendor (SAP) is tied to the success of the project 3) devote best functional resources full-time to implementation project

43   Talk to companies hat have gone thru process

Make sure top management, middle management, and key opinion leaders are aligned and behind the implementation. Make sure you staff the team with your strongest players as the ERP system is your future and it is more important to get that right than ensure your legacy

44   systems/business processes run well during the implementation.

Interview multiple vendors. In addition to reference checking on the vendor's customers, do reference checking on the individual team members, and especially the project manager. Make sure they have experience leading implementations in their areas. Many consultants

45   just have staff augmentation experience.

46   See above comments in 20.

Have an option in the terms of the implementation consultants contract that allows you to ask for alternative people. This way if you get a consultant in a critical area that has NO

48   experience whatsoever you can request someone else.

you can't possibly do enough change management -- the impact of the business process changes is huge. Training helps, but tends to focus on how things should work when they work correctly. How end users can troubleshoot and do analysis in the operational system

55   is the key to successful take-up.

Global single instance and process standardization are key - enforced via Global Process

56   Owners   Data Governance is key.

Its powerful, but don't expect SAP to be the best tool for every application - it does everything well, but not as good as stand-alone software can handle specific tasks - but you

57   can't beat the integration of SAP.

Top management leadership and support. Good project management, Backfill subject matter expert positions. Retain those you train while doing implementation. Cash bonuses

59   for the team! Incentives during project for team members and their families!

61   Leverage process documentation and expertise

Have a dedicated team whose whole focus is the project. Empower them to make

62   decisions. Don't under estimate change management and training.

63   ensure that consultants are qualified as well as certified.

Get detailed training in ERP functionality as early as possible for project team members,

64   before configuring system for your needs.

Start with a global vision, develop standard template, roll-out by country and stick to

65   template. Use one development for all configuration...

66   Same as above.

67   Less customization, more change management and training

Plan on changing. Look for lean processes. Remember that ERP does not correct poor

71   management practices.

74   All of the above.

78   Have patience

Understand your employees needs. Support customization to fit your business practices. Our business practices did not fit the standard business model, but the implementors shoe horned it in. Our ERP took from a system where project managers could enter purchase requests and track their own budgets to one where due to the complexity of the core finacial system we employ a staff of experts to retrieve information for us (similiar to what we did

83   with the old mainframes in the 70's)

87   Very complex process that must have full management support

Ensure global business process owners at appropriate level to understand low level

89   business processes but also empowered (formally and informally) to make decisions.

The Project Team needs to be the 'Fighter Pilots'. This may not be the top paid individuals,

94   it is the right people, with the right skill set. It is very important that the PM have full support

to be able to hold the team to the Project Schedule and avoid scope creep. Above all consider the full, long-term implications of modifying the new system. In most cases the modification is not mission critical, it is not the reason your company has a leading edge in the market. The reoccurring theme of all businesses that modify their systems (not just SAP) is they are dissatisfied with the end results. Over time, this translates to overall dissatisfaction with the business system.

102   Do it

105   Look at the skill sets of their staff to see if they match moving to the type selected.

You need a long time to ramp up employee skill sets to take on a major ERP
108   implementation. Do not underestimate turnover during the project...

Survey mid level management during the early phases of the project to assess their level of understanding and commitment to the project's success. Look for a role for them to play or
109   an active role requiring their participation.

112   Make the tough Go/No Go decisions - if you aren't ready to Go live, don't do it.

Re-engineer business processes prior to implementation. Involve the end users as soon as possible and keep them engaged; test, test and test again. Ensure knowledge transfer for
113   internal resources for maintenance and support after go-live.

115   Make sure the product is ready for your industry before purchasing.

118   Don't underestimate training

Phased is best. Do one module at at time, starting with FI. Work hard to retain own sfaff
121   when project completes. Take good time selecting consultants.

Don't underestimate change management Keep the team together after the the implementation for at least a year to provide guidance and knowledge as the organization
125   matures in relation to the ERP and issues surface

Must focus on the entire company and value of ERP. Our implementation focused on a general ledger system, manufacturing system, a portion of our billing system, AP and HR/Payroll. System has never been viewed as an integrated solutions for project management, treasury, planning & budgeting and information warehouse and so is limited
127   in its value to improve the company strategically.

135   Change your business processes to match the SAP processes!

136   Expect to spend a lot of cash and time. Train, train, train!

Trust no one. Network with as many people as you can. Get a hardware estimate along with the software. Determine if the hardware will require facilities changes. Do not
137   purchase the software bundled with an implementation service provider.

Evaluate your key legacy applications against SAP functionality early in order to determine a direction and clearly define scope.   Staff your process team with a mix of process experts from the business and people with systems/implementation experience.   Enable your team members to make key decisions quickly. Key decisions that stall can hold up the
138   entire project or create significant rework.

141   Find a way to measure results

Talk to others that have done it - get advice. Be reasonable about expectations. Test, test
147   and test again.

Build and test security roles during the unit test phase. Perform integration testing with
149   business roles.

150   Bring your whole plant up at once do not try to phase in the modules.

Make sure that there is management support for fully implementing process re-engineering
153   and sticking with it. IT changes alone are not enough.

Make certain configuration changes and development are completed before interfacing with
154   legacy systems

make sure there is an adequate supply of both qualified consultants to implement the system as well as adequate supply of qualified candidates to staff IT positions to support
159   the system going forward.

It is worth the effort. Know your processes. Business process owners must be involved and knowledgeable to avoid incorrect assertions and configurations that do not meet business needs. Need to keep SAP team together to fix the configuration issues after go-live. Make sure they respond to the business owners' needs. Need to keep training up to ensure continuity. As SAP power users leave company, need to have a sustainable

160   knowledge base.

1. Implement at the beginning of a fiscal year.   2. Re-engineering processes in the legacy

165   systems before implementation of an ERP.

Make sure that there is a project champion who can help mediate squabbles that may arise during the project. Make sure to have buy-in from all organizations. Make sure to provide adequate (and ongoing) training to end-users. After go-live, setup a support organization to help with issues that arise and staff it with people with the right skills (possibly project team members). Have someone continue to be a champion for the application once it is in

166   Production to promote expanding the functionality and continuing to settle squabbles.

Focus on the planning, design output (changes in how people will do there work) and make

168   sure leadership team is fully involved

Don't under estimate the time and resources required. Make sure you have the best of the

169   best on the implementation team.

170   Choose qualified consultants that can be team leaders and know how to communicate

175   Don't be afraid to pay for quality external consulting - it will pay dividends in the end.

Get high-level executive support based on the business being required to standardize their business processes. Do not scope your implementation to only map your existing old

176   system into SAP, most likely resulting in heavy customization.

Fully understand the costs of ERP user licensing and the costs of upgrades so you don't encounter 'sticker shock'. The initial purchase and development costs are high enough but

178   it's only the tip of the iceberg moving forward, if you want to remain current.

The technology and applications are the easiest part. Organizational change management is the key to the entire implementation. Don't underestimate the amount of time and effort

184   needed to shift the organization to a new way of doing things.

Don't let your executives and senior teams get off of the bus after your selection has been made. They must participate at every step (including training) so that they get the opportunity to hear and (hopefully) validate the messages being delivered to their teams. ERP system implementations are not simply software replacements, they are an opportunity to re-evaluate your business process and it is this change that muddies the

185   water upon delivery of a new ERP.

188   change your processes to conform - pressure test data before loading

Start to down and bottom up and check properly and carefully your processes from the beginning on a regional and global base then starting country by country with too much

189   exceptions for the business process ...

193   Get Mgt Support

Documentation needs to include before and after business process, not just SAP steps. Inventory computer skills of all end users and bring them up to standard prior to implementation. Get managers involved on the implementation and testing so they know

194   what their staff will be doing.

Form a solid and cross functional team including key stakeholders from the business. Segregate that team from the day-to-day work so they can focus on the project, but promote ERP related communications. Follow ASAP methodology to its fullest. Plan, plan, plan. Over emphasize the need to adopt business best practice / business process re-engineering. Assume your organization is going to grow and become more diverse than it

195   is today then manage the project accordingly.

205   Good requirements documentation.

209   Involve the business users early and often. And get a resource commitment from them off

the bat with very clear expectations.

213   Test more horizontal scenarios allow data to process completely (or as close as possible to it) before going live More resources and more dedicated resources, less turnover Better go live Planning, training, communication and feedback

216   Patience is a virtue! Long hours and hard brain work, but well worth the experience. Be very specific in what you need in configuration.

217   Time, time, time. Do not rush to meet a deadline, ensure that the system is working the way you had intended.

221   A good focus on change management with a good understanding of process changes that are required ill improve the rollout, support, training and implementation.   Understanding how to reverse, cancel and or undo an undesired transactions or series of transactions. This is very important for support and was a big gap in our process design.

223   Get involved, ask questions, learn. Build scope and communicate it to the teams. Clarify goals and spend time in training and standardizing business processes to work smoothly in the tool.

227   Be prepared to change business processes, keep the software as standard as possible, and emphasize the importance of data integrity.

228   avoid customization at all cost!

230   use a phased approach change management is essential don't underestimate the effort required for data cleansing and conversion. this is time well spent. provide staff with adequate training. get the end user community heavily involved from the beginning and throughout the project in the decision making process and testing. have executive support and buy in. keep everyone in the organization informed on the project goals and progress. choose the best people available to work on the project team. celebrate and share the victories.

232   Get end users involved early

233   ERP are big systems. You don't understand complexity until you have done some pilot implementation.

235   minimize customization. establish business owners

236   Map all business processes fully PRIOR to embarking on project.

238   Start with FI & CO components. Use an implementation partner that you have an ongoing relationship with. Focus implementation and keep scope under tight control. Assure top level management support. Be prepared for budget overruns.