

Date Published: 10-1-2012

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William S. Thomas

*University of North Carolina at Pembroke*

Danielle Babb

*American Public University System*

John E. Spillan

*University of North Carolina at Pembroke*

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### Recommended Citation

Thomas, W. S., Babb, D., & Spillan, J. E. (2012). The Importance Of Culture Change And Change Management In Successful Implementation Of Sap Enterprise Resource Planning Systems. *Mountain Plains Journal of Business and Economics*, 13(1). Retrieved from <https://openspaces.unk.edu/mpjbt/vol13/iss1/2>

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# **THE IMPORTANCE OF CULTURE CHANGE AND CHANGE MANAGEMENT IN SUCCESSFUL IMPLEMENTATION OF SAP ENTERPRISE RESOURCE PLANNING SYSTEMS**

**WILLIAM STEWART THOMAS  
UNIVERSITY OF NORTH CAROLINA AT PEMBROKE**

**DANIELLE BABB  
AMERICAN PUBLIC UNIVERSITY SYSTEM**

**JOHN E. SPILLAN  
UNIVERSITY OF NORTH CAROLINA AT PEMBROKE**

## **ABSTRACT**

Enterprise Resource Planning (ERP) has enabled organizations to connect vendors, the organization, and customers in an almost seamless manner with real-time accurate communication and information. In an increasingly competitive environment, businesses are looking for ways to become more competitive within their marketplace. Many are turning to ERP solutions to facilitate multiple competitive priorities to stand above competing businesses or to create a new competitive advantage. Critical success factors and change management are the primary vehicles for the achievement of success in the adoption of these systems. This research studies how change management becomes a significant link to successful ERP implementation.

## **I. INTRODUCTION**

In today's business world, manufacturers looking to gain strategic advantage by competing among multiple priorities have found the use of Enterprise Resource Planning (ERP) systems to be a valuable asset in gaining a competitive edge (Porter, 2001). The achievement of a 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 (JIT) management and inventory processes 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. The core function of ERP is to give decision makers 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, they have also gained popular reception among large companies and are now filtering down to medium-sized organizations throughout Europe and North America. Successful ERP systems can provide the essential business intelligence for an organization as it integrates multiple functional areas and provide visibility into processes. It gives a new perspective on how the integration process operates. With this approach management can unify its view of its processes and enables control over those ERP practices that exist among the functional units (Gale, 2002).

Considering the vast difference between ERP requirements and existing management practices of most organizations, it is essential that ongoing measurement of its attributes become an important part of the ERP implementation process (Adam & O'Doherty, 2000). ERP requires a major change in business culture. Business as usual will be a historical artifact (Gale, 2002). ERP's added degree of complexity and change to the organization requires a culture shift within the organization. This cultural change should incorporate a mechanism for informing employees of their new roles and responsibilities, as well as how each individual's role is important to the new ERP environment. Change management from all levels of management is required (Gale, 2002). A lack of understanding on the part of employees as to why it is important to adhere to ERP system input requirements will ultimately lead to employees having poor information exchanges that promote shortcuts in their work effort, and subsequent ERP implementation disaster (O'Leary, 2002). These dysfunctional elements of the ERP system cause misuse and underutilization of important attributes thus, potentially resulting in poorer organizational performance.

In many instances companies wrongfully assume that ERP implementation is an information technology change when in reality it is a business organization change. Since the late 1990's, large companies including Whirlpool, Hershey's Foods, Waste Management Incorporated, and W. L. Gore and Associates have encountered vast difficulties with their efforts to implement ERP. Several of these companies experienced problems that nearly bankrupt the company (Wah, 2000). Throughout the decade of the 2000's, the failure rate for ERP implementation continues to be high. While research exists that identifies critical success factors for ERP implementation, there is a gap in the literature that exists for an overall assessment of the impact an organization's focus on change management has on success during ERP implementation. Even though many practitioners and scholars assume this to be true,

little if any research exists to validate this assumption. With this in mind, the research question of this paper is as follows:

Is a focus on change management required for the successful adoption and implementation of an ERP system?

The remainder of this research is in four sections. In the first section 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 the Literature Review. Section two covers the research methodology and design of the research employed in this study. This section 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. Section three presents the data obtained in the study and addresses the research question under study. Section four concludes the research with a discussion of the findings, conclusions gained from the study, and assumptions and/or limitations of the study.

## **II. LITERATURE REVIEW**

### **1. ERP IMPLEMENTATION CONSIDERATIONS**

One could view the implementation of an ERP system as either a transition from one technology system to another or a culture change or a paradigm shift that an organization needs to embrace. From a transition point of view, one observes a change from one state to another, while a paradigm shift is much more complex and comprehensive than a mere change. The paradigm shift idea represents a change from one set of interrelated assumptions to another. These interrelated assumptions form a conceptual framework for which an environment exists (Kuhn, 1962). Considering the importance and correlation of this issue to the success of ERP implementations, the study of change management becomes an integral part of ERP implementation.

Many organizations consider the implementation of ERP to be a transition from one technological platform to another (Markus, Axline, Petrie, & Tanis, 2000). While many organizations plan for the technological impact of an ERP implementation, they fail to consider the people and cultural impact that is associated with this transformation. Failure to consider the human resource management issues can lead to insufficient planning and coordination among functional areas (O'Leary, 2002). This will result in lower or no return on investment for the project. Since most ERP systems are large in scope, and require major change for the management personnel involved, we can predict that there will be an emergence of many risks associated

with human error and lack of allegiance to the new way of doing business (Ragowsky & Somers, 2002). ERP systems generally fail because of top management's lack of commitment, insufficient human resource training, and ineffective communication. All of these factors are people and cultural related issues that are determinants of successful implementation of an ERP system (Davis & Heineke, 2005). Moreover, an ERP system is most often implemented to invoke positive change in the composition of an organization. This effort requires integrated cross-functional support across the organization (Jones, Cline & Ryan, 2006). Therefore, a significant amount of focus on the change management process of ERP implementations should be devoted to people and culture related issues.

## **2. DEVELOPMENT OF AN ORGANIZATIONAL CHANGE MANAGEMENT STRATEGY**

The implementation of any ERP system poses many problems and obstacles. Some of the major challenges include a) an excessive functional approach rolled out without training personnel as to their role in the grand scheme of the ERP environment, b) inappropriate scope, c) lack of testing and use of non-proven processes, d) existence of data quality issues, e) unanticipated business results, f) fragile human capital, and g) lack of upper management support all have an impact on implementation of ERP. One example that has occurred in some companies is upper management's hasty decision to cut training budgets and user involvement. This circumstance creates a negative impact on ERP success (Markus et al., 2000) and is generally the opposite approach to what professionals recommend.

An often-overlooked aspect of ERP implementations is the effect that the new system will have on employees and other stakeholders. As mentioned previously, research confirms that ERP implementation teams are influenced by existing organizational culture (Jones et al., 2006). ERP systems introduce large-scale change that can cause resistance and confusion among employees. They can also produce redundancies and errors in processes if not managed effectively. This can negate many of the positive benefits of using ERP. Various ERP implementations fail to achieve expected benefits because companies underestimate the efforts involved in change management (Somers & Nelson, 2004).

An organizational change management strategy should be developed that will maximize productivity and customer satisfaction as a direct byproduct of ERP technology. The experience of Rolls Royce provides an example that validates this choice strategy for change management. In the Rolls case, they identified culture or people as a problem in their ERP implementation (Yusuf, Gunasekaran & Abthorpe, 2004). The technology systems worked perfectly well but the people issues created

obstacles to seamless transformation of the organization. The people problems have been repeatedly documented as the major cause of ERP implementation difficulties and failure (Davenport, 1998; Hsiuju & Chwen, 2004). Proper change management is an important attribute affecting people issues in all organizations.

Communication, planning, teamwork, and education are core functions that affect and are affected by the management of organizational change. They arise from peoples' different perspective about change management as it relates to an ERP implementation. The first attribute, communication is the most critical aspect of change management for an ERP implementation. It includes several components. Initially, there is a need for a clear understanding of strategic goals as they relate to the ERP implementation. Secondly their needs to be a clear understanding of implementation steps and their impact on workers at all levels (Umble, Haft & Umble, 2003). Third, it is necessary to present a clear understanding of new business processes and the new responsibilities these processes bring to employees. Finally, an understanding of measurements used for tracking implementation progress is essential (Somers & Nelson, 2004).

Both vertical (up and down the management chain) and horizontal (peer to peer) communication is imperative for a clear understanding of user roles and responsibilities required from 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, Sharma & Godla, 1999).

The second attribute for successful change management is appropriate planning. This is essential for a successful change management strategy to maximize ERP implementation productivity and customer satisfaction. Information Week identified poor planning 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 team (Mabert, Soni, & Venkataramanan, 2003). A well-trained cross-functional implementation team is imperative to successful planning (Umble et al., 2003). Teams with implementation and rollout experience fair better than those without the expertise.

The third attribute is user education and training. These components 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, Zammuto, & Aiman-Smith, 1999; Somers & Nelson, 2004). Training is most essential during the acceptance phase when employees are uncertain about the existing change (Somers & Nelson, 2004).

The fourth attribute is teamwork. This factor is a crucial change management practice 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 minimizing departmental boundaries, exposing hidden agendas, and delivering appropriate communication to all areas affected by change (Murray & Coffin, 2001).

Employee involvement in the decision-making process is a necessary ingredient. It makes goal attainment more realistic and achievable. It also provides a mechanism for measuring accountability at all levels of the organization. As previously mentioned, commitment and support by top management are additional people related issues associated with incorporating a change management strategy for ERP. 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).

### **3. THE REQUIRED CULTURE CHANGE OF ERP**

ERP is more than just a new software system; it's an organizational cultural change (Gale, 2002). A culture change of this type involves many interrelated factors that impact users of the system, employees and potential outcomes of implementation. One example of this inter-staff dynamic is helping employees understand that ERP systems usually require them to do more work or different administrative tasks that do not necessarily add obvious value to their individual jobs but do add value to the decision-making that occurs at a higher level in the organization. When there is a lack of understanding as to why it is important to adhere to ERP system input requirements, and why the information they are inputting is important, employees may find a way to work around or avoid performing the necessary tasks in the ERP environment. If not corrected this situation can ultimately lead to an 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, Newel, Scarbrough & Swan, 2000).

Besides change, we also find that patience and analysis are required of ERP implementations. Anticipated results can be slow and take longer than projected to achieve. According to an "ERP Trends" survey, while 24 percent of survey participants reported no decrease in productivity following implementation, 75 percent experienced a moderate to severe productivity decline among workers. One-fourth of the companies surveyed had decreases lasting up to one year while the majority of the participants reported decrease 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).

Culture change is expensive, especially for ERP implementations. 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).

#### **4. ATTRIBUTES FOR SUCCESS**

How does an organization determine if it is successful in its ERP implementation efforts? Quantitative operational objectives that are often sought after and met from ERP adoptions include: 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 productivity of 2%, 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 (ROI) 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. They want to measure whether proper quantitative success is achieved (Lutchen, 2004). With greater emphasis on ROI,

organizations can find increased financial success using their ERP investment dollars (Scherpenseel, 2003).

To generate return on investment, and value, companies are adding strategic applications on top of ERP to find value. These value-added applications, or “bolt-ons” as they are many times labeled, include solutions in customer-relationship management (CRM), supply-chain management (SCM), advanced planning and scheduling, strategic procurement, e-Commerce, and business intelligence (Stevens, 1999). Many organizations have found merit in expanding ERP efforts throughout their organizations. Demonstrated successful results of ERP implementations include:

- a) Reduction of planning cycle (95%)
- b) Reduction of delivery times (10 – 40%)
- c) Reduction of production times (10 – 50%)
- d) Lower stock levels (10 – 25%)
- e) Reduction of later deliveries (25 – 50%)
- f) Increase in productivity (2 – 5%)

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

## **5. SO WHAT ARE THE ERP CRITICAL SUCCESS FACTORS (CSF)**

An analysis of previous work on ERP issues provides some helpful insights into some of those critical success factors (CSF). We reviewed works for four leading authors on the topic. Table 1 summarizes ERP implementation critical success factors (CSFs) emphasizing factors that affect people, business, and technology issues.

The majority of organizations realize their employees are their greatest assets. Excellence in people management can add substantially to shareholder value in every aspect of their performance, including their reception and acceptance to change (Somers & Nelson, 2004). Employees represent the internal users of ERP and have a major role in ERP and business success (Kingsmill, Bishop, Smith, Brown, Kearns, Phelps, et al. 2005). Some of the CSFs that affect people include, a) change and expectation management (including user education and training), b) communication, c) cross functional ERP team composition and teamwork, d) evaluation of business performance, e) appropriate project champion, f) support of upper management, g) support of steering committee, h) knowledgeable implementation consultants, and i) establishing vendor / customer relationships (Kraemmerand, Møller & Boer, 2003; Laughlin, 1999; Nah, Zuckweiler, & Lee-Shang Lau, 2003; Somers & Nelson, 2004).

Understanding how to manage these issues is essential to successful implementation of ERP.

**TABLE 1**  
**CRITICAL SUCCESS FACTORS OF ERP IMPLEMENTATIONS BY**  
**SCHOLAR**

Group	Critical Success Factor	Nah <i>et al.</i> (2003)	Somers and Nelson (2004)	Laughlin (1999)	Kraemmerand <i>et al.</i> (2003)
Technology	Appropriate Business and 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 and Composition	X	X	X	X
Business	Monitoring and Evaluation of Performance	X			
People	Project Champion	X	X		
Business	Project Management	X	X	X	
Technology	Software Development, Testing, and	X			
People	Top Management Support and Involvement	X	X	X	X
People	Steering Committee		X		
People	Implementation Consultants		X		
Group	Critical Success Factor	Nah <i>et al.</i> (2003)	Somers and Nelson (2004)	Laughlin (1999)	Kraemmerand <i>et al.</i> (2003)
People	Vendor-Customer Partnership, Tools, and		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 final critical factor relating to people relates to the support of upper management. Continual support from upper management is cited as the most relevant factor in many studies to ERP implementation success. Many researchers and scholars cite support of upper management to be the single most important factor in predicting ERP success (Somers and Nelson, 2003). Public and explicit support for the ERP project should be a top priority of upper management (Laughlin, 1999). The presence

and approach of top management communication and leadership is of utmost important. Research has shown top management influence can lead subordinates from "...an individual oriented, self-indulgent, rational-economic mode of operation to a collective, moral and value-oriented mode of operation..." (Ke & Wei, 2008, p 216). Should this support and endorsement not be present from upper management and employee's resist to the change brought about by ERP, their support will alienate the project (Shanks, Parr, Hu, Corbitt, Thanasankit & Seddon, 2000).

Somers and Nelson (2003) consider the use of a steering committee to be an effective vehicle for 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) also present a comprehensive list of CSFs that include the importance of knowledgeable consultants. The role of consultants is important for setup, installation, and customization of ERP software systems (Somers & Nelson, 2004). Success of the ERP project is influenced 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).

Establishing solid relationships between the vendor and the organization implementing the ERP and the tools and support offered by the vendor are also fundamental to success. 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.

Change management is dynamic and difficult to manage. Successful management of change involves innovative mental, not physical work in an effort to educate numerous people on how to think strategically and critically (Duck, 1993). Since change management involves a vast array of variables, measurement of change management is practically impossible to quantify alone.

The vast amount of change necessary to implement ERP as well as the required management of such change suggests a focus on change management is essential for a successful ERP implementation. Nonetheless, a study of various elements of change management testing their presence and correlation to successful implementation is in

order to begin to close a gap in the literature. With these ideas about the importance of ERP and organization change management in mind, we can posit that:

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

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

In the subsequent section we will test and analyze these hypotheses.

### **III. RESEARCH METHODOLOGY AND DESIGN**

#### **1. DATA COLLECTION**

The study of this ERP concept was completed using empirical data. The survey includes questions that relate to the ERP critical success factors presented earlier. 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 survey instrument was made available via the Internet. Using SurveyMonkey an independent online survey organization the authors were able to sample a large cross section of organizations. The Americas SAP User's Group (ASUG) randomly selected SAP implementations, completed in the past 3 years, were the base for the sample in this study. All participants were notified by ASUG to inform them of the survey. Two follow-up notifications were also sent by ASUG to encourage participation in the survey. The initial contact from ASUG to the sample was 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.

An Appendix contains the survey questions used for the study and analysis of the research question.

#### **2. ASSUMPTIONS AND LIMITATIONS OF STUDY**

To establish a context for the analysis, various assumptions had to be made about the data. Listed below are eight assumptions that provide a very comprehensive

understanding of the issues that were considered when collecting and analyzing the data:

- a) The areas represented in the survey instrument were extracted from CSFs 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).
- b) The study included observations of implementations using SAP ERP software only and did not include other ERP software vendors.
- c) 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.
- d) The respondents honestly answered the survey.
- e) Data to corroborate the existence of a correlation between ERP success and successful ERP implementation attribute groups can be gathered through the survey instrument.
- f) Respondents of the survey had responsibility, as well as the appropriate proficiency for making decisions regarding ERP implementation, for their respective companies implementing ERP.
- g) 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.
- h) The survey instrument was dependent upon self-reported data as well as subjective opinions.

Having these assumptions, establishes a more realistic association between the data collection process, the analysis of the data and the ultimate findings.

#### **IV. ANALYSIS OF RESEARCH QUESTION**

The research question was analyzed based on the data received from the survey respondents. 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, version 14.0, 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.

## 1. ANALYSIS

The data from these attribute responses was examined and summarized. The analysis included of 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.

The survey of the 600 SAP user organizations resulted in a total of 239 responses, or 39.8% response rate (see Table 2). Sixty-six of these responses were not used because their implementations had occurred within the past year and fell outside the scope of the study. An additional forty-seven responses were not used due to incomplete survey responses. The final number of valid responses that were used totaled 126 representing a response rate of 21%. This response rate is within the acceptable level for e-mail surveys of this type (Prahalad & Hamel, 1990)

Table 2 illustrates the distribution of the respondents to the questionnaire.

**TABLE 2**  
**SURVEY RESPONSE RATE**

	<i>N/n</i>	Percent of sample	Percent 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.

## 2. RESULTS AND FINDINGS

The first step of this analysis 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, and responsibility of the respondent, industry in which the company participates, implementation status of ERP in the company, and ERP modules implemented.

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.

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.

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.

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.

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%).

The highest frequency for implementation teams was for the size of 20 members or more, 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.

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.

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.

The sampled 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 was very similar in implementation style used. There was less than a 3% overall deviation for each category to the total sample.

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).

### 3. SUCCESS VERSUS NO SUCCESS

The second step in the analysis focused on measuring the successful ERP implementations against unsuccessful. As previously shown in Table 2, 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. These nine criteria were based on "Attributes for Success" as summarized in the previous literature review. One additional attribute was added for realized expected return on investment as set by the organization implementing ERP. This attribute was added due to the fact some organizations may set their target ROI lower than the suggested 5% due to financial structure of their organization and industry. Respondents indicating the presence of one or 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:

- a) Realized expected Return on investment
- b) Realized ROI > 5%
- c) Increased productivity => 2%
- d) Reduced operational cost by 5%
- e) Experienced reduction in scheduling and planning cycle > 50%
- f) Experienced reduction in delivery times => 10%
- g) Realized reduction in production time => 10%
- h) Reduced inventory stock => 10%
- i) Reduced late deliveries => 25%

As shown in Table 2 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.

Tables 3 and 4 show the frequency of focus on change management attributes for no success versus successful 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 3**  
**FREQUENCY OF NO SUCCESS CHANGE MANAGEMENT FOCUS**  
**ATTRIBUTES**

	<u>Yes</u>		<u>Somewhat</u>		<u>No</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Top management support	23	37	29	47	10	16
End user involved in implementation	28	45	29	47	5	8
Organization prepared to manage change	14	23	30	48	18	29
Effective user training	16	26	35	56	11	18
Project team diverse and represented major areas	39	63	19	31	4	6
Employees informed of project during and prior to implementation	35	56	24	39	3	5
Resources dedicated to project as needed	35	56	18	29	9	14
Focus dedicated to resolution of issues during project	38	61	19	31	5	8
Implementation adequately staffed	24	39	22	35	16	26
Implementation adequately funded	41	66	16	26	5	8
Prepared for internal employees' reactions to implementation	15	24	33	53	14	23
Prepared for supplier / customer's reaction to implementation	18	29	33	53	11	18
Employee morale positively changed by ERP implementation	7	11	23	37	32	52

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 5 shows the results of the Spearman Rank Correlation.

**TABLE 4**  
**FREQUENCY OF SUCCESS CHANGE MANAGEMENT FOCUS**  
**ATTRIBUTES**

	<u>Yes</u>		<u>Somewhat</u>		<u>No</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Top management support	56	87	8	12	0	0
End user involved in implementation	44	69	18	28	2	3
Organization prepared to manage change	25	39	30	47	9	14
Effective user training	31	48	28	44	5	8
Project team diverse and represented major areas	54	84	10	16	0	0
Employees informed of project during and prior to implementation	50	78	14	22	0	0
Resources dedicated to project as needed	47	73	15	23	2	3
Focus dedicated to resolution of issues during project	46	72	17	27	1	2
Implementation adequately staffed	42	66	18	28	4	6
Implementation adequately funded	51	80	11	17	2	3
Prepared for internal employees' reactions to implementation	25	39	31	48	8	12
Prepared for supplier / customer's reaction to implementation	36	56	19	30	9	14
Employee morale positively changed by ERP implementation	13	20	36	56	15	23

The Spearman Correlation shows eight of the thirteen focus attributes indicate a correlation exists between the attribute and a successful ERP implementation, and two of the remaining five attributes report values less than or equal to .017 which are extremely close to full correlation. The eight focus attributes showing correlation are, a) End user involved in implementation, b) Organization prepared to manage change, c) Project team diverse and represent major areas, d) Employees informed of project during and prior to implementation, e) Resources dedicated to project as needed, f) Implementation adequately staffed, g) Prepared for supplier / customer's reaction to implementation, and h) Employee morale positively changed by ERP implementation.

**TABLE 5**  
**SPEARMAN’S RANK CORRELATION FOR FOCUS ON CHANGE**  
**MANAGEMENT**

	Correlation Coefficient	P-Value
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
P-values are from a two-tailed test of the null that the correlation is zero.		

While all 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 6. The Kruskal-Wallis test for significance shows seven of the thirteen attributes have asymptotic significance 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 KruskalWallis 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 6**  
**KRUSKAL-WALLIS TEST FOR CHANGE MANAGEMENT ATTRIBUTES**

	Asymptotic Significance	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
Organization 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 represent 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 / customer's 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
P-values are from a two-tailed test of the null that the correlation is zero.				

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 variables also supported correlation. 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.

## **V. DISCUSSION**

### **1. SUMMARY OF THE FINDINGS**

The findings in this study provide an interesting perspective on how companies implement ERP. As we stated previously our purpose was to answer the research question:

Is a focus on change management required for the successful adoption and implementation of an ERP system?

As previously stated, the null hypothesis was rejected due to the results of the Spearman Correlation Rank, Kuskal-Wallis Test, and frequency analysis which all showed favorable results for correlation between successful ERP implementations and focus on change management.

The analysis presented in this study revealed 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 to test for correlation of the attributes to successful implementations. The Spearman Rank Correlation showed a correlation existed for 8 of 13 attributes, which supports 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 employee's 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. Second, 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 31% 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, employees could construe the Plunge method 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.

## 2. CONCLUSIONS

The purpose of this study was to understand the relationship between successful ERP implementation and organizational change during implementation. Based on the findings of this research, the following conclusions were formulated in regard to ERP implementations using SAP:

When implementing ERP systems, a focus on change management within the organizations as well as outside of the organization, is significantly related to a successful ERP implementation. The research shows 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 from the following: 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.

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. Top management support, end user involvement, the presence of effective training, the presence of a project team well represented from major organizational areas were all significant change management related findings in successful implementations. Further, appropriate and continuous communications to internal and external stakeholders as well as appropriate funding from upper management were present. These conclusions lead us to develop practical recommendations for management action.

### **3. MANAGERIAL IMPLICATIONS**

The intent of this research was to identify whether a correlation exists between successful implementation of ERP and the presence and / or absence of focus on change management. Based on the conclusions and findings, the researchers suggest the following recommendations to organizations implementing SAP ERP:

- a) Organizations should 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.
- b) Organizations should consider all critical success factors, success attributes, and groups of success attributes when planning for ERP implementations.
- c) Organizations should 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.
- d) Organizations top management should 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.
- e) Organizations should educate users, management, suppliers, and customers that while ERP does incorporate an adoption of new

technology and focuses to some degree on an information system-based approach, a focus on change management is much more critical to success, than focusing on the change in technology.

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## **APPENDIX – SURVEY QUESTIONS**

Survey questions used to analyze the topic of this study 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?

These survey questions incorporate the critical success factors previously identified by Nah, et al. (2003), Somers and Nelson (2004), Laughlin (1999) and Kraemmerand et al. (2003) as well as Gale (2002), O'Leary (2002), Markus, et al. (2000), Davis & Heineke (2005), Umble et al. (2003). Bingi et al. (1999), Mabert et al. (2003), Griffith et al. (1999), and Murray & Coffin (2001).