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AN INTEGRATIVE FRAMEWORK FOR CONTEXTUAL FACTORS AFFECTING INFORMATION TECHNOLOGY IMPLEMENTATION

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ABSTRACT

While previous research has provided a great deal of information on individual factors that play a role in IT implementation success, a gap in the research exists when it comes to formulating a holistic view of overall environmental factors. This paper conducts a literature review and expands Weill's conversion effectiveness model to develop a framework integrating the various enterprise-level contextual factors affecting IT implementation. It also discusses relationships among contextual factors and cross-border issues in the global outsourcing environment. This holistic interpretation of individual factors is an initial step toward understanding the complexities of corporate environments and their effects on IT implementation success. The framework can provide companies with a useful tool to evaluate their current environment, determine its strengths and weaknesses, and assess how these will affect IT implementation.

INTRODUCTION

Information Technology (IT) has moved from the role of organizational support to become an integrated part of core business processes and a driver of business strategy, thereby changing the traditional relationship between business units and technology departments. In an adverse economic climate, such as the first years of the 21st century, business enterprises are particularly interested in capturing the highest possible return from IT investments, which can represent a significant portion of their expenses.

The emphasis on value raises new questions, and the research community has identified various means of quantifying the value of IT investments. Value is not directly derived from IT investments because there are many factors that affect value throughout the implementation process. Implementing a new technology project typically entails a great deal of cooperation among various divisions, departments, and employees within the enterprise. The technical aspect of implementation is only one component of a chain of events between initial investment and final evaluation. During that time, a wide

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range of factors, both internal and external to the corporate environment, react with implementation processes and will ultimately become part of the output value of the original technology investment.

Previous research has provided insight into numerous factors playing a role in the level of success associated with IT implementation (Bassellier, and Benbasat, and Reich 2003; Beath 1991; Earl and Feeney 1994; Ginzberg 1981; Kwon and Zmud 1987; Markus 1981; Rockart, Earl, and Ross 1996; Senn 2003; Somers and Nelson 2001; Weill 1992; Weill and Olson 1989). While this research into the various factors affecting successful IT implementation has provided a great deal of information, there is a gap when it comes to integrating these factors into a holistic model (Richardson, Subramani, and Zmud 2003). Much of the research looks at individual factors in a specific environment, without exploring the relationship among factors and how the findings can be applied to other enterprise environments.

The challenge of identifying critical individual factors and the best possible combination of factors remains an issue for both researchers and corporate managers seeking to optimize their operations for the highest possible return on IT investments. Firm-wide integration of technology and core businesses continues to grow, extending beyond corporate boundaries to create networks among business, customers and partners, which make the need for successful implementations more critical than ever.

The importance of successful implementation of IT investment poses a fundamental question: "How can a company improve the chances of an IT implementation being successful?" While factor research has identified various elements of the corporate environment that are likely to lead to successful implementation, the end result is a fragmented summary of disparate factors that have been tested in various situations at different points along the implementation process. It is important for researchers to integrate these fragments into a holistic approach that will allow companies to coordinate efforts in the most effective way.

CONTRIBUTION

This paper develops a framework, based on Weill's conversion effectiveness model, integrating the various enterprise-level contextual factors affecting IT implementation. Much of previous research on IT implementation has resulted in a fragmented summary of disparate factors that have been tested in various situations at different points along the implementation process, but there has been no work that systematically integrates the data into a coherent whole. This paper takes a different approach by developing an integrative framework of seven contextual factor categories, with increased granularity in the description of each factor represented in the category. This paper also includes relationships among contextual factors, which was not part of the original work on conversion effectiveness, and discusses how external factors associated with cross-border IT projects augment the significance of contextual factors. This holistic interpretation of individual factors is an initial step toward understanding the complexities of corporate environments and their effects on IT implementation success. The resulting framework provides companies with a useful tool to evaluate their current environment, determine its strengths and weaknesses, and assess how these will affect IT implementation.

CONVERSION EFFECTIVENESS

The environment of IT implementation includes the people, processes and organizational structure of a company. Since no two business enterprises have exactly the same environment, it follows that no two IT implementations have same context. Conversion effectiveness is closely linked to these unique environments. Conversion effectiveness was originally identified by Weill (1992), who defined it as a measurement of the "quality of the firm-wide management and commitment to IT" that affects the level of firm performance generated from IT investment. Weill assessed the impact of four factors: top management commitment, user satisfaction, internal political turbulence, and

IT experience. According to Weill's conversion effectiveness model (Figure 1), technology investments of equal dollar value made in different firms do not translate into equivalent value because of differences in the effectiveness of management teams in converting each dollar of investment into actual business value. As he points out, however, the study does not examine which characteristics would actually lead to higher user satisfaction and lower turbulence. The processes and underlying components of conversion effectiveness are left as an open issue.

RELEVANCE OF CONTEXTUAL FACTORS

The need to understand the factors affecting IT implementation and to increase the value derived from it has resulted in factor research aimed at defining a variety of individual factors in different situations and contexts. Factors such as management ability and political environment are a critical component of performance variance when comparing firms implementing similar technologies. Conducting an analysis of the contextual factors at manufacturing plants, McKone and Schroeder (2002) show that 47% to 59% of the variance in the value of IT implementation is due to contextual factors generalized into three categories: environmental, organizational, and strategic. A compelling illustration of the importance of contextual factors affecting IT implementation value is shown by Brynjolfsson and Hitt (1995). They found that more than 50% of the variance in the impact of IT investments was generated by firm-specific idiosyncrasies.

There is a need to integrate the research on contextual factors in order to develop a better understanding of how the comprehensive environment of the enterprise influences the outcome of IT projects. Indeed, measuring the value is only part of the battle. Attempts to directly link IT investment and organization performance are flawed because such a methodology places firms at equal levels of efficiency and assumes they have equal ability to create value from IT investments (Brynjolfsson and Hitt 1995; Soh and Markus 1995; Weill 1992; Xia 1998).

In this paper, we introduce the concept of intermediate IT value, which we will define as the associated benefit of the specific technology implementation. The benefit can be measured in terms of monetary value, increase in customer base, decrease in expenses, or any other means that can be measured in terms of changes between pre- and post-implementation and tracked specifically to the technical implementation.

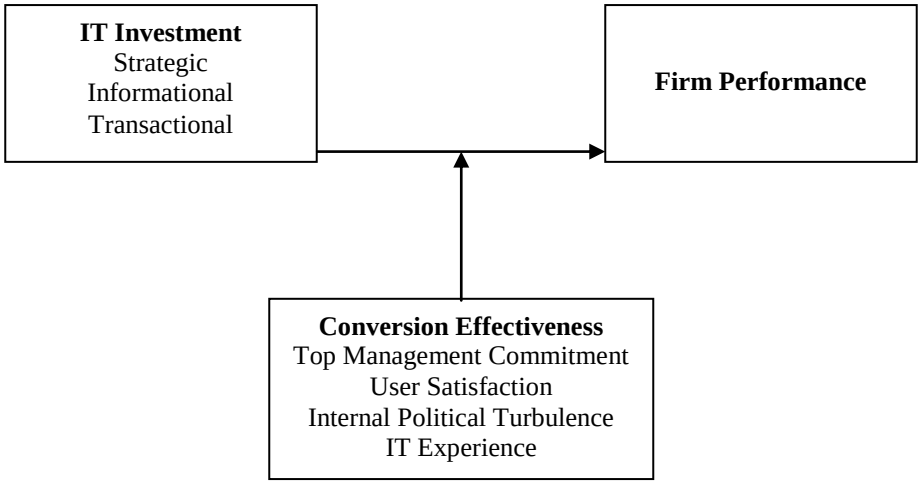

Figure 1: Weill's conversion effectiveness model

LITERATURE REVIEW OF CONTEXTUAL FACTORS

Research devoted to IT and its impact on business value has generated a great deal of information on very specific and unique situations. We conduct a broad review of the literature that explores contextual factors and their impact on the perceived success or failure of a technology project. The individual factors found in the literature are classified into seven categories, which together comprise an enterprise-level framework of contextual factors. This framework allows for a more holistic view, which we argue is necessary to realize the maximum value from technology implementation.

Path dependencies

Technology decisions are not made solely in response to the current business environment. Today's decisions are affected by past technology decisions, which may either limit or increase the range of current choices (Markus 2000). The best technology choice today may not be an option if legacy systems do not integrate with today's preferred system choice. Employees will also hold more expertise in the previous systems, and the introduction of new systems can create issues of training and acceptance of the newer technology. The level of disruption to the current processes and social systems is also an important factor to consider. If the new technology is vastly different and requires extensive retraining and restructured workflows, the cost/benefit ratio must be carefully considered prior to implementation (Ryan and Harrison 2000).

Legacy systems such as those initially deployed at the beginning of the technical modernization cycle have an effect on the systems that will be implemented many years later. Flexibility and interoperability are key issues affected by initial system choices. Systems that were beneficial when initially implemented may no longer be the best solution when the dynamics of the marketplace change. Beath (1991) describes the trade-off between long-term and short-term goals using an example: future data mining efforts may be severely hampered by past decisions favoring a quick and timely implementation that didn't include integration steps necessary for more efficient data mining techniques needed in the future. Changing, integrating or removing the older systems is sometimes economically unfeasible, and these previously implemented technologies may limit the choice of new technology projects (Tallon and Kraemer 2003).

Project-related factors

Project-related contextual factors include the people and processes involved in the management of the implementation. Project-related factors can include the communications methods used to disseminate information as well as the type of information itself (Daft and Lengel 1986), the management of expectations (Senn 2003; Somers and Nelson 2001), the participation of end-users (Barki and Huff 1990) as well as project team members, who bring unique skill sets and resources (Somers and Nelson 2001).

Communications: Project management requires regular communications between members of the project team and stakeholders. A lack of information or a misinterpretation can create delays and errors. Daft and Lengel (1986) describe two factors in communications that critically influence how information is shared within an organization: One is *uncertainty*, a situation in which information is not available, and *equivocality*, an ambiguous situation that is subject to multiple interpretations. Both uncertainty and equivocality need to be addressed throughout the implementation process through the use of rich communication media such as face-to-face meetings, where discussions can lead to a common interpretation. Using the optimal form of communication for the specific task improves the chances of a successful implementation by preventing misunderstandings and establishing correct expectations.

Managing expectations: Managing expectations in an effort to eliminate surprises is an essential factor for successful projects (Senn 2003; Somers and Nelson 2001). Ginsberg (1981) explored end-user expectations by conducting interviews based on an extensive questionnaire at the last possible moment prior to implementation. His study found a positive correlation between

successful rating of a project and a realistic pre-implementation expectation. Not only did realistic expectations lead to satisfaction with the project, they also related to actual use of the system. The importance of equalizing expectations is evident in research indicating significant differences between the views of managers and IT professionals regarding IT spending. This is especially true of managerial concerns about the tendency of IT professionals to "over promise." If both parties are accurately informed with the same information, they will have an easier time reconciling their viewpoints.

Dedicated Resources: Dedicated resources with the required technical knowledge are another key to a successful implementation. Vendor or third party resources may be called upon, but they should not be the main driver behind the implementation or act as project managers. Key tasks such as project management should be held by qualified in-house staff members. In particular, during the adaptation phase of an implementation, which is when the project is installed and available to users, dedicated personnel with the appropriate skills are more important than during any other phase of the implementation. It is upper management's responsibility to assure that properly skilled personnel are available to work on the project for the necessary time period (Somers and Nelson 2001).

End-user participation: User participation throughout the implementation process is critical to implementation success. Barki and Huff (1990) studied the implementation of decision-support systems and found that end users who were actively involved in implementation were less resistant to changes created by the new technology. The authors concluded that when end-users are involved, they develop a sense of pride and ownership, which creates a more positive association with the new technology and hence a willingness to adapt to the change. Current research is moving toward a more granular understanding of the types of user participation and the conditions under which these different responses occur to determine where and when participation is most important. For example, user participation was found to change substantially depending on the difficulty of the task and the level of system complexity; the more complex the system or task, the greater the need for user participation in order for the technology to be considered successful (McKeen, Guimaraes, and Wetherbe 1994).

End-user participation in the requirements-gathering phase of a project will help to ensure that the needs of users are met and improve the acceptance level of the new technology. The early inclusion of end users is critical to obtaining the information that will be used to create a system based on those needs; however, the methodology and approach to eliciting this knowledge from the experts continues to be a challenge. In a study of the development of an aircraft warning system, for instance, Noyes, Starr, and Frankish (1996) found that gathering this data was time consuming, but that the co-operation of end users was of "paramount" importance in the iterative environment of a systems design project.

Organizational management structure

Corporate organization impacts projects through the structure and power of its management team in relation to the project. For example, a management structure that isolates the technical divisions from the business units creates an environment in which the CIO may not have the information necessary to make sound project decisions (Raymond, 1985). The role of senior management is crucial for success. If the organization is aligned positively with the project, there is a better chance for the success of the project. Projects can fail, not because of technical difficulties, but due to human or organizational factors such as an inexperienced management team or the inability to identify related costs/benefits of a project (Irani and Love 2000-2001).

Role of CEO: As the head of the management structure, the CEO is significant to the development and deployment of activities affecting the value of technology projects. Earl and Feeney (1994) found two specific ways in which the CEO can create a structure that will improve the chances for successful technology implementations and hence improve the final outcome. First, the CEO can elevate the CIO to the top of the management hierarchy, which puts the CIO in

a better position to understand business needs and strategic concerns associated with project implementation. The CEO can also include the CIO on senior management teams that bear responsibility for strategic direction. Membership on this team does not require the CIO to report directly to the CEO; the value catalyst is the interaction with the team rather than the reporting structure itself. Benefits of positioning the CIO in the top management level can extend to lower levels of the hierarchy, where users perceive improved technical support and better understanding of the technology (Raymond 1985). The second role of the CEO is to stimulate debate regarding the enterprise strategy. Forcing the team to discuss and reaffirm, or change, the direction of the business is vital to maintaining competitive advantage, and in times of extreme industry change to simply maintain the performance for any firm in that particular industry (Earl and Feeney 1994).

Commitment level: A common factor associated with implementation success is the commitment level from top management (Ginzberg 1981; Kwon and Zmud 1987; Somers and Nelson 2001; Swanson 1974; Weill 1992). Senior members of the management team play a key role in IT conversion effectiveness by expressing their support and interest in the new systems and setting a tone of positive acceptance for other employees. Commitment can be demonstrated in various ways; some senior managers take a hands-on approach and are involved to some degree with the actual project management. Jarvenpaa and Ives (1991) found that psychological factors, such as the degree of importance placed on information technology by the chief executive and the CEO's view of how critical IT is to the organization's success, are transmitted to employees as indications of senior management commitment. Not only is top management support one of the critical factors in success, it is a critical factor in every stage of the implementation lifecycle, from initiation to infusion (Somers and Nelson 2001).

Corporate Project Champion: A project champion, someone who markets the project within the company and facilitates incorporation of the new technology, is one of the top ten critical success factors discussed in the research conduced by Somers and Nelson (2001). This individual should not be confused with the project manager. The champion is typically someone from a relative high management level. Information, technical resources, and political support are all important elements for the champion's success. The champion sometimes needs to work around information systems (IS) rules and procedures in order to move the project to a higher priority or to overcome obstacles impeding success. A significant issue for IT managers is "how to deal with the project champion"; while the champion is important to implementation success, he or she is often asking IS people to "give up something" (Beath 1991). Examples of championing behavior that places stress on IS management may include: using relationships higher in the organization in order to move the project into a priority position, asking for exceptions that go against standard IS policies, and reducing the efficiency of current operations in favor of a shortened implementation time. Ironically, it is precisely these potentially disruptive behaviors that make the champion so valuable to the project; he or she can bring about the organizational changes needed to accomplish the task at hand (Beath 1991).

IT Competency

Firm's past IT experience: The past IT experience of the firm's management also plays a role in overall IT effectiveness (Weill and Olson 1989). There is a circular link between IT investment and performance in one year and the prior year's level of conversion effectiveness. That is, the relationship between investment and performance in any specific year is affected by the level of conversion effectiveness in prior years (Weill 1992).

CIO competency: In the senior role of the IT organization, the CIO is perceived to have a level of experience and knowledge that will guide technology decisions and manage the technical teams efficiently. Technical knowledge is critical, but the CIO's level of business knowledge can also contribute significantly to implementation success. Armstrong and Sambamurthy (1996) examined the interaction between IT and business knowledge levels of both the CIO and

the senior management teams and showed the influence these factors have on successful IT deployment. Their results indicate that the CIO's business knowledge is more important to the overall successful IT use than is the senior management teams' IT competency.

Business Line Manager IT Competency: The level of IT competence existing at the business management level creates a context that can influence the implementation of new technology projects. Bassellier, Benbasat, and Reich (2003) argue that business managers' IT competence consists of both knowledge and experience. They define knowledge as the understanding of both fundamental IT concepts and the technology, and argue that knowledge must be put into everyday practice for competence to exist. The value of technology projects is strongly connected to business line leadership, since business managers play a role in promoting (or preventing) the use of technology throughout the firm. A more knowledgeable business manager can communicate more efficiently with IT staff and interpret the value of IT for the business unit, ultimately enhancing the success of a technology project.

An IT-competent business staff is an important asset. In order to assist enterprises in determining their level of knowledge, Sambamurthy and Zmud (1992) developed an assessment of management competencies from an enterprise-level perspective. These competencies are placed into seven categories: business deployment, external networks, line technology leadership, process adaptiveness, IT planning, IT infrastructure, and data center utility. They created a questionnaire-based assessment of management's IT knowledge that can be scored according to these seven categories, thus allowing an enterprise to determine its strengths and weaknesses. Rockart, Earl, and Ross (1996) also place strong emphasis on line managers' knowledge of IT, since it is at the business level that the value of IT can be recognized most easily. A business manager who lacks IT competency may not be able to optimize the technology in order to generate the full value from the investment.

Project Team IT skills: Competence of the project team is also a critical factor for implementation success (Somers and Nelsom 2001). Project challenges can be overcome more efficiently or even avoided with a project team that has the necessary knowledge and skill sets for a particular implementation. Somers and Nelson's work (2001) on enterprise resource planning (ERP) implementation found project team competence to be second only to top management support as a factor in successful implementation.

Team members do not all need to be employees of the company. Consultants can be valuable factors in the success of a project in circumstances where the internal project team lacks specific knowledge or experience. End-users with technical skills should also be part of the project team, since they will have a better understanding of the current business processes and any changes that may need to be made (Clemons 1998).

Techno-political culture

Techno-political culture describes a broader range of factors than the socio-technical factors in obtaining IT benefits (Ryan and Harrison 2000). The term "socio-technical" addresses the factors embedded within an organization such as social subsystems like employees' knowledge, skills, attitudes and relationships. These subsystems incur costs as well as benefits from an IT initiative, and the overall effectiveness of IT implementation hinges on this cost/benefit interplay. For instance, social subsystems will be affected negatively by a new technology effort when it replaces staff by automating tasks usually completed manually. The technology automation project provides obvious benefits in terms of automation; however, the social impact of losing personnel is a negative component that must be factored into the equation. These multiple relationships and their role in the organizational context are often ignored in IT value research (Xia 1998). The techno-political culture takes into account the political nature of a social system and includes the following factors:

Political: Technology projects are implemented within the social environment of a business enterprise, where informal power

hierarchies and political realities inherently exist. The prioritization of projects, the selection of packaged software, and the selection of project team members can all be affected by the individuals or groups that hold the most power at the time of the decision. Political considerations often hold more weight in the decision process than technical factors (Weill and Olson 1989).

Political turbulence creates an environment that can impede IT effectiveness. In such an environment, individuals will act in accordance with their personal interests rather than for the good of the community. Since technology implementations cross many internal boundaries, from the individual to the departmental, cohesive relationships among these areas is critical to the realization of the full value of the technology. Lack of agreement or outright conflict can reduce the value of technology, causing wasted resources, including time and money, and create an impediment to the acceptance of change (Weill 1992). Markus's case study (1981) emphasizes the importance of a cohesive environment. It indicates that in a new project, the interaction between design and context is more important than the overall system design because such interaction reduces resistance to new projects. If the organization's context, such as social or political culture, is not compatible with the design features of the new technology, it will be difficult to gain end user support. For example, politics and power struggles between departments can create a context that is unfavorable to end user support.

In fact, resistance to new technology can sometimes be attributed to internal political issues and the power associated with them (Markus 1981; Markus and Bjorn-Andersen 1987). Power and politics go hand in hand; if there is a loss of power, there is also a decrease in politic clout. For example, if an automated system allows employees to have equal access to information previously limited to a few users, then the original users perceive a drop in their political net worth since access is no longer an entitlement of only a few employees.

Social Order: Ethnographic and socio-metric data compiled by Barley (1990) illustrate the impact of technology on the interactions within the social structure of an enterprise. Clearly technology modifies the tasks performed by individuals; however, these changes do not take place in isolation. These modifications, in turn, shape role relations. A technically altered task may increase (or decrease) individuals' roles or dependencies on others. The frequency and type of interactions with colleagues may also be changed by the introduction of technology. The technology has modified the task, which in turn modifies the roles of individuals, thereby impacting the hierarchy or social structure of the network of employees. Barley (1990) refers to the social changes as a "series of reverberations that spread across levels of analysis much like ripples on the surface of a pond." He looks at relations between individuals as the beginning of a process that impacts the social network of a firm and determines how changes introduced by technology can affect the social network of the entire structure.

Interdepartmental cooperation: Developing cooperation between departments, particularly business lines and IT, is always challenging. Different departments often have different goals, agendas, and performance objectives. Since interdepartmental cooperation is a factor relating to improved IT implementation, developing an environment that rewards cooperative behavior encourages this. Peer reviews are a means of keeping the focus on developing such relationships. For example, if the CIO and the IT team are rewarded by increased bonuses when end users provide positive feedback or express satisfaction with a project, then the cooperative relationship is more clearly defined and to some degree, more objective (Earl and Feeney 1994).

Mutual understanding: Shared domain knowledge or mutual understanding is an important factor at every level of the organization. Reich and Benbasat (2000) make a number of suggestions, including the physical positioning of IT people in business units, mandatory conference attendance, and coursework as tools, to develop an atmosphere conducive to the development of shared knowledge. The value of the CIO's interaction with the business management team via involvement in senior-level committees was

previously posited by Earl and Feeney (1994), who also went on to describe relationship-building as a key part of the CIO's membership in this group. Access not only to the individuals responsible for various business components, but also exposure to the discussions and debates provide the CIO an opportunity to see the business challenges and find how decisions are made regarding strategies to meet those challenges. The CIO gains an enhanced understanding of the business decision process as well as the dynamic environment in which such decisions must be made, while business managers also increase their knowledge of the abilities and limitations of the technology systems currently in place. This exchange of information at a senior level and in an interactive forum provides a critical base to developing mutual understanding.

Complementary investments

There has been some development in the area of complementary investments that add to the potential for greater IT returns. A complementary investment is one that will enhance the success of the new technology. Such investments can include changes to business processes that augment the new technology, new organizational structures, and additional or auxiliary IT investments.

Change Management: Implementations involve changes of many types, which affect various departments and employees at different levels of the hierarchy. In the workplace, change management techniques are mostly overlooked when it comes to implementation. However, previous research considers change management to be a complementary investment that can increase the success of implementation (Kohli and Sherer 2002; Sherer, Kohli, and Baron 2003). Ryan and Harrison (2000) interpret the changes using a cost/benefit analysis. According to them, the social structure of the organization is often affected by new technology automating work flows, changing working patterns or otherwise changing how and with whom people interact. These social changes need to be considered when evaluating the costs and benefits because the social impacts may be quite extensive and negate the expected benefits.

Techniques for change management can be borrowed from organizational development (OD) literature. A framework for improving the chances of IT implementation success using OD methodology to manage change was developed by Castle and Sir (2001). They suggest the importance of a collaborative environment, which facilitates the relationships between IT and management. They define OD as the planned process of developing an organization to become more effective in accomplishing its goals and creating an architecture to reduce the resistance associated with the change process. The architecture takes into consideration organizational factors such as culture, competencies, human resources and management practices. Cross-disciplinary involvement in a collaborative environment appears to improve the success of IT implementations when a change management framework is used.

Acceptance of a new technology is not always the norm. Change, even if it is aimed at improving a situation, creates a level of discomfort for many individuals; therefore, persuading employees' to adopt new technologies typically requires great finesse. Generating adoption compliance during project implementation is similar to the diffusion efforts surrounding new innovation. The parallels between innovation diffusion and the adoption of new projects are useful for creating an environment that embraces change and fosters enthusiasm about new projects. The similarities are noted in Kwon and Zmud's (1987) definition of IS implementation as "an organizational effort to diffuse an appropriate information technology within a user community."

Business process re-design/work flows: New technology often means new procedures, new workflows, and new communications requirements. In addition to the psychological impact of change on employees, the physical changes in work processes need to be addressed if technology is to provide full efficiency. A case study at McKesson Drug Co. detailing the effects of a new order-entry and distribution system called Economost indicates the value of analyzing the necessary changes in procedures that occur when technology is introduced into work flows

(Clemons and Row 1988). The major benefit was initially thought to be the efficiency of the electronic order-entry system. However, the study found that "this was only partly correct; many of the benefits result simply from *rationalizing* operations in preparation for Economost." McKesson's experience exemplifies how optimizing operations and process flows can affect the value of a technology investment by leveraging its effects.

Getting business line managers on board is essential to the success of technology implementation, particularly when changes in work processes or work flows are involved. The IT staff has responsibility for the technical components of success, and the business manager must recognize the processes that need to be changed and the methods of training needed to convey those changes to the staff (Rockart, Earl, and Ross 1996).

Training: Training is an important aspect of building confidence with end users; it ensures their comfort with the new technology and increases their willingness to use it. Familiarity with the system, as early in the implementation as possible, also sets proper end user expectations. Thus, there is less of a gap between what users ask the systems designers to provide and what the system can actually do. End users will have more positive attitudes toward the technology and are more apt to voluntarily use the system if they receive adequate training (Ginzberg 1981; Kleintop, Blau, and Currall 1994). Training prior to implementation assures users that the system is easy to use and helps to ease any fears they may have. Training is particularly important for ensuring that knowledge is maintained within the organization when an outside consultant is used (Davenport 1998). Implementation team members should be well versed in the technology, and the use of consultants should include adequate time for transferring the necessary knowledge to the in-house team.

End users

End users who are unhappy learning new technology or feel that their roles have been diminished by the new technology are bound to be dissatisfied. The presumption often is that the implementation was unsuccessful when in fact the technology itself is fine but the end users are not utilizing it.

Satisfaction: The level of end-user satisfaction or dissatisfaction may stem from a number of sources other than the technology itself. Insufficient training, the complexity of new procedures involved, or the loss of communication with the traditional network of employees previously part of the now-automated workflow can all influence the acceptance of the new system. Striving for higher rates of satisfaction is important since lower rates of IT effectiveness can be expected with dissatisfied end users (Weill 1992). Dissatisfaction can also be caused by users' perception of how well the new system improves their job performance. If a system is difficult to use, its value to an employee may be seen as very low and thus the employee will register his or her dissatisfaction by choosing not to use the system, if that is an option (Adamson and Shine 2003).

Willingness to change: There are numerous reasons why individual employees may not be willing to accept the changes created by new technology projects. Fear of not being able to learn the new techniques, misunderstanding the intent of the new implementation, or loss of an employee's previous role may all contribute to an unwillingness to adapt to the new technology. Griffith, Sawyer, and Neale (2003) present an example of how fear generates a stumbling block to change. They point out that information is an intellectual property that makes an employee valuable. If information is easily disseminated across the company, then the value of the employee can be decreased. IT success can be affected negatively by employees threatened by the deployment of technology that will decrease their value to the company.

In order to decrease the resistance to change and hence improve the end value of the newly installed technology, end user participation in the implementation process is critical (Barki and Huff 1990). The psychological attachment that comes with being part of the entire process reduces the fear and uncertainty associated with change and increases the users' willingness to accept the change.

Stakeholders: Most technology implementations have a number of stakeholders, representing various departments or units in the enterprise, such as the board of directors. Not all stakeholders will assess new technology in the same way. For example, a line worker may look for increased efficiency in daily operations while the department manager looks for the cost savings. Determining end user satisfaction is not as easy as simply measuring the level of satisfaction within one group of stakeholders. A project can be successful for three out of five stakeholders, while falling short for the other two groups. Seddon, Staples, Patnayakuni, and Bowtell (1998) developed a matrix with one dimension representing the "point of view" from which the technology is being evaluated and a classification of the system being studied as the second reference. There are five points of view included in the matrix: the independent observer with no stakeholder involvement, the individual who wants to be better off, the group who wants to be better off, the manager or owner who wants the organization to be better off, and the country which wants the society as a whole to be better off. In this study, a stakeholders is defined as "a person or group whose interests are in the evaluation of IS success." While the matrix is useful in comparing historical literature, it also makes clear the important differences between stakeholders, the different ways success is measured, and the idea that "success" represents among the pool of stakeholders involved in the project.

INTEGRATIVE FRAMEWORK OF CONTEXTUAL FACTORS

The previous literature on contextual factors affecting IT implementation has identified a broad range of issues within unique environments. Each study focuses on different factors and how they affect the outcome of IT investment. But while these studies have greatly added to the understanding of individual contextual effects, an overall or holistic perspective of the contextual environment is largely missing. Looking at the individual pieces of the whole, the contextual factors, is critical and a necessary first step. Research is now needed to identify and integrate the factors that would be particularly useful for a complete implementation plan. Business environments typically consist of several factors that improve IT implementation while simultaneously possessing other factors that hinder the very same implementation.

Weill's (1992) seminal work on conversion effectiveness focused on only four contextual factors and did not seek to determine the factors that would lead to higher satisfaction, thereby leaving the understanding of the processes and underlying components of conversion effectiveness to further research. The integrative framework proposed in this paper expands the general categories into seven areas (Figure 2). It also provides deeper granularity with specific sub-categories culled from prior research (Table 1). The contextual factors are integrated into an enterprise-level

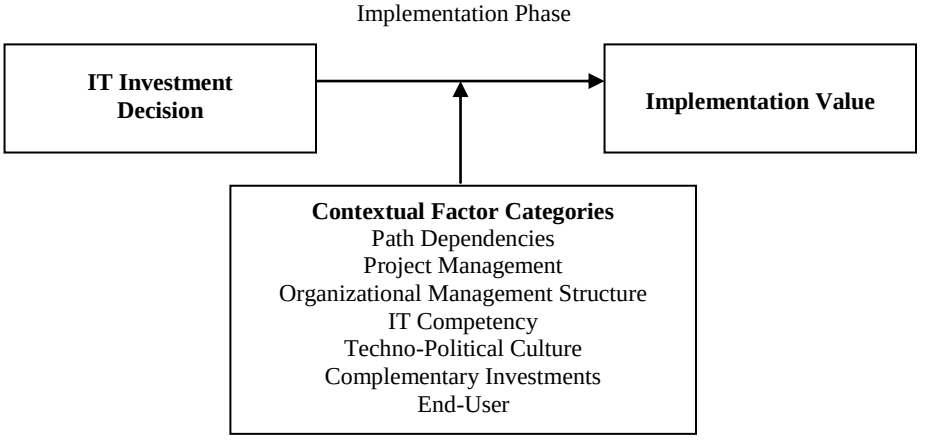

Figure 2: Integrative framework of contextual factors

framework providing a means of examining the internal business environment while the sub-categories assist in practical application of the research findings. This holistic approach leverages Weill's (1992) initial work and is a starting point for further research on the possible interaction of these factors.

Relationships among contextual factors

Organizations are complex entities, and the large array of factors that impact IT implementations makes it difficult, if not impossible, to test individual factors in isolation. In practice, factors do not exist in isolation and their relationships with other factors are therefore highly important. The following model of relationships among contextual factors illustrates an example of the types of interactions that can be found during a project implementation (Figure 3). Individual factors can impact others in such a way as to strengthen, weaken or neutralize the effects of others. An individual factor can be more or less significant than other factors within the same category.

Table 1: Categorization of contextual factors

Category	Individual Factors	Historical Research
Path Dependencies	Path Dependencies	Beath 1991; Ryan and Harrison 2000; Markus 2000; Tallon and Kraemer 2003
Project Management	Managing Expectations	Ginzberg 1981; Senn 2003; Somers and Nelson 2001
	Dedicated Resources	Somers and Nelson 2001
	Communications	Daft and Langel 1986
	End-user Participation	Barki and Huff 1990; McKeen, Guimaraes, and Wetherbe 1994; Noyes , Starr and Frankish 1996
Organizational Management Structure	Role of CEO	Earl and Feeney 1994; Raymond 1985
	Commitment Level	Ginzberg 1981; Jarvenpaa and Ives 1991; Kwon and Zmud 1987; Senn 2003; Somers and Nelson 2001; Swanson 1974; Weill 1992
	Corporate Project Champion	Beath 1991; Somers and Nelson 2001
IT Competency	CIO Competency	Armstrong and Sambamurthy 1996
	IT Experience	Weill 1992; Weill and Olson 1989
	Business Line IT Competency	Bassellier, Benbasat, and Reich 2003; Rockart, Earl, and Ross 1996; Sambamurthy and Zmud 1992
	Project Team IT Skills	Clemons 1998; Somers and Nelson 2001
Techno-Political Culture	Political Environment	Markus 1981; Markus and Bjorn-Anderson 1987; Weill 1992; Weill and Olson 1989
	Social Order	Barley 1990
	Interdepartmental Cooperation	Earl and Feeney 1994
	Mutual Understanding	Earl and Feeney 1994; Reich and Benbasat 2000
Complementary Investments	Change Management	Castle and Sir 2001; Kohli and Sherer 2002; Kwon and Zmud 1987; Ryan and Harrison 2000; Sherer, Kohli, and Baron 2003
	Business Process Redesign/Work Flows	Clemons and Row 1988; Rockart, Earl, and Ross 1996
	Training	Davenport 1998; Ginzberg 1981; Kleintop, Blau, and Currall 1994; Somers and Nelson 2001
End User	Satisfaction	Adamson and Shine 2003; Weill 1992
	Willingness to Change	Barki and Huff 1990
	Stakeholders	Seddon, Staples, Patnayakuni, and Bowtell 1998

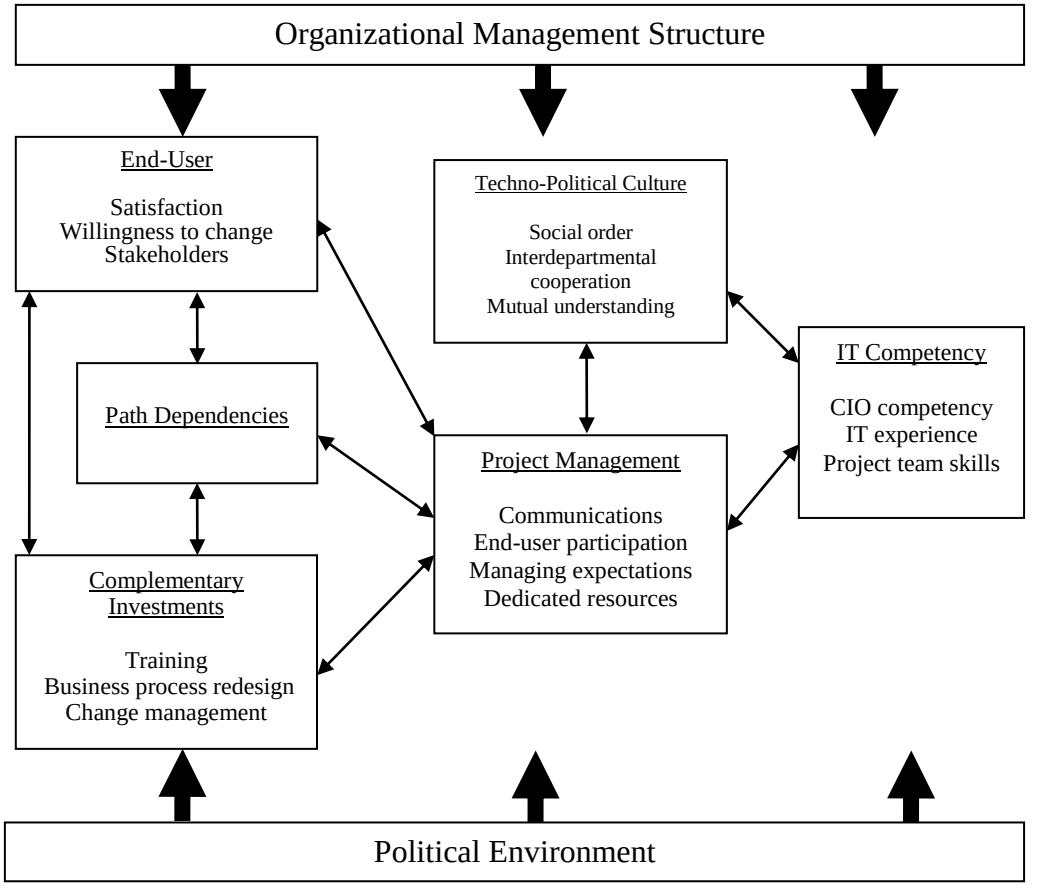

Figure 3: Contextual factor relationship model

This model, derived from Edington's focused ethnography study (2005), provides an example of the impact that different factors may have on each other. Take the relationship between path dependencies and complementary investments: if path dependencies are not aligned with the new technology, then complementary investments such as training become even more critical. For example, if the new technology being implemented is Linux-based, and end-users only have experience with MS Windows, the need for training end-users in the new environment is more critical than if they were already working in a Linux environment. Change management, one of the factors in complementary activities, was not utilized and the employees did not adapt well to the new technology; they resisted the change and used the Linux system as little as possible thereby limiting the success of the implementation.

Project management is a critical component for successful implementation because of its relationship with many other factors. The project itself can be affected negatively if the project team's level of IT competence is low, or it could suffer if techno-political factors such as interdepartmental cooperation are weak. Project management also affects the implementation of complementary investments such as training. The project management team would need to ascertain the types of training that are needed and then include them in the overall project timeline and budget. The project management team would also need to understand the existing path dependencies and determine the best course of action in order to improve the probability of the project's success. The satisfaction levels of end-users also hinges upon the communication and interaction with the project team. Clearly the multiple interactions associated with project

management make it a critical component of a successful implementation.

Organizational management structure and political environment (an individual factor in the techno-political culture category) are two items that broadly impact IT implementations. They affect the entire project because they define the environmental context in which the project is implemented.

The political factor represents the political environment of the organization. Since the organization is actually composed of many subsystems, the interaction between those subsystems and their relationship within the organization creates a highly charged, constantly changing political environment where individuals and groups are vying for power. This political environment creates a formal power hierarchy as well as an informal power structure that plays in important part in every day activities. The political environment is an overriding force that can affect every other factor category. The power associated with political position can be helpful if the CIO is in a strong position within this hierarchy. Even the informal hierarchy position can be important to the general project team as a whole. If they are perceived as a powerful group that accomplishes goals, there is greater possibility that their interactions with other departments, such as the business units, will be fruitful and therefore improve the success of the project. Politics can also affect path dependencies, since political issues, such as relationships between external suppliers and high-ranking corporate managers, can influence the type of technology that has historically been selected, thus preventing or empowering the selection of the next technology.

Organizational management structure also has a wide-ranging impact on the project. Composed of several sub-factors, including the role of the CEO and the senior management commitment levels, organizational management creates the structure and the culture of the firm, which affects how all processes are conducted, including project implementation. The level of senior management commitment to a project can determine the level of resources allocated to it, which in turn impacts complementary items such as the amount and level of training that will be conducted. It can also change the way end-users feel about the project; if the perception is that management is ambivalent to the project, the end-user may not feel compelled to adapt to the new technology since there is no push from executives to do so. Certainly the project management factor category is affected by the role that the team plays in the organizational structure. The team will have more access to dedicated resources, and the ability to increase end-user participation, if project management holds a key position within the organization such as it does when there is a strong project champion from the executive team or if the CIO is seen as a member of the corporate-level management team rather than simply the head of an IT support function.

Factors related to cross-border projects

External factors, those found outside of the corporate entity, also have an impact on the firm's overall behavior, including investment decisions and technology project implementation. Regulatory bodies and governmental agencies are able to impose new rules and deadlines that impact IT decisions and implementation. The continuing strong trend toward outsourcing various elements of technology projects creates additional factors affecting the value of an implementation. Outsourcing can occur domestically, with one company outsourcing to another company within the same country, or work can be globally sourced. Either sourcing method adds complexity to the factors affecting an implementation.

In addition to the seven internal factors, a firm that outsources globally will have to be aware of external factors that are critical for the collaboration with outsourcing vendors. Cultural differences are an external factor that might affect IT implementation negatively if members of the two companies are not aware of them. In many cases, cultural differences do not surface in business communication and can discourage collaboration between outsourcing clients and vendors. In many Asian countries, for example, the cultural norm is not to disagree with superiors; thus, a worker might agree to a deadline that is not possible. Formal reports are seldom used because positions are

often filled with relatives, with evaluations and hiring based on connections rather than merit. Thus, incentives that work well in North America may not work well in Asia (Davis, Ein-Dor, King, and Torkzadeh 2004). As a result, global IT outsourcing, which needs intense cooperation between outsourcing clients and vendors, can run into difficulty due to misunderstanding of each other's cultural backgrounds, motivations, and communication styles (Kaiser and Hawk 2004). Political stability is another factor that might affect offshore IT outsourcing. For example, the conflict between India and Pakistan over Kashmir might affect IT projects outsourced to India. Thus a firm may have to create backup centers outside the region and perform security checks on vendors to manage its IT outsourcing successfully (Davis, Ein-Dor, King, and Torkzadeh 2004). According to Abraham et al. (2006), in the global outsourcing environment, the mission of the IS function has been shifted from providing technology-based solutions to managing the process of delivering and providing them. Thus, a CIO's project management skills and business domain knowledge are ever more important for IT implementation that depends on offshore IT outsourcing. While IT cost reduction is one of the main motivations for offshore outsourcing, the damage from mismanaged projects can exceed the potential benefit from IT cost reductions (Strassmann 2004). Thus, in addition to technical skills, the CIO's business domain skills, such as negotiation of outsourcing contracts and management of outsourcing vendors, are critical for IT implementation.

Cross-border projects associated with global IT outsourcing make the corporate environment dynamic and complex. In such an environment, contextual factors become even more important for the success of globally outsourced IT projects. Thus, as discussed above, IT managers must be aware of the increased importance of contextual factors, particularly techno-political culture (cooperation with outsourcing vendors and mutual understanding of cultural differences), IT competency (CIO competency), and project management (communications).

This paper differs from the seminal work by Weill (1992) in several ways. First, we have expanded the contextual factors into seven categories and provided increased granularity in the description of each factor, as shown in Table 2. Secondly, the factor relationship was not part of the original work on conversion effectiveness. The factors affecting the implementation of IT projects do not exist in a vacuum; rather, they interact with each other, and the strength associated with one factor and the weakness of another can decide which factor will have the most influence over the project as a whole. Third, we discuss how external factors associated with cross-border IT projects increase the importance of the contextual factors. Finally, the model proposed in this paper uses "implementation value" – an intermediate level of value measurement derived specifically from the project – whereas Weill (1992) uses firm performance as the value indicator in his original model. The value here is associated with the specific project being assessed, whereas in Weill's model (1992) the ultimate return on investment can be influenced by many factors, thus making it difficult to determine how much of the value is derived directly from the implementation of a specific project. By narrowing Weill's concept of firm performance to intermediate value, we focus on the outcome (or value) of the project implementation, not on the change in the value of the firm.

CONCLUSIONS

Historical research has provided a great deal of information on individual contextual factors contributing to the success of IT projects. There is, however, a need for a framework that integrates these factors into an enterprise-level perspective. This holistic interpretation of the individual factors is an initial step toward understanding the complexities of the corporate environment and their effects on IT implementation success.

Weill's (1992) original concept of conversion effectiveness noted four contextual factors, and additional factors have been identified by subsequent researchers. However, a business environment is a microcosm of social networks where many of these factors are interacting in dynamic relationships. A better understanding of the factors associated with IT implementation is

valuable to organizations since it will help identify the environmental context needed to improve the chances of successful IT implementation.

The framework of contextual factors developed in this study can provide companies with a useful tool to evaluate their current environment, determine its strengths and weaknesses, and understand how these will affect IT implementation. Looking at only one factor, or even one category, does not provide the holistic interpretation supplied by integrative examination of all the different factors and their interactions at the enterprise level.

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REFERENCES

Abraham, T., C. Beath, C. Bullen, K. Gallagher, T. Goles, K. Kaiser, and J. Simon, "IT Workforce Trends: Implications for IS Program," *Communications of AIS*, 2006, 17, 1147-1170.

Adamson, I. and J. Shine, "Extending the New technology Acceptance Model to Measure the End User Information Systems Satisfaction in a Mandatory Environment: A Bank's Treasury," *Technology Analysis & Strategic Management*, 2003, 15:4, 441- 455.

Armstrong, C.P. and V. Sambamurthy, "Creating Business Value through Information Technology: The Effects of Chief Information Officer and Top Management Team Characteristics," *Proceedings of the 17th International Conference on Information Systems*, 1996, 195-208.

Barki, H. and S.L. Huff, "Implementing Decision Support Systems: Correlates of User Satisfaction and System Usage," *INFOR*, 1990, 28:2, 89-101.

Barley, S.R., "The Alignment of Technology and Structure through Roles and Networks," *Administrative Science Quarterly*, 1990, 35, 61-103.

Bassellier, G., I. Benbasat, and B. Reich, "The Influence of Business Managers' IT Competence on Championing IT," *Information Systems Research*, 2003, 14:4, 317-336.

Beath, C., "Supporting the Information Technology Champion," *MIS Quarterly*, 1991, 15:3, 355-372.

Brynjolfsson, E. and L. Hitt, "Information Technology as a Factor of Production: The Role of Differences among Firms," *Economics of Innovation and New Technology*, 1995, 3, 183-199.

Castle D. and M. Sir, "Organization Development; A Framework for Successful Information Technology Assimilation," *Organization Development Journal*, 2001, 19:1, pp 59 – 72.

Clemons, C., "Successful Implementation of an Enterprise System: A Case Study," *Proceedings of the 4th Americas Conferences on Information Systems*, 1998.

Clemons, E. and M. Row, "McKesson Drug Company: a case study of Economost – a strategic information system," *Journal of Management Information Systems*, July 1988, 5:1, 36-50.

Daft, R. and R. Lengel, "Organizational Information Requirements, Media Richness and Structural Design," *Management Science*, 1986, 32:3, 554-569.

Davenport, T.H., "Living with ERP," *CIO Magazine*, December 1, 1998, 12:5, 30-31.

Davis, G.B., P. Ein-Dor, W.R. King, and R. Torkzadeh, "Information Technology Offshoring: Prospects, Challenges, Educational Requirements, and Curriculum Implications," *Proceedings of the 25th International Conference on Information Systems*, 2004, 1027-1038.

Earl, M.J. and. D. Feeney, "Is Your CIO Adding Value?" *Sloan Management Review*, 1994, 35:3, 11-20.

Edington, B., "A Model of Internal Contextual Factor Relationships Affecting Technology Implementation," *Unpublished Doctoral Dissertation*, Pace University, New York, 2005.

Ginzberg, M.J., "Early Diagnosis of MIS Implementation Failure: Promising Results and Unanswered Questions," *Management Science*, 1981, 27:4, 459-478.

Griffith, T., J. Sawyer, and M. Neale, "Virtualness and Knowledge in Teams Managing the Love Triangle of Organizations, Individuals, and Information Technology," *MIS Quarterly*, 2003, 27:2, 265-287.

Irani, Z. and P. Love, "The Propagation of Technology Management Taxonomies for Evaluating Investments in Information Systems," *Journal of Management Information Systems*, Winter 2000-2001, 17:3, 161-177.

Jarvenpaa, S.L. and B. Ives, "Executive Involvement and Participation in the Management of Information Technology," *MIS Quarterly*, 1991, 15:2, 205-228.

Kaiser, K.M. and S. Hawk, "Evolution of Offshore Software Development: From Outsourcing to Cosourcing," *MIS Quarterly Executive*, 2004, 3:2, 69-81.

Kleintop, W., G. Blau, and S. Currall, "Practice Makes Use: Using Information Technologies before Implementation and the Effect on Acceptance by End Users," *Proceedings of the Computer Personnel Research Conference on Reinventing IS*, 1994, pp.120-132

Kohli, R. and S. Sherer, "Measuring Payoff of Information Technology Investments: Research Issues and Guidelines," *Communications of the Association for Information Systems*, 2002, 9, 241-268.

Kwon, T. and R. Zmud, "Unifying the Fragmented Models of Information Systems Implementation", in *Critical Issues in Information Systems Research*, Boland, J.R. and R. Hirschheim (eds.), John Wiley & Sons, 1987, 227-251.

Mckeen, J., T. Guimaraes, and J. Wetherbe, "The Relationship Between User Participation and User Satisfaction: An investigation of Four Contingency Factors," *MIS Quarterly*, December 1994, pp 427-451.

McKone, K and R. Schroeder, "A Plant's Technology and Approach: A Contextual View," *International Journal of Operations & Production Management*, 2002, 22:7-8.

Markus, M.L., "Implementation Politics: Top Management Support and User Involvement," *Systems, Objectives, Solutions*, 1981, 1:4, 203-215.

Markus, M.L., "Conceptual Challenges in Contemporary IS Research," *Communications of the Association for Information Systems*, 2000, 3, 1-21.

Markus, L. and N. Bjorn-Andersen, "Power Over Users: Its Exercise by System Professionals," *Communications of the ACM*, 1987, 30:6, 498-504.

Noyes, J.M., A.F. Starr, and C.R. Frankish, "User Involvement in the Early Stages of the Development of an Aircraft Warning System," *Behavior & Information Technology*, 1996, 15:2, 67-75.

Raymond, L., "Organizational Characteristics and MIS Success in the Context of Small Business," *MIS Quarterly*, 1985, 9, 37-53.

Reich, B. and I. Benbasat, "Factors that Influence the Social Dimension of Alignment between Business and Information Technology Objectives," *MIS Quarterly*, 2000, 24:1, 81-113.

Richardson, V, M. Subramani, and R. Zmud, "Benefiting from Information Technology Investments: The Role of IT Conversion Capability," *Working Paper*, 2003.

Rockart, J., M. Earl, and J. Ross, "Eight Imperatives for the New IT Organization," *Sloan Management Review*, 1996, 43-55.

Ryan, S. and D. Harrison, "Considering Social Subsystem Costs and Benefits in Information Technology Investment Decisions: A View from the Field on Anticipated Payoffs," *Journal of Management Information Systems*, Spring 2000, 16:4, 11-40.

Sambamurthy, V. and R.W. Zmud, *Managing IT for Success: The Empowering Business Partnership*, Financial Executive Research Foundation, Morristown, NJ, 1992.

Seddon, P.B., D.S. Staples, R. Patnayakuni, and M. Bowtell, "The IS Effectiveness Matrix: the Importance of Stakeholder and System in Measuring IS Success," *Proceedings of the 19th International Conference on Information Systems*, 1998, 165-176.

Senn, J., "Do Managers and IT Professionals View the Business Value of Information Technology Differently?" *Proceedings of the 36th Hawaii International Conference on System Sciences*, 2003.

Sherer, S., R. Kohli, and A. Baron, "Complementary Investment in Change Management and IT Investment Payoff," *Information Systems Research*, 2003, 5:3, 321-333.

Soh, C. and L. Markus, "How IT Creates Business Value: A Process Theory Synthesis," *Proceedings of the 16th International Conference on Information Systems*, 1995, 29-41.

Somers, T. and K. Nelson, "The Impact of Critical Success Factors Across the Stages of Enterprise Resource Planning Implementations," *Proceedings of the 34th Hawaii International Conference on System Sciences*, 2001.

Strassmann, P.A., “Most Outsourcing Is Still for Losers,” *Computerworld*, February 2, 2004.

Swanson, E.B., "Management Information Systems: Appreciation and Involvement," *Management Science*, 1974, 2:2, 178-190.

Tallon P. and K. Kraemer, "Investigating the Relationship between Strategic Alignment and IT Business Value: The Discovery of a Paradox," in *Creating Business Value with Information Technology*, N. Shin (ed.), Idea Group Publishing, 2003, 1-22.

Weill, P., “The Relationship between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector,” *Information Systems Research*, 1992, 3:4, 307-333.

Weill, P. and M. Olson, “Managing Investment in Information Technology: Mini Case Examples and Implications,” *MIS Quarterly*, March 1989, 12:1, 3-17.

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