Do National Culture and Organizational Development Affect the Effectiveness of ERP Implementation? A Tale of Two Cultures: US versus China

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ABSTRACT

As many US and European companies have implemented Enterprise Resource Planning (ERP) Systems, most of the previous implementation studies have tended to focus on companies from more developed countries. This research points out that there is need for academics and practitioners to "take stock," to examine what is happening in broad terms across organizations in the ERP implementation process, and to consider whether cultural differences in the U.S. when compared to another culture can impact the process. In this study, we are concerned with several issues surrounding current ERP implementation status and report initial findings from managers in a wide variety of organizations in the U.S. and China on their experiences with ERP implementation and attempt to suggest implications. Our findings center upon cultural differences, especially in the reported context surrounding ERP implementation in the two cultures. Moreover, we report that there is evidence for differences in ERP complexity and implementation extensiveness in the two cultures. Finally, we find some evidence for differences in reported outcomes. We include suggestions for future research.

KEYWORDS: US, China, ERP, implementation, Cultures

INTRODUCTION

As global economic competition becomes more intense, companies all over the world have to find ways to become more productive and profitable. In many U.S. companies, Enterprise Resource Planning (ERP) Systems have been implemented in order to gain operational effectiveness (Ifinedo & Nahar, 2006; Stedman, 1999c; Zviran, Pliskin & Levin, 2005). These systems are viewed as a means to integrate the different functions within the organizations so the speed of response to the market can be increased. In Europe, many European Union manufacturers are increasingly trying to be more innovative and flexible using ERP (Powell, Riezebos, & Strandhangen, 2013). In both U.S. and Europe, it is commonly known that implementation of such systems have not all been

successes. Many reported implementations have encountered huge cost overruns, and some of them even consumed so much in the way of resources from the organizations that the promised benefits of these systems never materialized. As an extreme example, companies have gone bankrupt after implementation, because adhering to the system forced the companies to modify their existing ways of doing business, even when it may have been precisely that way of operating which had previously made the organizations successful (Beatty & Williams, 2006; Lotta & Olli-Pekka, 2008; Osei-Bryson, Dong & Ngwenyama, 2008; Scarbrough, Robertson & Swan, 2008; Vilpola, Vaananen-Vanio-Mattila, 2006).

China surpassed Japan as the world second largest economy in 2010; its impressive growth was arguably enabled by abundant inexpensive labor. This competitive advantage has since, however, eluded as labor costs in many part of China have increased significantly in recent years. Many companies in China have begun to look for other means to remain competitive. It is also commonly known that before the World Trade Organization (WTO), most Chinese companies were funded and influenced by the central government. In many cases, these companies were driven by the political decisions made by the central government instead of driven by profitability. After WTO, many of these companies became more independently profit driven and as such, will have to find ways to become more efficient and cost effective. Productivity became the main focus. Looking towards the west, many Chinese companies have also begun to look for concepts and systems employed by its U.S. or European counterparts to boost productivity. They are, however, quite new to these systems and philosophies. In fact, concepts such as management by objective (MBO), total quality management (TQM), or lean manufacturing (Lean), including ERP, are quite unknown to many Chinese companies before the 1980s. Most of the companies are therefore playing catch up in the past thirty years.

In addition, very few can argue that the ultimate driver of productivity is still people involved in the system. It is, therefore, impossible to isolate the human factor out of any new management concept introduction or system implementation. As we are all aware, country culture impacts people's behavior on the job. It will be important to study how country culture impacts the implementation of a new management system, including ERP. Many studies have been done on the implementation of ERP in the U.S. or other western companies (Grabski, V., Leech, S., & Schmidt, P., 2011), very little has been done, however, to study similar implementations in China. As well documented in Hofstede's research, there are noticeable differences in the U.S. and China's cultures in two important dimensions, namely: individualism, and long-term orientation (Hofstede, G., 1993). It is, therefore, interesting to study companies in China versus the U.S. as they engaged in the implementation of the ERP systems. Our study focuses on providing such comparison. It is our intention to use this research to shed some light on specific issues involved in ERP implementation in China. We believe these issues may be quite different than the U.S. counterparts. It may provide some insights for managers in companies that operates in both U.S. and China and perhaps lessons can be learned across the borders.

RESEARCH OF ERP SYSTEM AND ERP IMPLEMENTATION – EXPERIENCES FROM U.S. MANAGERS

Enterprise Resource Planning (ERP) System is defined as an information system "that allows companies to automate and integrate business processes, share a common database and business practices throughout the enterprise, and produce information in real time" (Heizer and Render, 2006). The primary objective of an ERP is to help the firm integrate the organization as a whole, from the supplier's evaluation to customer invoicing effectively and efficiently (see especially commentary on the importance of integration by Cagliano, Caniato & Spina, 2006; Correa, 2005; Gattiker, 2007). ERP Systems have made a "splashy entrance" into the market (Beatty et al, 2006; Ferris 1999). This "splashy" introduction has been accompanied by widespread beliefs that ERP would be a shortcut to increased profits and productivity (Beheshti, & Beheshti, 2010; Grabbski, Leech, & Schmidt, 2011). ERP has evolved rapidly from modest beginnings during the 1970's, originating with discussion at IBM of integrating organizational planning and financial systems and the startup of SAP AG during that period to the reported current position of SAP as a global software giant (Gwin, 1998/1999). Traditional ERP systems include applications that integrate individual company's operations within and across the company legal entities. As these systems continue to develop, these applications extend supply functionality to external enterprises (generally vendor-affiliated companies or enterprises) to reduce cost, improve supply chain efficiency and to improve possibility of collaborative innovation. These systems are mostly known as ERP II systems although ERP continues to be the term used generically. In any event, the rate of changeover to ERP and in turn to ERP II has been so swift, as Stedman (1999c) and Beatty and Williams (2006) point out, that early adopters have been faced with systems which became obsolete almost as soon as they are developed. Also notable has been the recognition that while organizations have made enormous investments in ERP, the systems are gaining "… a reputation for high costs, overruns, and failure to deliver" (Beatty & Williams, 2006; Gant, 2001; Lotta & Olli-Pekka, 2008; Scarbrough et al, 2008; Grabski, Leech, & Schmidt, 2011). "Very expensive to purchase, even more costly to customize," "require major change in the company and its processes," and "involves an ongoing process for implementation, which may never be completed" are some disadvantages listed in Heizer and Render (2006). Somers, Nelson and Karimi (2003) have pointed to the need to measure end-user computing success in evaluating whether ERP implementations are successful. Moreover, these researchers report validation of an earlier end-user computing satisfaction (EUCS) instrument initially developed by Doll and Torkzadeh (1988) for use in management information system (MIS) evaluation and report that in the ERP environment EUCS includes five factors, Content, Accuracy, Format, Ease of Use and Timeliness, consistent with the earlier research.

Several authors (Liang, Saraf, Hu & Xue, 2007; Mendel, 1999; Fui & Delgado, 2006) suggest that a major factor distinguishing less successful ERP adoptions from more successful ones may include lack of milestones throughout the process, lack of attention by top management, and poorly designed cross-functional implementation teams. Mabert, Soni and Venkatraramanan (2001) find that successful organizations, as defined as meeting budget and/or time targets, are characterized by extensive preparation *prior to* the implementation and by higher levels of authority, accountability, and communication during the implementation (i.e., *empowerment* during the process). Moreover, Mabert et al. (2001) point to a third factor, the issue of *customization*. From the perspective of Mabert et al. (2001), the key is in the up-front analysis, moving to best practice – and presumably higher-quality – business systems *before* ERP adoption, and thus avoiding the

need to customize. Thus, high quality, *effective* systems are in place *before* ERP adoption (see also Beatty & Williams, 2006). Grabski, Leech, and Schmidt (2011) suggest that an important point to notice in ERP implementation is most ERP systems are primarily people systems that are enabled through technology. Moreover, Fok et al. (2004) indicate the need for organizations to implement ERP in a *comprehensive* manner, where a full array of features, subsystems, and components are implemented, rather than attempting to implement limited features. Studies have examined the sequencing of TQM implementation and ERP implementation and findings generally suggest that an effective TQM implementation *prior to* ERP implementation increases likelihood of success (see especially Li, Markowski, Xu & Markowski, 2008; Schnederjans & Kim, 2003).

Moreover, recent research has suggested that the *extensiveness* of ERP systems, in the sense that the systems are used throughout the organization and are tightly integrated may be important in ERP success (note especially Cagliano et al., 2006; Foster & Ogden, 2008; Hill, 2008; Michel, 2007; Tokman, Richey; Marina & Weaver, 2007).

Schniederjans and Kim (2003) have noted that the use of business reengineering, establishing a total quality management culture have all shown to be important factors to successful implementation of ERP. Al-Mashari and Al-Mudimigh (2003) show that "SAP R/3 has been widely implemented to create value-oriented business processes that enable high level of integration, improve communication within internal and external business networks …"   Jones and Price (2004) propose that knowledge sharing in ERP implementation requires the end-users to understand how their tasks fit into the overall process, and understand how their process fits with other organizational processes. Grabski, Leech, and Schmidt (2011) suggest that successful ERP implementation rely heavily on correct change management via user education. Additionally, Pflughoeft, Ramamurthy, Soofi, Yasai-Ardekani and Zahedi (2003) have pointed to the importance of what they refer to as the organizational context in determining web use and benefits and report validation of an instrument to measure two key context variables, Market Pressure and Scope of Operations, and in this research, we extend the use of that instrument to measure the variables in China and the U.S.

Russell and Taylor (2006) have pointed out that ERP vendors and their customers have learned from earlier debacles. Facing the huge pressure from the market, ERP vendors have made swift progress. The new generation of ERP (ERP II) offerings sport stand-alone modules and open architecture. With the new ERP, companies can install only the modules they want, and they may even be able to install the modules from different vendors in the same ERP system.

SYSTEMATIC STUDY OF CULTURAL DIFFERENCES

The systematic examination of cultural differences has its origin in Hofstede's (1980) original study, where four dimensions of culture were identified: uncertainty avoidance, individualism/collectivism, masculinity/femininity, and power distance. The idea is that these are underlying dimensions which can be used to systematically distinguish one culture from another. Unfortunately, Mainland China was not included in this body of early work. In a later study, Bond & Pang (1989), using a survey designed by Chinese scholars, has suggested another category which appears related to Hofstede's original set -- Confucian dynamism (Bond & Pang, 1989; Hofstede & Bond, 1988; The Chinese Culture Connection, 1987). Finally, Trompenaars (1994)

has reported an examination of cultures including China which suggest that there are cultural differences in perceptions about organizations and the individual's place in the cultural context. In turn, for all of these researchers, cultural differences lead to differences in the way the economy, organizational environments, and the workplace operate. Of interest to this research is the prospect that, in differing cultures, there may be differences in managerial perceptions about ERP implementation, and the extent and effectiveness of its adoption.

Of importance to our expectations of differing perceptions about ERP adoption in China, note that there has been some recognition that China and the U.S., the two cultures of interest in this study, may differ in their approaches to *technology*. Sun and Bhattacherjee (2011) recently reported that in China, organizational intervention mechanisms are effective in indirectly shaping organizational users' technology utilization behavior, using Information Technology as a measurement. Ong (2001) reported a discussion with a research director for GarnerG2 Asia-Pacific who pointed out that U.S. e-businesses cannot, for example, simply count on transferring their practices to China. Moreover, Yin (2001) has pointed to the frustration expressed by U.S. expatriates working to introduce technology change into Mainland China. Such expatriates note not only differences in but also the slowness of the decision making process in China. Additionally, Chin, Pun and Hua (2001) have provided an extensive discussion of Mainland China's movement into what they term "quality transformation," a concept which may impact ERP adoption. They point out that the move to a real embrace of quality programs, including ERP, has been slow in China and there have been numerous obstacles and setbacks. While not explicitly using the term *cultural differences*, they discuss differences between China and the West, including lack of readiness to accept Western approaches to management, concern for bureaucracy, and lack of concern for quality or customer resulting from state controls rather than market incentives. In general, the existing literature suggests that there are cultural differences between Mainland China and the West – the U.S., in this study – which may impact organizational culture or perceived organizational outcomes. Moreover, there may be differences in the extent and quality of the adoption of programs such as ERP, with some indication that China may be slow to adopt such programs. However, as researchers have begun to examine ERP implementation in China, compared to other cultures, the differences which emerge appear to be less a function of national culture (see especially Liang & Li, 2008; Newman & Zhao, 2008; Ngai, Law & Wat, 2008; Xu & Ma, 2008) and that the *organizational* culture may be the more important factor (see Al-Mashari, Sairi &Okazawa, 2006; Huigang, Saraf, Quing & Yajiong, 2007; Ke & Wei, 2008).

Of interest to this research is the prospect that, in differing cultures, there may be differences in how ERP is implemented and in satisfaction with ERP and the implementation. These ideas have recently been examined in China (Huang, Boehm, Hu,, Lu & Chan, 2006; Liang, Xue, Boulton & Byrd, 2004; Martinsons, 2004; Poon & Yu, 2006; Soh, Kien & Tay-yap, 2000; Wang, Klein & Jiang, 2006) and there has been limited study in Europe (Van Everdingen, Van Hillegersberg & Waarts, 2006). Reports suggest a general pattern of identifying cultural differences impacting adoption. The apparent emphasis on the study of China is understandable, given the importance of that area's importance as a growing economic engine (Wang et al, 2006).

In general, the existing literature suggests that there are cultural differences between Mainland China and the West – the U.S., in this study – which may impact organizational culture or perceived organizational benefits of ERP. Moreover, there may be differences in the extent and

quality of the adoption of programs such as QM and ERP, with some indication that China may be slow to adopt such programs. These ideas lead to the development of our first research question, which we state in the null:

> **Research Question 1:** There will be no differences in the U.S. vs. Mainland China samples with respect to Market Pressure, Organizational Culture, Use of TQM tools, ERP experiences and ERP Outcomes.

ORGANIZATIONAL CULTURE, QUALITY MANAGEMENT (QM), MARKET PRESSURE, AND ERP RELATIONSHIPS

Earlier research has suggested that organizational culture and QM Maturity has impacts upon a number of the subsystems comprising an organization. The quality movement has consistently, from Deming (1986) to current advocates, focused upon the customer and giving superb customer service and attention to related groups within the organization as internal customers (Hart, 1995; Rigby et al. 2002; Hammer, 2001; Prahalad & Hamel, 1990). In line with these ideas and earlier findings (Fok et al., 2001), use of high quality IS in concert with mature QM programs should lead those in organizations to report that the organization's culture (as opposed to *national* culture, our previous focus) is supportive of the quality movement and, for example, that it is empowering and participative. Finally, increased emphasis upon quality throughout the organization and its systems should lead to perceptions that the organization is performing in qualitatively better ways. Note that these ideas suggest that there should be *synergies or consistencies* in these relationships which should extend across national/cultural boundaries, leading to similarities between the U.S. and Mainland China. Thus, as suggested in our first Research Question, there may be differences across cultures in the levels of organizational culture, QM Maturity, extensiveness and effectiveness of ERP adoption, and perceived ERP organizational benefits. However, when changes are made and, of interest to this research, as organizations face more market pressures, become more QM Mature, and develop positive organizational culture, we expect consistent changes in ERP experiences and ERP outcomes, *regardless* of national culture. Figure 1 shows the linkages we expect and relates linkages to the corresponding research questions involving consistencies.

In addition, the literature on adoption of information technology (Gatignon & Robertson, 1989; Grover, 1993; Premkumar & Ramamurthy, 1995) state that market pressure as important environmental conditions that influence the adoption of new technologies. Competitors' adoption and use of a new technology, such as ERP, encourages other firms to adopt similar technology in order not to lose their competitive positions. Furthermore, the theory of network externalities suggests that a bandwagon effect is created when there are more users of the new technologies which in turn encourage even more to use the new technologies (Katz & Shapiro, 1991; Kauffman et al., 2000). Hence, as the number of competitors that use ERP grows, pressure mounts on the firm to get on the bandwagon to stay competitive.

In our study, we believe that organizational context, such as the market pressures that organizations face when implementing ERP, their QM Mature, and the organizational culture will affect the complexity of the ERP systems and the implementation experience (Research Question 2 and 3 labeled as RQ2 and RQ3 in Figure 1). Additionally, the ERP systems complexity will be related

to the outcomes of ERP in terms of End-User Computing Success and operational/strategic benefits (Research Question 4 and 5 labeled as RQ4 and RQ5 in Figure 1). Finally, the ERP implementation experience will have impact on End-User Computing Success and operational/strategic benefits (Research Question 6 and 7 labeled as RQ6 and RQ7 in Figure 1).

Research Question 2: Organizational context, such as market pressure, QM Maturity, and organizational culture, will affect ERP complexity for the U.S. and Chinese samples.

Research Question 3: Organizational context, such as market pressure, QM Maturity, and organizational culture, will affect ERP implementation experience for the U.S. and Chinese samples.

Research Question 4: The complexity of the ERP systems will affect End-User Computing Success for the U.S. and Chinese samples.

Research Question 5: The complexity of the ERP systems will affect the operational and strategic benefits of ERP systems for the U.S. and Chinese samples.
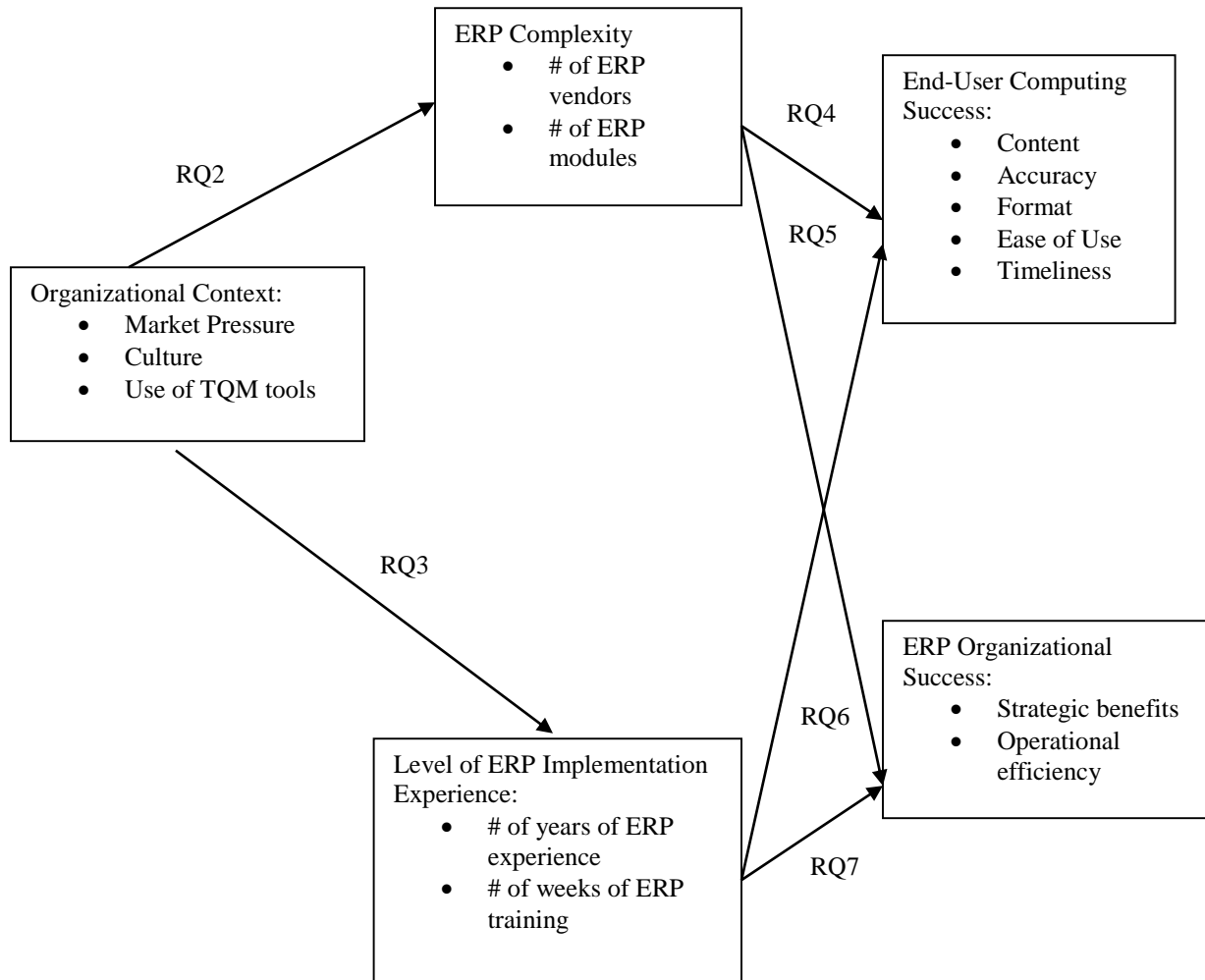
Research Question 6: The ERP implementation experience will affect End-User Computing Success for the U.S. and Chinese samples.

Research Question 7: The ERP implementation experience will affect the operational and strategic benefits of ERP systems for the U.S. and Chinese samples.

Figure 1: Research Model.

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                    ┌─────────────────────┐
                    │ ERP Complexity      │
                    │   • # of ERP        │              ┌──────────────────────────┐
                    │     vendors         │       RQ4    │ End-User Computing        │
                    │   • # of ERP        │─────────────▶│ Success:                 │
                    │     modules         │              │   • Content              │
                    └─────────────────────┘       RQ5    │   • Accuracy             │
          RQ2  ▲                          ╲              │   • Format               │
              ╱                            ╲             │   • Ease of Use          │
             ╱                              ╲            │   • Timeliness           │
┌──────────────────────────┐                 ╲          └──────────────────────────┘
│ Organizational Context:   │                  ╲
│   • Market Pressure       │                   ╲
│   • Culture               │                    ╲
│   • Use of TQM tools      │                     ╲
└──────────────────────────┘                      ╲
             ╲                                      ╲
              ╲ RQ3                                  ╲   ┌──────────────────────────┐
               ╲                                      ╲  │ ERP Organizational        │
                ╲                                      ╲ │ Success:                 │
                 ▼                              RQ6     ╲│   • Strategic benefits    │
        ┌──────────────────────────┐──────────────────▶ │   • Operational          │
        │ Level of ERP Implementation│                   │     efficiency           │
        │ Experience:               │         RQ7        └──────────────────────────┘
        │   • # of years of ERP     │
        │     experience            │
        │   • # of weeks of ERP     │
        │     training              │
        └──────────────────────────┘
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METHODOLOGY

SUBJECTS

The U.S. sample was from a university in a large Southern city in the U.S. and the Chinese sample was from a university in a large Northern city in China. There are 250 Americans and 79 Chinese in the sample. In the US sample, the subjects were 70% male and 30% female with an average age of 41 with 19 years of working experience and 12 years in management position. In the Chinese sample, the gender composition was the same as US but the subjects were younger and less experienced with an average age of 32, roughly nine years of working experience and five years in management position. This is expected since ERP implementation is still relatively new in China and the workforce is much younger in China.

In the US sample, 18% of the companies were in Manufacturing, 14% in Education, 10% in Utility, and the rest in various service industries. 57% of these companies employed more than 500 employees and 28% of them had annual revenue over 1billion US dollars. In the Chinese sample,

33% of the companies were in Manufacturing, 27% in High Technology, and the rest in various service organizations. 68% of these companies employed more than 500 employees and 48% of them had annual revenue over 1 billion dollars.

RESEARCH VARIABLES

Organizational Context - Market Pressure

The literature on adoption of information technology, especially those focusing on improving connectivity among companies, have shown that market pressure is an important environmental factor that influences the adoption of interorganizational systems (Gatignon & Robertson, 1989; Grover, 1993; Kauffman et al., 2000; Pflughoeft et al., 2003; Premkumar & Ramamurthy, 1995). To measure market pressure to use ERP from key external stakeholders, three questions are adopted from Pflughoeft et al. (2003). The 3-question measure covers the extent of pressure from competitors, customers, and suppliers on the firm to use ERP. The questions use a 6-point Likert scale – from 0 for "none" to 5 for "very great". Pflughoeft et al. (2003) reported a reliability index (Cronbach's Alpha) of 0.73 and this study has an index of 0.76. Exploratory factor analysis produced a single factor solution.

Organizational Context – Culture

 Based on previous research (Fok et al, 2000; 2001), we measured the Organizational Culture construct with a series of paired opposite items which asked whether the organization's climate should be described as open vs. closed, soft vs. tough, and the like. Table 1 below provides the items and shows the results of our factor analysis.

Table 1: Factor Analysis of Organizational Culture.

Rotated Component Matrix[a]

	Component	
	1	2
Open	.753	.161
Soft	.005	.690
Collaborative	-.038	.779
Informal	-.269	.527
Cooperative	.429	.625
Team Oriented	.752	-.046
Participative	.762	.024
Quality Oriented	.785	-.156
Innovation promoting	.803	-.067
Proactive	.784	-.037

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
   a. Rotation converged in 2 iterations.

As Table 2 indicates, we obtained a two-factor solution in the case of the culture items. We have labeled Factor 1 as "TQM Culture" and Factor 2 as "People-Friendly Culture" The TQM Culture

factor has a reliability index (Cronbach's Alpha) of 0.87 and the People Friendly Culture factor has a reliability index (Cronbach's Alpha) of 0.57. The results are generally in line with previous findings (Fok et al, 2000, 2001).

Organizational Context - QM Maturity

In this study, QM Maturity refers, in a qualitative sense, to the *degree* of QM implementation in an organization. We suggest, and previous research has shown (Ahire et al., 1996; Flynn et al., 1994; Fok et al., 2000, 2001; Patti et al., 2001; Saraph et al., 1989) that it can be measured by examining the perceived use of QM programs. These ideas assume that if an organization has more completely followed the QM philosophy, QM programs should be used throughout the organization and in various functional areas, rather than in isolation. Moreover, if "quality is indeed everyone's job," where QM is more fully in place, employees should be aware of the various QM tools and techniques which are in use. If an organization, on the other hand, has very little or no experience with QM, the opposite is expected. In earlier research (authors, 2000; 2001; 2002), we began the process of developing a measure of QM Maturity. The instrument we developed dealt with perceived program *use* and asked respondents whether seven programs are in use in the organization, with a range from "not used" to "high usage."

In this study, consistent with our earlier research, the QM Maturity instrument was used to gauge QM Maturity. We conducted a factor analysis to identify the underlying dimensionality. Two factors emerged from the "Usage" items.   The first factor appeared to include all the traditional quality management programs and was termed "Use of Basic TQM Tools." The second factor was termed "Use of Advance TQM Tools" and includes programs like Black Belt training and Six Sigma programs. The two factors have reliability index of 0.836 and 0.928, respectively. Table 2 below provides the items and shows the results of our factor analysis.

Table 2: Factor Analysis of Use of TQM Tools.

Rotated Component Matrix[a]

	Component	
	1	2
Quality Circles	.661	.375
Statistical process control	.734	.328
Employee suggestions channels	.826	.071
Employee quality training programs	.795	.104
Acceptance sampling	.663	.361
Six Sigma (Green Belt) Training	.228	.923
Black Belt Training	.207	.932

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

ERP Complexity

Based on the previous research (Hasselbring, 2000; Raymond, 1992; Scott & Vessey, 2000; Thong, 1999), ERP complexity is represented by the extent of ERP system implemented. This is measured by the number of ERP modules implemented and the number of ERP vendors or consultant partners involved in the ERP implementation process.

ERP Implementation Experience

The literature has emphasized the importance of user training and computing experience on system success (Ang & Soh, 1997; Sethi & King, 1998; Simon et al., 1996). In this study, we ask the respondents how many weeks of training they received internally and externally and how many years of ERP experience do they have.

End-User Computing Satisfaction (EUCS)

In this study, ERP success is measured by the instrument developed by Doll and Torkzadeh (1988). This 12-item survey instrument is a synthesis of the Ives et al. (1983) measure of user information satisfaction (UIS). The UIS instrument is a widely used, validated, and generalizable measure of IS success in computing environment (Au et al., 2002; Chen et al., 2000; Delone & McLean, 1992; Doll et al., 1994; Doll & Xia, 1997; Gelderman, 1998; Igbaria, 1990). The Somers et al. (2003) study examined the structure, as well as reliability and validity, of the EUCS instrument posited by Doll and Torkzadeh (1988) in the ERP environment. The findings confirmed that the EUCS instrument maintained its psychometric stability when applied to the users of ERP systems.

EUCS requires subjective self-reports of end-user satisfaction in five areas: content, accuracy, format, timeliness, ease of use of a computer application. The first four areas measure system usefulness while ease of use evaluates the user friendliness of the system. Factor Analysis has a 2-factor solution explaining 64% of the variance. The first factor contains all of the items measuring content, accuracy, format, and timeliness of ERP systems and therefore, named Information and System Quality (Table 3). This factor has a reliability index (Cronbach's Alpha) of 0.92. The second factor is consisted of the two ease of use items and therefore, named System User Friendliness. This factor has a reliability index (Cronbach's Alpha) of 0.93.

Table 3: Factor Analysis of EUCS instrument

Rotated Component Matrix[a]

	Component	
	1	2
Precise info	.697	.360
sufficient info	.751	.266
clear info	.610	.489
reports user need	.591	.362
in time info	.752	.198
useful output format	.541	.455
up-to-date info	.755	.035
content meet users need	.725	.342
accurate ERP system	.710	.350
ERP user friendly	.232	.917
easy to use ERP	.224	.918
accurate ERP	.746	.243

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

ERP Organizational Success

Factor analysis in this study indicated that two factors were present (see Table 4). We named Factor 1 as "Operational Benefits" and Factor 2 as "Strategic Benefits." The two factors have reliability index of 0.825 and 0.850, respectively.

Table 4: Factor Analysis of ERP Benefits

Rotated Component Matrix[a]

	Component	
	1	2
Increase communication with suppliers	.728	.291
Increase communication with customers	.796	.219
Increase sales	.816	.133
Support CRM	.778	.240
Improve business processes	.273	.858
Integrate sites and business units	.183	.836
Integrate information	.246	.852

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
   a. Rotation converged in 3 iterations.

RESULTS

Our first research question considered the possibility that managers from the two cultures (i.e., U.S. vs. China) might perceive that their organizations are at different levels in market pressure, organizational culture, QM Maturity, extensiveness and implementation experience of ERP systems, and ERP outcomes. Table 5 provides the MANOVA results. The overall results are significant (p-value = .000).   The results indicate that the respondents from the U.S. sample see their ERP systems have significantly higher levels of information and system quality and strategic benefits than those ERP systems from the Chinese sample. They also believed that their organizations have a higher level of People-friendly Culture than those organizations in the Chinese sample. The respondents from the Chinese sample, on the other hand, believe that their organizations have a higher level of use of Basic and Advanced TQM Tools and TQM Culture. In addition, the respondents from the Chinese sample reported more training for their ERP systems and more operational benefits by the ERP systems than the US sample. The results strongly support the idea that managers from different cultures have different experiences with culture, QM, ERP installation and performance.

Table 5: MANOVA results of the US v. Chinese Samples

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.849	119.770[a]	13.000	277.000	.000
	Wilks' Lambda	.151	119.770[a]	13.000	277.000	.000
	Hotelling's Trace	5.621	119.770[a]	13.000	277.000	.000
	Roy's Largest Root	5.621	119.770[a]	13.000	277.000	.000
Country	Pillai's Trace	.214	5.803[a]	13.000	277.000	.000
	Wilks' Lambda	.786	5.803[a]	13.000	277.000	.000
	Hotelling's Trace	.272	5.803[a]	13.000	277.000	.000
	Roy's Largest Root	.272	5.803[a]	13.000	277.000	.000

a. Exact statistic

b. Design: Intercept+Country

Country

Dependent Variable	Country	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
# of ERP modules implemented	USA	4.463	.183	4.104	4.823
	China	4.890	.316	4.269	5.512
# of ERP vendors used	USA	1.284	.049	1.188	1.381
	China	1.178	.085	1.012	1.345
REGR factor score 1 for analysis 1	USA	-.049	.065	-.177	.079
	China	.064	.113	-.158	.285
Use of Basic TQM Tools	USA	-.091	.065	-.219	.038
	China	.202	.113	-.020	.424
Use of Advance TQM Tools	USA	-.076	.069	-.211	.060
	China	.550	.119	.317	.784
Information and System Quality	USA	.006	.068	-.128	.140
	China	-.359	.117	-.591	-.128
System User Friendliness	USA	-.127	.064	-.254	-.001
	China	.063	.111	-.156	.283
Operational Benefits	USA	-.129	.064	-.255	-.002
	China	.478	.111	.258	.697
Strategic Benefits	USA	-.026	.066	-.155	.104
	China	-.284	.113	-.508	-.061
TQM Culture	USA	-.107	.067	-.238	.024
	China	.308	.115	.081	.535
People Friendly Culture	USA	.097	.071	-.042	.237
	China	-.073	.122	-.313	.168
Yr. implement ERP	USA	5.765	.302	5.171	6.358
	China	5.473	.521	4.447	6.498
ERP training	USA	2.383	.175	2.039	2.727
	China	3.562	.302	2.967	4.157

Our remaining research questions examined the implementation experiences and the impacts of ERP systems, regardless of whether from the U.S. or from China. Research Questions 2 and 3 held that organizational context, such as the amount of market pressure faced by organizations, the QM Maturity, and the organizational culture, would be related to the complexity of the ERP systems and the system implementation experience. For the US sample, the results show two pairs of significant relationship between the organizational contextual variables and ERP complexity and implementation experience while the Chinese sample has five significant pairs of relationship (Table 6). As American companies use higher levels of basic TQM tools, they are found to use higher numbers of ERP vendors (or consultant partners). Additionally, when they use higher levels of advance TQM tools, they show more experience in using ERP systems.

Table 6: Pearson's Correlation Matrix showing correlation between Organizational Context, ERP Complexity, and ERP Implementation Experience: US vs. China.

	ERP Complexity		ERP Implementation Experience	
USA	# of ERP Modules	# of ERP Vendors	# of weeks of training	# of years of ERP experience
Market Pressure	NS	NS	NS	NS
TQM Culture	NS	NS	NS	NS
People-Friendly Culture	NS	NS	NS	NS
Use of Basic TQM Tools	NS	.141*	NS	NS
Use of Advance TQM Tools	NS	NS	NS	.174**

	ERP Complexity		ERP Implementation Experience	
China	# of ERP Modules	# of ERP Vendors	# of weeks of training	# of years of ERP experience
Market Pressure	NS	.272*	NS	.288*
TQM Culture	NS	NS	NS	NS
People-Friendly Culture	NS	NS	NS	NS
Use of Basic TQM Tools	.250*	NS	NS	NS
Use of Advance TQM Tools	NS	.255*	NS	.253**

NS - not significant
** - Correlation is significant at the .01 level.
* - Correlation is significant at the .05 level.

In the Chinese sample, companies using more basic TQM tools are found to implement larger numbers of ERP modules while those using more advanced TQM tools are found using higher number of ERP vendors and have more experience in using ERP systems. Additionally, the

Chinese companies that face higher levels of market pressure are found to use more ERP vendors and have more ERP experience. The results provide some support for these two research questions but the significant relationships are quite different in the US and in the Chinese samples.

Research Questions 4 to 7 suggested that the complexity of the ERP systems and the ERP system implementation experience would be related to the two measures for ERP success: End-User Computing Satisfaction (EUCS) and Organizational Success. There are three significant pairs of relationships in the US sample while the Chinese sample has three (Table 7). In the US sample, when the companies increase the number of ERP modules implemented, the systems are found to have higher levels of strategic benefits to the company but are perceived to be less user friendly. Similarly, the Chinese companies that implemented larger number of ERP modules are showing higher levels of information/system quality and strategic benefits to the organization. For the US companies that use higher numbers of ERP vendors show higher levels of strategic benefits to the organization. The Chinese sample lacks evidence to support the relationship between the number of ERP vendors and the ERP success measures. The results show some support for Research Questions 4 and 5.

Table 7: Pearson's Correlation Matrix showing correlation between Organizational ERP Complexity, ERP implementation Experience, EUCS and ERP Organizational Success: US vs. China.

	EUCS		ERP Organizational Success	
	Info/System	User	Operational	Strategic
USA	Quality	Friendliness	Benefits	Benefits
ERP Complexity				
# of ERP Modules	NS	-0.126*	NS	0.124*
# of ERP Vendors	NS	NS	NS	0.139*
ERP Implementation Experience				
# of weeks of training	NS	NS	NS	NS
# of years of ERP experience	NS	NS	NS	NS

	EUCS		ERP Organizational Success	
	Info/System	User	Operational	Strategic
China	Quality	Friendliness	Benefits	Benefits
ERP Complexity				
# of ERP Modules	0.296**	NS	NS	0.233*
# of ERP Vendors	NS	NS	NS	NS
ERP Implementation Experience				
# of weeks of training	NS	0.226*	NS	NS
# of years of ERP experience	NS	NS	NS	NS

NS - not significant

** - Correlation is significant at the .01 level.

* - Correlation is significant at the .05 level.

When examining the relationship between ERP implementation experience and ERP success measure, no support was found in the US sample while the Chinese sample had one significant pair of relationships. In the Chinese sample, companies that give more ERP training are perceived by the users to have more user-friendly ERP systems. The results show minimal support for Research Question 6 and no support for Research Question 7.

DISCUSSIONS AND CONCLUSIONS

In this paper, we have reported the results of exploratory research into a series of proposed relationships between an important system for enhancing organizational competitiveness: Enterprise Resource Systems (ERP), and have considered whether differences emerge when these systems are implemented in two different cultures – the U.S. and Mainland China. Figure 1 shows the relationships we consider. We first considered what we describe as *organizational context* and the possibility that respondents in the two cultures could report differences in the context variables we considered, in this study, market pressure, organizational culture, and QM Maturity. Our MANOVA results found support for differences in levels of reported levels of the variables in the two cultures. We speculated that differences in levels of the context variables could, in turn, impact the complexity of ERP systems in the two countries as well as reported levels of ERP implementation effectiveness. Our results generally showed that there are some differences in reports of ERP complexity and implementation effectiveness in the two cultures. Finally, we considered whether these variables would influence our outcome measures, end user computing success and ERP organizational success. While we found some evidence for differences, we found no differences in ERP implementation extensiveness and ERP organization success.

Our results from this exploratory study offer considerable support for the sorts of relationships we have suggested. Especially notable are our significant MANOVA results, which suggest that the managers we surveyed see significant differences in their organizations, with the U.S. sample more critical of QM Maturity but more people friendly while the Chinese see their organizations as higher in use of Basic and Advanced QM Programs but culturally less accepting. Could the Chinese be experiencing the kind of de-humanizing pressures experienced in the U.S. in the early 1900's with the advent of the industrial revolution and scientific management, where it was not until the 1930's and 40's that Hawthorne Studies ushered in more concern for people. Are these differences *real,* in the sense of reflecting objectively-based differences in the ways ERP has been implemented in the two countries? Are there objective differences in the Accepting Culture and Organizational Performance across the two national cultures? Or could there be few "real" differences, and the differing reports from the managers in the two countries simply reflect the different ways managers from the two cultures respond to definition of successful implementation of various systems in their organizations?

Clearly, the information from this exploratory study does not provide a basis for answering these questions. What *does* provide an intriguing clue to guide future research is that the organizations

may have had a number of similarities, in objective terms. Recall that we pointed out that the Chinese managers were uniformly working in Chinese branches of U.S.-based companies. Thus, there may have been a number of points of organizational similarity to our U.S. sample, yet the managers saw their organizations differently from the U.S. managers. Future research will need to clarify how extensive the similarities are and what differences exist. What is notable, however, regardless of the similarities and differences along organizational lines, cultural differences appear to be impacting managers' perceptions about their organizations, their organizations' cultures, and their experiences with ERP.

Note, however, that in considering our findings, it is important to recognize that this research is, in fact, exploratory. We were attempting to get a preliminary "handle" on whether the constructs involved could be related and how they operated across two specific cultural settings. In effect, we asked a sample of managers for their perceptions and beliefs about the constructs, asking, for example, how extensively the managers believed that the programs were used, how well the organization was performing, and what the culture was like. As noted previously, there will need for clarification about how the differing reports across cultures are related to "real" organizational differences as well as how cultural differences could have brought about organizational differences.

Moreover, reliance on respondent perceptions in any setting can potentially introduce single source measurement bias, and as a next step it will be important to attempt to confirm our findings with more independent and observable measures. Thus, this study should be regarded *simply* as exploratory work which suggests that it may be worthwhile to examine our proposed relationships in a more sophisticated manner.

In addition, the correlation analysis which we used in this study to search for consistencies across cultures is, of course, inadequate to reveal issues of causation. For example, did organizations which *first* became QM Mature *then* go on to establish more extensive and effective ERP systems? Does QM Maturity and adoption of high quality ERP *lead to* high organizational outcomes, or are high-performing organizations simply more capable of implementing virtually any program in a high-quality manner? Clearly considerable additional, and probably longitudinal, study will be needed to tease out the directionality of the possible relationships.

From our perspective, what is notable is that context factors are potentially important for organizations searching for ways to improve their ERP effectiveness. This research suggests an intriguing series of relationships between the two cultures and, we believe, indicates that further study could lead to an understanding of the potential cross cultural impacts and could be helpful to managers seeking competitiveness and researchers hoping to learn more about ERP, organizations and quality.

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