1-2003

Analyzing ERP implementation at a public university using the innovation strategy model

Keng SIAU
Singapore Management University, klsiau@smu.edu.sg

J. MESSERSMITH

INTERNATIONAL JOURNAL OF HUMAN–COMPUTER INTERACTION, *16*(1), 57–80

Analyzing ERP Implementation at a Public University Using the Innovation Strategy Model

Keng Siau
Jake Messersmith
Department of Management
University of Nebraska–Lincoln

Enterprise Resource Planning (ERP) systems have revolutionized the way companies are using information technology in their businesses. ERP was created in an effort to streamline business processes and has proven to be successful in many operations. Unfortunately, not all ERP implementations have met expectations. One way that businesses may be able to increase success rates is to embrace creativity and innovation in their ERP implementations. For businesses to do this, they must first understand how creativity originates and how that creativity can be integrated into business solutions. This article presents a case study that examines the ERP implementation at a public university and analyzes the applicability of the Innovation Strategy Model on public sector organizations.

1. INTRODUCTION

Since the end of World War II, technology-based innovations have been advancing in rapid succession. They have been seen as the crucial source of societal prosperity, as well as the universal remedy for all business problems (Burgleman & Maidique, 1988). In fact, technology today is speeding up the pace of daily operations, forcing organizations to keep their information accurate and available in real time. These market demands have given birth to Enterprise Resource Planning (ERP) systems (Lee, Siau, & Hong, 2003). The idea behind ERP software is to integrate business functions into one networked database. One of the key selling points of ERP systems is that they offer integration across the entire business, including Human Resources, Accounting, Manufacturing, Materials Management, and all other business modules (Davenport, 1998). This integration means streamlined processes, better customer service and, in turn, added value to the company. Unfortunately, many ERP systems have not lived up to their promises (Siau & Messersmith, 2002). One factor leading to the disenchantment of many corporations that have attempted to imple-

Requests for reprints should be sent to Keng Siau, University of Nebraska–Lincoln, NE 68588–0491. E-mail: ksiau@unl.edu

ment ERP is the problem of "best business practice" standards. These have caused confusion in organizations, because everyone's opinion of best practice varies significantly from one person or organization to the next, thus best practice is different in each organization. This problem is further complicated by the fact that Enterprise Systems are generally designed to match the norms, rules, and regulations that the package developers generally interact with. Additionally, this causes greater confusion for public sector organizations because most ERP packages were originally established for use within private sector businesses. Therefore, the current challenge for ERP implementers within the public sector is to train end users to be more creative as they implement systems to gain the desired effects. Information Technology (IT) professionals have recognized this difficulty and consistently rank "creativity and innovation" as critical issues facing IT management (Niederman, Brancheau, & Wetherbe, 1991; Siau, 1995, 1996, 1999, 2000; Zawacki, 1993).

Creativity and innovation have many different meanings. These vary from a relatively simple definition like an "effective surprise" to Freud's more complicated definition, "a means of expressing inner conflict that otherwise would issue in neuroses, … a mental purgative that keeps men sane" (Couger, 1996, p. 4). All of the possible definitions of innovation are valid, but the most important element of creativity to the business organization is that it is a tangible product, just like any other good or service. A more formal definition would then define creativity as, "the production of novel and useful ideas by an individual or small group of individuals working together" (Amabile, 1988, p 126). In addition to this, the product of creativity must provide utility to the company producing the idea. Thus, by defining *creativity* as a product, the implication is that creativity is the result of a specific process aimed at the attainment of a final goal. Therefore, for the purposes of this study, *innovation* is defined as the development, acceptance, and implementation of new ideas or processes that add utility or value to the organization (Couger, 1996; Kanter, 1983; van de Ven, 1986).

This research focuses on end users of ERP systems, which is a relatively new area of research that needs to be further explored. In the past, the primary focus of researchers has been on enhancing the innovative capabilities of information systems professionals (e.g., Couger, 1996; Couger, Higgins, & McIntyre, 1993) rather than on the actual users of the system. Also, the research conducted herein looks at the emerging public sector—because much of the private business sector has become saturated with ERP systems, prompting ERP vendors to direct their attention to public institutions. In this study, a public institution is defined as being a nonprofit organization that is funded primarily by the government. Specifically, this research involves a case study on the SAP implementation at a large public university system in the midwestern United States. The public university system consists of four large campuses in three different cities of the state.

2. LITERATURE REVIEW

The true end user of most ERP systems is commonly considered to be a passive participant. This reactive role can lead to turbulence within the organization, espe-

cially considering that end users represent a mostly untapped source of creativity, and may offer considerable promise for the initiation of IT innovation (e.g., Hippel, 1994). Therefore, it is important to integrate end users into the implementation process. This requires organizations to be more innovative about the ways in which they implement new technologies and train end users. At the outset, the integration of innovation into business processes may seem more burdensome than helpful; however, creativity has been proven to enhance the performance of businesses (Bernacki, 2000). In addition to the higher performance attained by creative organizations, the study by Bernacki also found a correlation between financial returns and innovation. In fact, the study found that those major companies that had a rate of turning over new products and services of 80%, at least doubled their market capitalization over a 5-year period (Bernacki, 2000). Success rates like these are important for organizations implementing ERP software because more often than not, expected returns on investment have only achieved marks of 25 to 50% (Langenwalter, 2000).

These numbers lend a great deal of support to utilizing innovation in the implementation of ERP systems, because of the success found in updating business processes and the financial returns that may be achieved. For businesses to reap the rewards of including innovation in their implementations, they must first understand that implementations are also people projects, not merely technical projects. Successful implementations require that people change (Langenwalter, 2000) and it is the role of organizational management to facilitate, encourage, and reward that change. For managers to most effectively do this they must understand how creativity is developed and fostered in individuals and groups.

2.1. Creativity Origination

In the past, creativity has been viewed as a personality trait that only certain people are born with. Creativity must instead be viewed as a tangible product used to develop breakthrough solutions and products to meet ever changing business demands (Folan, 1999). According to several studies, individual creativity is a complex combination of many different elements. A few of the characteristics that have been linked to individual creative development are knowledge, personality, locus of control, intrinsic motivation, self-esteem, self-motivation, risk-orientation, and behavior in a given situation (Amabile, 1988; Woodman, Sawyer, & Griffen, 1993). Generally, the higher individuals rank in these categories, the more creative they are likely to be. Therefore, understanding these characteristics prior to ERP implementation is essential, so that projects can be organized in a way that will maximize creative output. Individual creativity only tells part of the story, however, because creativity and innovation must also be understood on a group level. The group dynamic is especially important to implementing ERP systems because most development and implementation is done by teams.

Amabile (1988) showed that freedom, good project management, sufficient amounts of resources, encouragement, and recognition benefit group creativity. The study done by Woodman et al. (1993) echoed these results by showing that

group creativity is not simply a sum of individual creativity, but is rather a function of individual autonomy, group diversity, group cohesiveness, group size, as well as the problem-solving strategies and social information processes of the group. An additional study by Cooper (2000) reinforced the Woodman et al. (1993) model by showing the effects that group task, group norms, group diversity, and group problem solving have on the innovative capabilities of an organization.

Cooper (2000) summarized that group tasks could benefit IT innovation by forcing groups to develop clear goals, along with allowing a degree of uncertainty to exist in relation to how exactly those goals might be reached. This uncertainty is important because too many formal extrinsic constraints often hinder the creative capabilities of individuals (Amabile, 1988). Cooper also showed that group norms could benefit creative IT requirements by fostering a degree of certainty regarding roles and responsibilities, as well as fostering a group environment conducive to cooperation and trust. Cooper went on to explain that group diversity could benefit IT change by mixing different functional backgrounds together within the group. It can also be useful to combine the collective nonwork experiences of team members, including such things as culture, education, and leisure time pursuits. All of the factors of individual creativity that were discussed earlier are important for ERP implementers to understand, because many times the biggest roadblock to implementation success is the unwillingness of people to change. Therefore, to enhance implementation success, understanding the factors that influence individual and group creativity is essential.

2.2. Creativity Enhancement

As the earlier studies have analyzed, organizational creativity is a complex function of individual and group creativity. Several studies have been published about the manner in which creativity may be enhanced in organizations. One such study done by Rubenson and Runco (1992) identified creativity in economic terms of supply and demand. They began their research by stating that each individual has a certain amount of human capital, which is comprised of an individual's knowledge, skills, education, and creative potential. Rubenson and Runco determined that individuals could choose to invest in any of the areas of human capital, and each unit of investment incurs a certain marginal cost to the individual. This marginal cost is, of course, offset by some marginal benefit, which may include extrinsic rewards, such as pay increases or promotions, or intrinsic rewards, such as job satisfaction or personal sense of accomplishment. Their study states that individuals may choose to invest in their creative potential just as they may choose to invest in formal education, by first carefully measuring the psychological, emotional, and time costs against the benefits of increased creative potential. Rubenson and Runco concluded that many organizations in society had misallocated the resources needed to direct and invest in the creation of units of creativity. They showed that creativity was often hampered because creative development was not nearly as often rewarded as formal education, causing fewer employees to make investments in creative potential.

By using the Rubenson and Runco (1992) study, it can be derived that creativity may be enhanced in organizations by ensuring that the marginal benefit of increasing individual or group creative potential is greater than the opportunity costs associated with that investment. Therefore, it is important to analyze the elements of both extrinsic and intrinsic motivations that may be utilized to enhance creative potential.

Much literature has been published about the importance of having motivated individuals in the workplace. But motivating to improve job performance in most cases is very different than motivating individuals to improve their creative capabilities. In fact, many of the types of ideas that aim to increase employee motivation may decrease individual creativity. Findings show that performance on algorithmic tasks is increased by extrinsic motivation, whereas performance on creative tasks is adversely affected by extrinsic motivation (Amabile, 1996; McGraw, 1978). These findings are echoed by Cooper (2000), who stated that traditional IT development had generally encouraged extrinsic rewards, such as performance bonuses, but creativity theory revealed that such rewards could have a negative impact on creative development. This viewpoint shows that extrinsic rewards (e.g., pay increases, benefits, and promotions) are not a negative influence on organizational behavior; however, they do not necessarily lead to improved creative performance. Intrinsic motivation has, therefore, been shown to be much more effective in enhancing creative potential.

According to Amabile (1996), intrinsic motivation is a primary mechanism of individual creativity. Therefore, for creative development to increase in organizations, the intrinsic motivation of individuals must increase. This is quite obviously a difficult proposition because the very nature of intrinsic motivation implies that it must come from within. Cooper (2000) offered the following solution to remedy this problem: He showed that intrinsic motivation could be fostered by providing individuals with tasks that provide for increased autonomy, provide an opportunity for professional growth, and are perceived as enjoyable by group members. Cooper's suggestion of giving individuals tasks that would lead to intrinsic motivation offers one solution to creativity development in organizations; however, another important factor that must be included in the equation is an organizational environment that is conducive to creative development. As Amabile (1996) stated, "intrinsic motivation can be significantly affected by the social environment" (p. 17). The study by Rubenson and Runco (1992) agreed with these findings by showing that investments in creative potential occur at a higher rate among individuals who function in an environment where creativity is valued and rewarded. This latest statement offers an apparent contradiction to previous research, as findings by Hennessey and Amabile (1987), Amabile (1996), McGraw (1978), and Cooper (2000) indicated that extrinsic rewards might hamper individual creativity, whereas the findings of Rubenson and Runco (1992), Torrance (1965), and Harrington (1981) found that explicit rewards may lead to increases in individual creativity. This contradiction suggests that a balance must occur, in which organizations promote intrinsic values while still providing an environment where those intrinsic rewards are valued and encouraged, not stifled.

It is essential that organizations create an environment for their employees in which creativity is valued. In fact, successful IT reengineering requires an environ-

ment that can foster creativity (Amabile, Conti, Coon, Lazenby, & Heron, 1996; Cooper, 2000). Khalil (1996) offered four major components to create such an environment. The first important element identified by Khalil is to create an environment where employees are motivated intrinsically, which is in agreement with the discoveries of Amabile (1988, 1996), Woodman et al. (1993), Cooper (2000), and Rubenson and Runco (1992). The second factor listed is giving employees access to relevant information, which allows employees to submerse themselves into appropriate data and information. This feeds into the element of individual knowledge, which has generally been positively correlated with creative outcomes. Individual knowledge, and specifically a degree of IT knowledge, is important for creative development because this knowledge allows employees to develop and apply context-specific ideas within the organizational environment (Cooper, 2000). This requires adequate training and information to be given to end users and ERP implementers so that appropriate innovative thinking can occur. The third component is to allow individuals to search their personal experiences by giving employees things that will remind them of past successes and to stimulate their thinking. This is in accordance with the discoveries of Folan (1999), who identified practice as an essential ingredient to creativity enhancement. The fourth ingredient is transferring problem-solving experience. This allows workers to use past experiences to develop analogies that may work as solutions. These four factors are important for both creativity enhancement and ERP implementation because providing this type of environment will stimulate creative thought and allow employees to drive changes.

Echoing Khalil's (1996) findings is Amabile (1988), who chose to focus on not only the environment that individuals work in, but also the fostering of individual characteristics that are conducive to innovation. As Amabile (1988) stated in her article,

> If people perceive that they are working in an environment where project goals are clear, challenging, and personally interesting, where they are given autonomy in deciding how to achieve project goals, where their new ideas are met with encouragement and enthusiasm, where they are not burdened with impossible project schedules or resource limitations, where others in the organization willingly cooperate in achieving project goals, where their best efforts will be recognized, rewarded, and above all, where creativity is valued, they will work with high levels of intrinsic motivation, and they will produce creative ideas. (p. 161)

The ideas represented in this statement are vital to ERP implementation. Resource allocation is an important part of ensuring implementation success. A lack of resources hinder the project by overloading employees and causing unneeded stress. On the other hand, the allocation of a proper amount of resources gives employees a sense of top-management commitment, which works to push employees toward supporting the systems change. The findings of Khalil (1996), Amabile (1988), and Folan (1999) are shown in Table 1.

To capture creativity and use it most effectively managers must first understand all of the aforementioned factors and match individual and organizational resources with the factors that induce creative outcomes. This involves understand-

Table 1: Creative Enhancers and Constraints

Qualities Linked to Creativity Enhancement		*Qualities linked to Creativity Constraint*	
Individual characteristics	*Organizational characteristics*	*Individual characteristics*	*Organizational characteristics*
Persistence	Freedom	Lack of motivation	Inappropriate reward systems
Curiosity	Good project management	Lack of skill	Inadequate resources
Energy	Sufficient resources	Inability to be flexible	Excessive red tape
Intellectual honesty	Encouragement	Lack of intrinsic motivation	Lack of freedom
Self-motivation	Recognition	Inability to work well in a group	Organizational disinterest
High degree of risk orientation	Group diversity	External locus of control	Poor project management
Expertise in the given area	Group cohesiveness	Low degree of risk orientation	Inappropriate feedback
Autonomy	Properly allocated resources		Insufficient feedback
Internal locus of control	Practice		Time pressure
Intrinsic motivation	Time		Task restraints

ing not only the external factors that promote creativity, but also the environmental and business distractions that hinder creative output. One method of doing this is to allow organizations to take a snapshot of their current creative capabilities, by using the Innovation Strategy Model.

3. THEORETICAL FOUNDATION

The theoretical framework proposed by Woodman et al. (1993), which is alluded to in the literature review, comes from an interactionist perspective and shows that a creative outcome is measured by combining individual, group, and organizational creativity. The framework is based on previous research by Woodman and Schoenfeldt (1989, 1990), who propose a model of creative behavior on the individual level. This model seeks to combine the complex elements of individual creativity by providing an integrated framework. The study by Woodman et al. (1993) extended this study to include group and organizational influences on creative development.

The new theoretical model describes individual creativity as a measure of antecedent conditions (past reinforcement history and biographical variables), knowledge, intrinsic motivation, personality, cognitive abilities (divergent thinking and ideational fluency), social influences, and contextual influences. Individual creativity then results in creative behavior, which acts as an input into group creativity. The model shows that creativity is further influenced by the interaction of other

individuals as a combination of group composition, group characteristics (norms, size, and degree of cohesiveness), and group processes (problem-solving techniques). Flowing out of the function of group creativity is the modified creative behavior, which is further influenced by the organization and the environmental contexts, ultimately leading to a creative outcome on an organizational level. In addition to the complex interaction of individual, group, and organizational entities, the model further shows feedback loops, which attempt to show the effects of the consequences of behavior on the individuals and groups in an ever changing environment. The theory is depicted graphically in Figure 1.

As the aforementioned model indicates, organizational creativity is a complex function of individual and group creativity, as well as the external environment, contextual influences, antecedent conditions, and social influences. The aforementioned model has been extended into a systems model, which pertains specifically to ERP implementations. The model is shown in Figure 2.

The figure shows that the complex factors of individual, group, and organizational creativity have a definite impact on the creative process and creative situation, which in turn leads to a creative product within the organization (Woodman et al., 1993). This theory is important to ERP implementation because it shows the complex interactions that must be present for a creative outcome to occur. Organizational creativity is especially difficult and important to understand within the context of public institutions because the overall goal of the business is different from its private-sector counterparts. This shows the importance of the environmental and motivational factors of the Woodman et al. (1993) model. Although the environment of public institutions is significantly different from that of private-sector organizations, it still has a significant impact on the overall creative outcome. Therefore, for organizations to receive a creative outcome in their implemen-

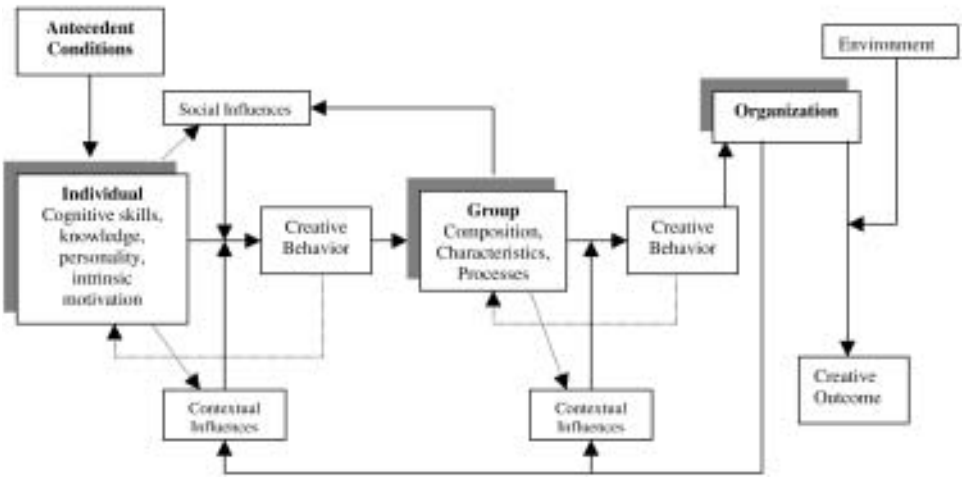

FIGURE 1 Woodman, Sawyer, and Griffen (1993) interactionist model of organizational creativity.

tations, the different factors of individual, group, and organizational creativity must be understood and enhanced. This is where the Innovation Strategy Model comes into play, as it measures the creative outcome by taking a creative snapshot, based on organizational, individual, and group characteristics.

4. THE INNOVATION STRATEGY MODEL

The Innovation Strategy Model (Amidon, 1997) is a systematic framework used to analyze the capabilities of an organization to create and implement new ideas. The Innovation Strategy Model is important for measuring innovation in ERP implementations because it analyzes the different factors that result in creative outcomes. The model has two segments: the first measures internal management re-

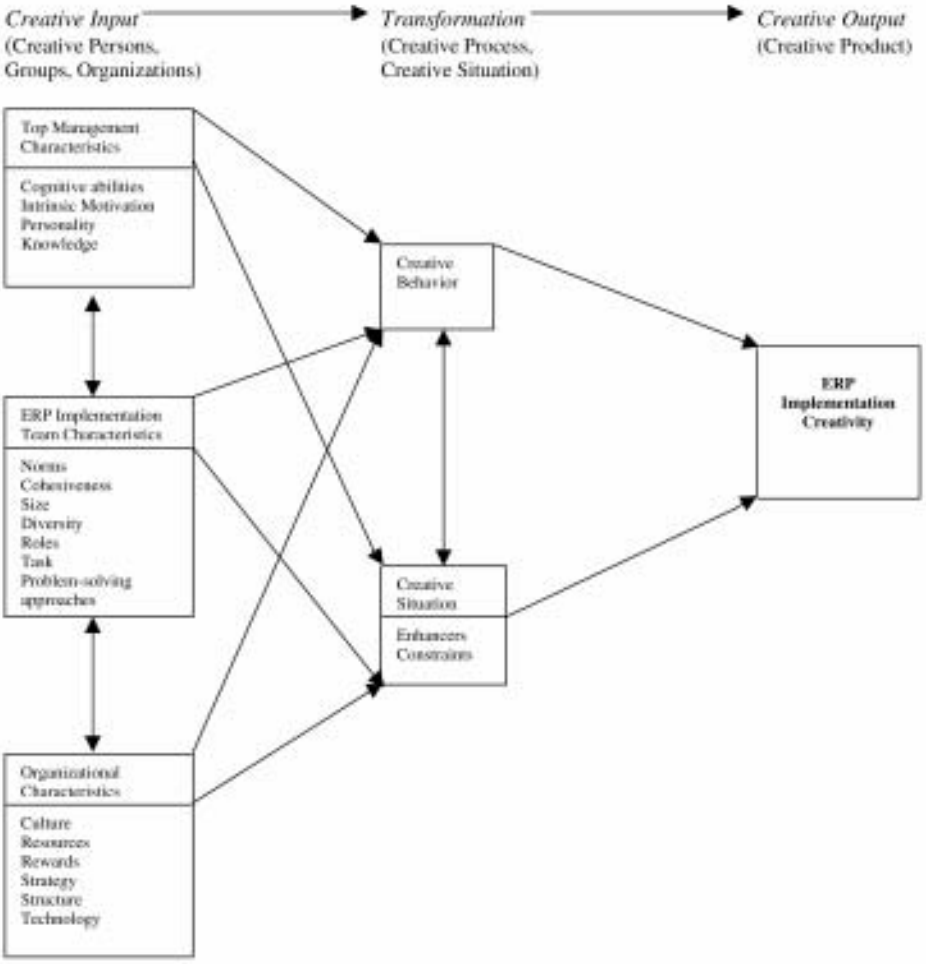

FIGURE 2 Theoretical framework for innovation enhancement in ERP implementations.

sponsibilities and the second measures external organizational interfaces. The model is then broken down into 10 primary factors that analyze the innovation capability of an organization—half of the factors addresses Internal Management Responsibilities and the other half addresses External Organizational Interfaces. The 10 factors are listed and described following:

Internal Management Responsibilities:

1. Collaborative Process—Evaluates the appointment of the primary contact person, who has cross-organizational leadership. This factor also measures the amount of collaboration that exists between the various stakeholders.
2. Performance Measures—Evaluates what methods are in place to measure performance.
3. Education and Development—Examines how extensive the education and training facilities are.
4. Distributed Learning Network—Measures how well the organization gives all stakeholders the opportunity to participate in the innovation process with local collaboration on issues, business opportunities, and products/services of mutual benefit.
5. Intelligence Market Positioning—Analyzes the business' ability to systematically glean information and forward the results to those who need to know.

External Organizational Interfaces:

6. Knowledge Products and Services—Measures an organization's ability to produce products, software tools, and consulting services that support the value-adding process of applying new ideas efficiently and effectively.
7. Collaborative Market Penetration—Refers to the measurement of managing external organization partner interactions for both learning and economic value.
8. Market Image Campaign—Measures how effectively the organizations' marketing message supports their culture and competencies.
9. Leadership Competencies—Measures an organization's competency and capability at leadership.
10. Communications Technology—Evaluates how well an organization understands and utilizes current technologies.

The aforementioned factors can be linked to the theoretical foundation by measuring certain organizational characteristics that both inhibit and enhance creative behavior. For instance, the distributed learning network, the collaborative process, and education and development measure the amount of knowledge given to employees as well as feedback received from them in the creative process. This is linked to the individual knowledge factor in the theoretical model. Also, performance measures can be used to review the current motivational factors in the organization (items such as bonuses and intrinsic rewards that may be received from the organization). In addition to these linkages, communications technology can also be linked back to the technology factor (a component of organizational creativ-

ity) and the model can be used to measure how well organizations take advantage of their technical capabilities. When these competencies and the other factors are aligned with the critical success factors of an ERP implementation, they provide insight for managers to properly gauge the current innovative capabilities of the organization against the optimal goals for success.

5. RESEARCH MODEL

The Innovation Strategy Model was utilized as the research model for this study. The data collection sites for the case study are the four campuses of a large midwestern university system in the United States. The university system, which consists of four campuses, implemented SAP/R3 system to support the administrative functions. A survey on the outcome of the ERP implementation at the midwestern university was carried out by Nah, Teh, and Beethe (2001). The survey revealed that the majority (68%) of the respondents felt that the SAP system was useful to their job and helped them in doing their job better. Also, the majority (56%) of the survey respondents agreed that the SAP system is easy to use. As for the question on Perceived System Success, the survey showed that "a strong majority of respondents felt the overall SAP implementation was a success" (Nah et al., 2001, p. 14).

The current research looks at the innovative capabilities of the university and their impact on the outcome of the ERP implementation. The study involves 25 present or past employees. Most of the participants are from a variety of different business units across all four of the university's campuses and were closely involved with the implementation of SAP at the university. The interview process involved the interviewer explaining the definition of innovation being used for the study. Next, the participants were asked two sets of questions. The first set of questions was designed to gauge the respondents' overall view of how innovation was included in the implementation of SAP at the university and the second set of questions was designed on the aforementioned Innovation Strategy Model. The questions were then coded based on the Innovation Strategy Model. The respondents were asked to rank their respective business units on the 10 factors in the model and the interviewer later analyzed these data and calculated the composite averages of the respondents' rankings. The interviewer also reviewed the responses to the other questions and assigned qualitative measures.

6. RESULTS AND ANALYSIS

The quantitative results show that the university ranks between 5 and 8 on all 10 of the factors on a scale ranging from 1 (*poor*) to 9 (*outstanding*), indicating that the employees at the university feel innovation is moderately included in both everyday business and throughout the implementation of SAP. The results are shown in Table 2.

The results indicate that five of the factors ranked fairly high in the rating system, whereas the other five were ranked as average. The factors that rated highest

were: collaborative process, communications technology, education and development, intelligence market positioning, and market image campaign. The factors that ranked lowest were: collaborative market penetration, performance measures, leadership competencies, distributed learning network, and knowledge products and services. Of these lower ranked factors, performance measures ranked significantly lower than any other factor. This is especially interesting because motivation and feedback are cited as important element for organizational creativity (Woodman et al., 1993). The results can be further broken down into a discussion of the individual components as related to their overall score among the rest of the factors.

6.1. High Ranking Factors

Communications technology. This factor scored higher than any of the other nine factors, having an average of 7.4. Basically, this means that the participants felt that their business units were aware of current advancements in technology and felt that for the most part that they were able to utilize those advances to make their business processes more effective. Illustrating this confidence is the fact that 23 of the 25 respondents felt that their business units were aware of the current advancements in technology. As one participant stated, "our business unit is definitely aware of advancements in technology, and is somewhat willing to capitalize on new technologies, but at the same time we are fairly cautious." This sentiment was echoed by another employee who stated that, "We are definitely aware of new technology, yes, but the flexibility is hampered a little bit by a fear of technology and whether or not technological advances will really add value to what the business unit is doing." Also, related to the communications technology factor is the fact that 24 of the 25 individuals interviewed felt that the SAP system was being used as an enabler to business processes rather than being an end in itself.

Another reason why this factor rated higher than the others is because many of the participants in the study felt that the university is utilizing technology to define

Table 2: Averages of Participant Responses

Factors	*Average*	*Range*	*# of N/A*
Internal management responsibilities			
Collaborative process	7.3	2–9	0
Performance measures	5.6	2–8	2
Education and development	7.0	3–9	0
Distributed learning network	6.3	4–9	0
Intelligence market positioning	7.2	4–9	0
External organizational interfaces			
Knowledge products and services	6.4	4–8.5	2
Collaborative market penetration	6.1	1.5–8	9
Market image campaign	7.1	4–9	1
Communications technology	7.4	4–9	0
Leadership competency	6.8	4–9	1

roles and develop career paths in an effort to motivate optimal innovation. As stated by one of the respondents,

> All of the information for roles and career paths are on-line because we have a big focus on TQM [total quality management], which means that all of our teams are responsible for treating customers well and meeting expectations as efficiently as possible.

The collaborative process. This factor scored second highest among the participants in the study, thus showing an underlying feeling that the different business units, as well as the university as a whole, work well together. This also shows that the participants in the SAP project felt that the implementation was a collaborative venture and was not top-down and hierarchically driven. This is supported by the fact that 20 of the 25 respondents acknowledged that the implementation was at least partially a collaborative venture. As one interviewee stated, "The way that the different teams were set up, with individuals from all campuses, and from different business units, it really caused the implementation to be a mostly collaborative venture." Another interviewee replied by saying, "the implementation was definitely a collaborative venture; it was very much a bottom-up procedure because buy-in was so important." The high ranking of the collaborative process also demonstrates that most of the participants feel as though their business unit has a clearly defined definition of success. As one participant stated, "Yes, I believe that the definition of success was established because there were certain goals that were set up for the implementation, and all of the goals for our unit were reached." Another participant stated that, "basically, success was determined by whether or not we met the go-live date, which we did, so in that way the strategy was aligned accordingly." This answer was common, as many of the individuals involved with the implementation of SAP saw going live as the most important goal. Another participant said, "success was defined as the ability to go live, so in that way the strategy was certainly aligned accordingly."

Intelligence market positioning. This factor received an average of 7.2 out of 9. This shows that most of the individuals that were interviewed felt that their business unit was doing a good job of capturing signals from other business units, as well as knowing their role within the university. Other components that went into this ranking included how wide of a vision the business units themselves had, as well as how well business units prioritized new ideas. A total of 21 out of 25 participants felt that their business unit had a wide enough vision to capture signals from other business units. As one participant stated, "the vision of our department is very wide because the management team does a great deal of external networking to see and hear what other departments are doing." Also included in this factor is a general feeling among those interviewed that their business units have techniques for prioritizing new opportunities in the context of the business unit's strategy. In fact, 22 out of the 25 participants felt that their business units were able to adequately develop techniques to prioritize new ideas in the context of the busi-

ness unit's strategy. One participant stated, "The business unit is definitely open to new ideas, and those are certainly prioritized." Another participant stated that "prioritization is extremely important, and our needs are always prioritized." Yet another participant said, "prioritization is an ongoing thing, in which flexibility is very important."

Market image campaign. This factor received a ranking of 7.1. This higher-than-average ranking shows that most of the participants felt that their business unit's image had uniqueness in the university and that the culture of the business unit supported that. Breaking these components down further reveals that 22 of the 25 respondents felt that their business unit's culture supported the overall image of the business unit. Also, 20 of the individuals felt that their business unit had a unique image within the university. As one participant in the study stated, "Yes and yes, we definitely have uniqueness within the university and our culture certainly supports our image messages; we are always making efforts to promote the efforts of our team within the institution." As another participant stated, "Yes, I believe our advertising position has uniqueness in the university, for a large part our advertising position is very different." Yet another participant echoed these feelings by stating, "Yes, the image of our business unit is very unique, and we are very public and proactive about promoting our image."

One reason that this factor did not rate higher is the fact that many of the business units did not feel that they have any type of real advertising position. As one of the respondents stated, "Our image campaign is somewhat multifaceted, but we really don't have any type of formal campaign; however, there are always ways in which our image is created." Although another participant stated, "We really don't have any type of advertising position." Another interviewee responded, "We don't really have an image campaign, but we definitely try to portray our internal values as being important."

Education and development. This factor received an average ranking of 7.0 on the scale ranging from 1 to 9. This indicates that the participants felt that the university is doing a moderate job of both focusing training on the learner and fostering an environment where learning is a part of the day-to-day operations. This evidence is further supported by the fact that 15 of the 25 felt that training was learner-centered and another 6 respondents felt that training was at least somewhat learner centered. As one participant acknowledged, "The training process is both teacher-centered and learner-centered. The beginning of training is mostly teacher-centered as new users are getting acclimated to the system, but after that we allow for a lot of on-your-own exploration, which is definitely learner-centered." As another respondent stated, "Currently, it's really a cross between teacher centeredness and learner centeredness. We really try to focus the education on the learner, but sometimes it's easier and makes more sense to look at if from a teacher perspective." Another participant responded, "Overall, the process is very learner-centered." Also, 22 of the participants felt that learning was promoted as an

integral part of the business. As one of the respondents stated, "Yes, learning is promoted as an integral part of the day-to-day operations." Another participant stated, "Yes, learning is definitely promoted within the business unit, but not in so many words: people simply know that they are responsible for learning." Another participant simply stated, "Yes, learning is definitely a part of the job."

Reasons for this ranking not being higher include the fact that much of the SAP training (at least in the beginning of implementation) needed to be teacher-centered, so that the necessary information could be disseminated. The real learner-centeredness came later in the process, when employees experimented with the system. As one participant in the study reflected, "the training is really a combination; specifically, the SAP training was pretty teacher centered." Another respondent stated, "The training in the business unit is primarily learner centered, but within the SAP system there could have been a lot more taught about how to use the system within the different functional areas." Yet another participant stated, "The training process for SAP was mostly teacher-driven, but there were some sessions that were open-ended and conducive to question asking."

6.2. Low Ranking Factors

Performance measures. This factor ranked lower than any of the other factors in the ranking system, at a ranking of 5.6 out of 9. This shows that participants viewed the university's ability to perform systematic evaluations as average. Much of this sentiment stems from the fact that many business units do not have explicit formats for evaluating performance. Also, most units currently do not have the ability to measure the intangible assets of their business units. At the same time, a number of respondents believed that their business units were on their way to establishing consistent performance measures, and most participants believed that the performance measures were created as a means to promote values, and not an end.

One of the reasons for this factor's low ranking is that many of the participants in the study did not feel that there is proper instrumentation (i.e., metrics, reports, technologies) in place to measure performance. As one employee stated, "The instrumentation that is in place isn't really followed, and there really is no standard or consistency." Another participant said, "In some cases the instrumentation is in place, but as a whole, this area is lacking." Yet another participant stated that, "The instrumentation is not currently in place; what is there is just a static judgmental measurement system."

Another reason for the lower ranking of performance measures is because many of the people interviewed feel that the strategy of their business unit is not well defined. As one individual replied, "The strategy is not known and clear, there really isn't anything written down at all." Another respondent said, "Before, the implementation the strategy was known and clear, but it really isn't now; the strategy needs to be updated and revised according to the changes that were made in the processes."

A third reason why this factor scored so low is that many of the participants felt that their particular business units were really not able to give incentives and re-

wards. The university is a public institution, and they may not have the power at their level to appropriately reward performance. As one participant stated, "our capability to perform systematic evaluations is pretty low because we are dealing with the university, which is almost impossible to move ideas quickly through." Another person replied, "We really are not in a place to measure performance because basically we just have to enforce and follow the rules and guidelines that are given to us by state government." A third interviewee commented by saying, "There are incentives built into the system, but not in terms of financial reward, because the state won't really allow that."

Collaborative market penetration. This factor received an average score of 6.1. In addition, 9 of the respondents felt that this category was not applicable for their business unit. The reason for this is because this factor primarily measures an organization's ability to monitor and collaborate with both partners and competitors. Nearly all of the participants agreed that they had a balance of cooperative relations with other business units, but only 11 of the 25 felt that their business unit had the capability to monitor the alliances of both their competitors and their partners. This indicates that many of the participants did not feel that their business units were collaborating with partners and competitors to penetrate new markets. The primary reason that this factor ranked so low is because many of the participants did not feel that this area applied to the public sector, especially their functional business units. As one participant indicated, "We don't really have an understanding of our competitors, nor do we form relationships with those competitors, because we really don't have any competition." Another employee answered, "We don't really monitor the strategic alliances with our competitors, because it is sort of difficult to determine who our competitors are." This sentiment was echoed again by another respondent, who said, "No, we don't have methods to monitor our competitors, because there is really very little competition in this area."

Distributed learning network. This factor scored third lowest among participants. This indicates that the individuals interviewed felt that the university does an average job of including all business units in the creation of overall university strategies. Several individuals indicated a lower ranking to this answer because they do not often see the university as a whole collectively creating business strategy, but are more likely to see this done on an individual campus basis. The average was above 6, which indicates that the employees are not completely dissatisfied with this area, but they do see room for improvement. One factor that is also underneath the heading of distributed learning network is whether or not the individuals interviewed felt that there was a common vision among all participants in the SAP project across all four campuses. Reactions to this question were very favorable: 22 of the 25 participants felt that all members of the implementation had a shared purpose for implementing the SAP software.

The distributed learning network factor scored lower than most, primarily because many of the respondents felt that the university as a whole was not doing an adequate job of collectively creating business strategies. As one interviewee put it, "There is a generic vision among all four campuses, but in terms of specifics, there

is definitely not a common vision and shared purpose among the different campuses and departments." Another participant stated that "The university, until recently, has done a very poor job of involving all business units in creating known business strategies, but things should be getting better." Yet another employee said, "Everyone is invited to participate in creating business strategy, but not everybody takes advantage of it."

Knowledge products and services. This factor received an average score of 6.4. This indicates that the individuals who were interviewed felt that on the whole the university and the individual business units are doing a moderate job of creating new ideas and allocating resources to nurture those ideas. One reason that this ranking is slightly lower than some is that 16 of the 25 participants felt that there was not any investment capital that was set aside to fund a percentage of new ideas. As one of the participants in the study stated, "There is a minimal amount of investment capital set aside, but overall there really isn't much." Another interviewee responded, "there really isn't any investment capital available, at least that I know of." Another respondent acknowledged, "No, there really isn't any investment capital set aside; the closest thing would be the dollars that are available to fund training."

Leadership competencies. This factor scored an average of 6.8, which reflects that most of the participants felt that their individual business unit was moderately effective at leading others in the university toward innovative changes. An important finding based on this element is that 18 of the 25 participants felt that their business units lacked, or were not properly using, any type of formal mechanisms to legitimize and encourage leadership. As one employee stated, "There are formal mechanisms set up to reward leadership, but they are definitely not being used enough or correctly." Another participant stated, "No, there aren't any formal concrete mechanisms to reward and encourage leadership." Another respondent said, "No, there aren't formal mechanisms set up, but that is somewhat rewarded as a part of the evaluation process." Also, 24 of the 25 participants felt that external leadership (i.e., overall university leadership including president, chancellor, etc.) is integral to the business. One participant responded, "external leadership is definitely important to our business unit, as we are largely a support organization." Another employee stated, "Yes, external leadership is very important, because we definitely need buy-in from the top of the organization." Yet another respondent agreed, "Yes, external leadership activities, and the activities of those higher up in the university, are definitely important for our business unit."

6.3. Analysis of Rankings

Overall, the results of this study show a distinctive break between the factors that scored highest in and those that scored lowest. Reasons for the ranking of each factor are indicated in the aforementioned sections, but on an aggregate level a further distinction can be made between the factors that tended to score highest and those that tended to score lowest. The factors that ranked highest had a tendency to be

measured from a business unit perspective, whereas those that ranked lowest were measured, primarily, from a university wide perspective. Certainly, each individual factor included characteristics of both the business unit scope and the university scope, but some were weighted higher in one direction or another. Further analysis shows that the questions asked of the participants pertaining to communications technology, the collaborative process, intelligence market positioning, and market image campaign were, primarily, asked from the perspective of the individual business unit. In contrast, questions pertaining to the distributed learning network, performance measures, and collaborative market penetration were, primarily, addressing the perspective of the university as a whole. The factors of education and development, knowledge products and services, and leadership competency were weighted evenly between business unit scope and university scope.

These results indicate that the factors pertaining more directly to specific business units tend to receive a higher ranking than those that pertain more to the university as a whole. There are several reasons as to why this difference occurs. First, the participants in the study, naturally, have a better understanding of the way their business unit operates than they do of the university as a whole. As a result, they are more knowledgeable about what actions are taken on a day-to-day basis, which would give them the ability to answer the questions more confidently. Second, because each individual has a greater stake and responsibility in his or her business unit, they may be more apt to give their business unit a higher ranking than they would the university as a whole. This does not necessarily indicate that the participants were being dishonest in any way, but it is natural for them to take pride in the performance of their business unit, which may lead to higher rankings. Finally, the factors that pertained more closely to the university as a whole may not be understood by all of the members of the four-campus university. Thus, participants may have been unaware of programs or innovative capabilities that do not directly impact their business unit, which could potentially cause them to give a factor a lower score.

From a top-level perspective it can be noted that factors more closely related to individual business units tend to rank higher than those that are more directly associated with the university as a whole. This division, along with the various qualitative data analyzed in this study, demand that each factor of the Innovation Strategy Model be analyzed in light of its effectiveness to measure the innovative capabilities of a public sector organization.

7. DISCUSSION

After carefully analyzing the rankings of the various factors in the Innovation Strategy Model, and examining the various reasons why some factors scored significantly higher than others, it is now appropriate to discuss the applicability of the factors of the Innovation Strategy Model to a public sector organization.

7.1. Applicability of the ISM for Public Sector Organizations

As stated earlier, the Innovation Strategy Model was originally created to measure the innovative capabilities of an organization, based on the following factors: col-

laborative process, performance measures, education and development, distributed learning network, intelligence market positioning, knowledge products and services, collaborative market penetration, market imagine campaign, leadership competencies, and communications technology. These factors were designed for private, profit-oriented businesses, and not public, government-operated institutions. Thus, many of the factors may not specifically be aligned properly to gauge the innovative competence of government-funded organizations, whereas others still appear to be applicable.

Those factors that seem to relate well to public organizations are the collaborative process, education and development, distributed learning network, leadership competencies, and communications technology. Collaborative process and distributed learning network both relate to how well an organization involves all of its members in creating business strategies and collaborating to have a common shared vision. This is still important because public sector organizations must operate as one cohesive unit. The degree of cohesiveness is an important determinant in organizational creativity (Woodman et al., 1993). Education and development remain important because the amount of knowledge given to employees effects how well they are able to establish creative ideas (Amabile, 1988; Folan, 1999; Khalil, 1996). Leadership competency is also very important for government organizations because good management is essential for organizing creative teams (Khalil, 1996). Finally, communications technology is an essential ingredient for creative success in the public sector because businesses must be able to keep their information up to date and accessible to their employees. Also, technology is listed as a critical factor in determining organizational creativity (Woodman et al., 1993).

The factors that are not necessarily applicable to the government sector include performance measures, intelligence market positioning, knowledge products and services, collaborative market penetration, and market image campaign. Performance measures are still important elements to achieving creative outcomes, as feedback is an important piece of the creative process (Woodman et al., 1993); however, the way in which the Innovation Strategy Model currently measures it is not adequate. This is simply because public, government-funded institutions are not generally able to hand out large bonuses or give financial incentives. Therefore, other programs must be created to ensure proper performance management. Intelligence market positioning and market image campaign are also important for public sector organizations because establishing the proper niche is still important. However, this is difficult to measure, as many public sector groups do not have the freedom or financial backing to market themselves or change their image, due to government regulations.

Knowledge products and services might not be as important because most of the units supported by ERP at the university are not in the business of creating new products or marketing new services. As one of the participants in this study stated

> We are just a functional department that pays the bills for the university; everything we do is pretty much regulated by state government, so there really aren't any opportunities for creativity or innovation. … Everything is pretty much black and white.

Also, collaborative market penetration is not a feature that most public institutions exhibit because competition is usually not their primary concern, especially at an end user level. Therefore, measuring the organization's ability to collaborate with competitors to create new markets does not necessarily apply to government service workers.

Therefore, upon examination of the Innovation Strategy Model and the results of this particular case study, the factors that appear to be an accurate predictor of organizational innovative capability in public sector institutions are the distributed learning network, collaborative process, communications technology, leadership competency, and education and development.

7.2. Research Findings Complementing the Literature Review

Many of the findings of this research study support the ideas and research that has already been conducted on creativity and innovation in the workplace. Specifically, supporting the literature reviewed in this article is the idea that intrinsic motivation often leads to creative outcomes (Amabile, 1988, 1996; Cooper, 2000; Rubenson & Runco, 1992; Woodman et al., 1993). Although this study focused on the innovative capabilities of a public sector organization, government-funded organizations simply cannot financially afford many of the motivational amenities that are available to private sector businesses. This puts more pressure on public institutions to provide opportunities and tasks to their employees that build intrinsic motivation (Cooper, 2000). This appeared to be the case in the study of the SAP implementation at the University of Nebraska (Sieber, Siau, Nah, & Sieber, 2000): Many of the participants felt a greater sense of job satisfaction after participation in the SAP implementation. As one participant stated, "The paybacks for participating in the SAP implementation were intangible things, like greater job satisfaction, personal growth, and a greater sense of responsibility." This sentiment was echoed by another participant who acknowledged, "The biggest benefit for participating in the implementation is the tremendous amount of trust and empowerment that was given to the members of the implementation team." Another employee responded,

> To me the biggest individual reward for participation in the implementation is the amount of knowledge that is transferred, and also the networking that I was able to take part in, as well as the amount of trust and motivation that was given to me as an implementer.

These viewpoints support the notion that intrinsic motivation needs to be at the heart of any creative organizational change. In this case, the employees of the university, who were tasked with the responsibility of implementing a large IT change, experienced greater feelings of trust and empowerment that intrinsically motivated them to add innovation to the implementation.

Another idea represented in the literature review that was supported by the findings of this study is the importance of collaboration among participants in any major organizational change. This is supported by the fact that 20 of the 25 participants in the study felt as though the implementation was a collaborative venture,

and that it was not top-down and hierarchically driven. The focus on collaboration supports the Woodman et al. (1993) model, which shows group cohesiveness to be a major factor in producing creative outcomes in organizations. This also reflects Amabile's (1988) findings, which show organizational freedom to be an important element to creative development. It also supports Cooper's (2000) model of creativity enhancement, which demonstrated the effects of group dynamics on creative development. This study, as well as previous literature, points out that creative change must be a collaborative venture that receives support from all levels of the organization. Specifically, for creative change to be a success, end users and implementers must be included in the innovative change and feel that they have the ability to contribute new ideas to the implementation.

Another finding of this research study that seems to support previous literature is the notion that successful implementations require people to change and should be treated as people projects (Langenwalter, 2000). This certainly appeared to be the case in the implementation of SAP at the university, as SAP itself seemed to be fairly inflexible when it came to meeting certain user needs. Therefore, the end users and implementers were forced to be innovative about the way in which they implemented the system. As one participant stated, "The software (SAP) allowed business units to make some changes, but most of the changes in business processes were driven by SAP, which somewhat forced the business unit to comply to how the software operated." Another employee said,

> With SAP we can access all of our information on-line, but for us to make sure that the data are entered into the system most accurately, it requires us, as end users, to be more creative about the way we use the system.

The feeling that changes needed to be made in the organizational processes for them to best fit SAP was a popular sentiment among individuals in the study, as one respondent recognized,

> The SAP software itself did not encourage creativity because it is so powerful and diverse that it really didn't need to; therefore the biggest times that creativity needed to be involved were when the implementers were determining the best alternatives to fit within the context of the software.

By reviewing the various responses, it is quite apparent that the implementation was actually much more of an organizational change project than a technical project, supporting the work of Langenwalter (2000), as well as many others.

7.3. Research Findings Contradicting the Literature Review

Most of the findings in this research study are consistent with previous literature that has been developed on the use of creativity and innovation to bring about IT change; however, there are some contradictions that are worth noting. The first apparent contradiction is in reference to the impact of having well-defined roles on the innovative capability of an organization. Both Cooper (2000) and Woodman et al. (1993) cited

having well-defined roles as being important for organizational innovation. This study, however, found that only 8 of the 25 respondents felt that the roles within their business units were well defined. Obviously, the low number of participants in this study means that these results are certainly not statistically significant, but at the same time, the individuals in this study, on the average, did not see having well-defined roles as being instrumental to implementing the SAP system.

Another possible contradiction that came out of this study is the importance of having enough resources allocated to motivate optimal innovation. Both Amabile (1988) and Folan (1999) cited properly allocated resources as important ingredients in creating organizational innovation and change. This, however, was not necessarily our case: only nine of the individuals in the study who were either fairly satisfied, satisfied, or very satisfied with the innovation included in the SAP implementation felt that proper resources had been allocated to their business unit for the implementation. Ten other participants in the study who were either fairly satisfied, satisfied, or very satisfied with the innovation included in the implementation felt that there were not enough resources allocated to their business unit for the implementation of SAP. Therefore, this study does not show a clear-cut, direct relation between properly allocated resources and organizational innovation. This is not to discount the importance of having enough resources available within an organization; this certainly seems like a logical ingredient to organizational success. However, this study did not show a clear connection between resource allocation and innovative ideas.

7.4. The Impact of This Study on Innovation and ERP Research

This study offers several implications for future innovation and ERP research, as well as insights for businesses seeking to implement innovative IT changes in their organizations. First, this study focuses on end users of ERP systems, who are often overlooked in the process of ERP implementation, but who also hold the key to ERP implementation success. This is a relatively new area of research that needs to be further explored. The findings of this study, specifically the findings pertaining to motivating employees intrinsically, should be of great benefit to not only academia, but also businesses seeking to make significant organizational changes. The findings of this research study affirm the results of prior studies by showing that intrinsic motivation is at the heart of driving organizational change.

The second contribution that this study has for business and academia is the critique of the Innovation Strategy Model as it pertains to public institution. Specifically, further research needs to be conducted on the factors that have proven to predict innovative effectiveness, to determine which factors are ultimately most important in deciding an organization's potential for innovation. Also, the factors that did not appear to be significant indicators of public institution innovation need to be rethought or realigned as to their effectiveness in a government-funded environment. This case study should offer public institutions a road map for innovative success, and will hopefully spawn further research on public sector organizations.

Third, this study increases the amount of literature and research targeted at ERP implementations in public sector organizations. This has been an area that has not seen a tremendous amount of research, as most research has been centered on pri-

vate business. Hopefully, however, the findings in this study, specifically the case study on a public university, will offer insights into the nature of ERP implementations at public institutions.

8. CONCLUSION

Creativity and innovation offer significant benefits to businesses that are willing to take the time to examine the elements of individual, group, and organizational creativity, and that will take the necessary steps to implement innovative change. This study has shown that each individual and small group comes with a certain amount of creative potential (Amabile, 1988). Each individual can decide whether or not to invest in that creative potential or to invest in other areas of their human capital, based on decisions of marginal benefit vs. marginal cost (Rubenson & Runco, 1992). Therefore, the goal of businesses is to provide employees with tasks that will increase their feeling of trust and empowerment, which will lead to an intrinsic motivation to increase creative potential (Cooper, 2000). Several factors also influence an individual's motivation to invest in creative potential, including environmental, contextual, and antecedent factors (Khalil, 1996; Woodman et al., 1993). Therefore, carefully analyzing these factors within the organization is important for developing creative solutions. This is why a model such as the Innovation Strategy Model is essential for businesses to utilize to gain a snapshot of their innovative capabilities (Amidon, 1997).

This case study has shown the importance of channeling all of the factors of individual, group, and organizational creativity into one cohesive unit to establish a creative outcome, such as an ERP implementation. For ERP implementations to be successful and not simply an automation of manual tasks, end users must be recruited for creative change, especially in public institutions. As this study has shown, this requires organizations to create environments where appropriate risks are rewarded and ideas are pulled from the bottom up so that end users and implementers are emphasized as an integral part of implementation success.

REFERENCES

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior, 10,* 123–167.

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview.

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal, 39,* 1154–1184.

Amidon, D. M. (1997). *Innovation strategy for the knowledge economy: The Ken awakening*. Boston: Butterworth-Heinnemann.

Bernacki, E. (2000). Chain reactive creative. *Management, 47*(2), 20–24.

Burgleman, R. A., & Maidique, M. A. (1988). *Strategic management of technology and innovation*. Homewood, IL: Irwin.

Cooper, R. B. (2000). Information technology development creativity: A case study of attempted radical change. *Management Information Systems Quarterly, 24,* 245–276.

Couger, J. D. (1996). *Creativity & innovation in information systems organizations*. Danvers, CT: Boyd & Fraser.

Couger, J. D., Higgins, L. F., & McIntyre, S. C. (1993). (Un)structured creativity in information systems organization. *Management Information Systems Quarterly, 17,* 375–397.
Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review,* 76(4), 121–131.
Folan, J. L. (1999). Creativity adds to your bottom line. *Communication World, 16*(7), 44–46.
Harrington, D. M. (1981). Creativity, analogical thinking, and muscular metaphors. *Journal of Mental Imagery, 6,* 121–126.
Hennessey, B., & Amabile, T. (1987). The conditions of creativity. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 11–38). New York: Cambridge University Press.
Hippel, E. V. (1994). *The sources of innovation.* New York: Oxford University Press.
Kanter, R. M. (1983). *The change masters*. New York: Simon and Schuster.
Khalil, O. E. M. (1996). Innovative work environments: Role of information technology and systems. *S.A.M. Advanced Management Journal, 61*(3), 32–37.
Langenwalter, G. (2000). *Enterprise resource planning and beyond integrating your entire organization*. Boca Raton, FL: St. Lucie Press.
Lee, J., Siau, K., & Hong, S. (2003). Enterprise integrationwith ERP and EAI. *Communications of the ACM, 46*(2), 54–60.
McGraw, K. (1978). The detrimental effects of reward on performance: A literature review and a prediction model. In M. Lepper & D. Greene (Eds.), *The hidden costs of reward*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
Nah, F. H., Teh, S. H., & Beethe, M. (2001). *A report on the SAP survey conducted at the University of Nebraska, Lincoln Campus.* Retrieved July 1, 2001, from http://www.ait.unl.edu/nah/SAPSurveyReport.pdf
Niederman, F., Brancheau, J. C., & Wetherbe, J. C. (1991). Information systems management issues for the 1990s. *Management Information Systems Quarterly, 15,* 474–500.
Rubenson, D. L., & Runco, M. A. (1992). The psychoeconomic approach to creativity. *New Ideas in Psychology, 10,* 131–147.
Siau, K. (1995). Group creativity and technology. *The Journal of Creative Behavior, 29,* 201–216.
Siau, K. (1996). Electronic creativity techniques for organizational innovation. *The Journal of Creative Behavior, 30,* 283–293.
Siau, K. (1999). Internet, World Wide Web, and creativity. *Journal of Creative Behavior, 33,* 191–201.
Siau, K. (2000). Knowledge discovery as an aid to organizational creativity. *Journal of Creative Behavior, 34,* 248–258.
Siau, K., & Messersmith, J. (2002). Enabling technologies for e-commerce and ERP integration. *Quarterly Journal of Electronic Commerce, 3*(1), 43–52.
Sieber, T., Siau, K., Nah, F., & Sieber, M. (2000). SAP implementation at the University of Nebraska. *Journal of Information Technology Cases and Applications, 2*(1), 41–72.
Torrance, E. P. (1965). *Rewarding creative behavior.* Englewood Cliffs, NJ: Prentice Hall.
van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science, 32,* 590–607.
Woodman, R. W., Sawyer, J. E., & Griffen, R. W. (1993). Toward a theory of organizational creativity. *Academy of Management Review, 18,* 293–321.
Woodman, R. W., & Schoenfeldt, L. F. (1989). Individual differences in creativity: An interactionist perspective. In J. A. Glover, R. R. Ronning, & C. R. Reynolds (Eds.), *Handbook of Creativity* (pp. 77–92). New York: Plenum.
Woodman, R. W., & Schoenfeldt, L. F. (1990). An interactionist model of creative behavior. *Journal of Creative Behavior, 24*(4), 27–90.
Zawacki, R. A. (1993). Key issues in human resource management. *Information Systems Management, 10*(1), 72–75.