The effects of organizational culture and environmental pressures on IT project performance: A moderation perspective

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Abstract

In this study we examine the impact of culture and environmental pressures on IT project performance. Specifically, the current study examines four dimensions of organizational culture (i.e., institutional collectivism, results orientation, positive work environment, leadership risk tolerance) and environmental pressures that are competitive and regulatory in nature. Within the context of these variables this study examines the moderating effect of environmental pressures (i.e., levels of competitive and regulatory pressure) on the relationship between organizational culture and IT project performance. The model was empirically tested with data from the United States and China. These two countries were chosen due to their very distinctive characteristics related to organizational resources and environmental factors.

Results support the theory that the relationship between organizational culture and IT project performance is moderated by environmental pressures. These results should aid project managers when making decisions pertaining to the designing and carrying out of project management practices.

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1. Introduction

A key question in project management research revolves around why some projects succeed while others fail. This question has led researchers to explore potential determinants that might lead to project success or failure. Despite recent advances in project management knowledge, the establishment of project management standards, and increased availability of project management resources to organizations under the leadership of the Project Management Institute during the last two decades, the majority of projects still fail (Yazici, 2009). For example, the Standish Group International (2009) found the overall project failure rate to be 72% in the US. Additionally, Gray and Larson (2003) found software development projects are often completed over budget and behind schedule.

Although it is difficult to quantify the financial cost arising from low success rates associated with information technology (IT) projects, a 2003 review estimated that a phenomenal $150 billion was attributable to wastage from IT failures in the United States, with a further $140 billion in the European Union (Dalcher and Genus, 2003). One reason for this high level of wastage may stem from IT projects being unique relative to other
types of projects due to several factors identified in a 2004 report from the Royal Academy of Engineering.

One of these factors is the lack of constraints associated with IT projects. That is people working on IT projects are sometimes guilty of taking on degrees of novelty and risk far in excess of the levels typically accepted by people working on other types of projects. A related problem for IT projects is the abuse of the perceived flexibility of IT. The inability to visualize the boundaries of what is practical or even possible in IT encourages people to change their minds more often than they might do for projects unrelated to IT where constraints are more obvious. Complexity can also be a significant obstacle to successful design and delivery of IT projects since complexity is both harder to detect and less well understood. This is due to the fact that the complexity associated with IT projects is more multi-dimensional, encompassing scale diversity, and heterogeneity.

Another unique factor associated with IT projects is the extremely rapid pace of technological progress in IT. This rapid change makes it difficult for expertise in a particular technique or language to become mature and established, as well as creating an environment where the use of unproven tools and solutions are acceptable. There is also a strong tendency in IT projects to start from scratch each time a new project is started, with software continually being reinvented to perform essentially the same function (The Royal Academy of Engineering, 2004).

The goal of the current study is to provide IT project managers with insights that will help them improve IT project performance. Nielsen and Michailova (2007) identified key success factors in the implementation of IT projects, specifically in the implementation of knowledge system IT projects. They were environmental factors, corporate culture and pressures such as following industry norms. They found the success of IT projects was related to the relationship between these factors and that management needs to be aware of their importance in planning IT projects.

In order to further examine the relationship between these factors, the current study examines how the alignment between organizational culture and environmental pressures impacts IT project performance. Specifically, the current study examines four dimensions of organizational culture (i.e., institutional collectivism, results orientation, positive work environment, leadership risk tolerance), and environmental pressures pertaining to competitive and regulatory pressures. Additionally, because IT projects are unique it is theorized that the manner in which the alignment between environmental pressures and organizational culture affects information technology (IT) project performance may also be unique for IT projects. It should be noted that within the context of the current study, alignment is viewed from a moderation perspective, where the interaction between two independent variables affects a dependent variable.

2. Theoretical framework

A common practice in management studies is to utilize contingency models when simpler models are considered insufficient to predict or explain the topic of interest. Over the years, several operations management studies have found a connection between alignment and business performance (Cao and Hoffman, 2011; Cao and Schniederjans, 2004; Joshi et al., 2003; Schniederjans and Cao, 2009; Tarigan, 2005). Traditionally, research on project performance (including IT project performance) has focused on the project manager’s individual leadership or on investigating organizational factors (Al-Ahmad et al., 2009; Yazici, 2009). One organizational factor that has been linked to project performance is culture (Belassi et al., 2007; Shore, 2008; Wang and Liu, 2007; Yazici, 2009). In addition to organizational factors being linked to project performance, research has also suggested that the environment may also play an influencing role in project performance (Schmidt et al., 2001). In the paragraphs below literature pertaining to organizational culture, environmental pressures, and the alignment between the two is reviewed. Hypotheses are then developed which examine how the alignment between organizational culture and environmental pressures affects project performance.

2.1. Culture and project performance

Culture is a multifaceted variable. Baba et al. (1996) studied technology management in American culture and concluded three interrelated forms of culture (i.e., national, organizational, and work culture) exist in corporations that use information technology. Work cultures are defined by a particular discipline (e.g., project management). Organizational cultures are subcultures within a nation derived from corporate founders and experiences. National culture is based on the behavior of people in a specific country. As mentioned earlier, the focus of the current study is on the effect of organizational culture on IT project performance.

Schein (1990) defined organizational culture as a pattern of basic assumptions that are invented, discovered, or developed by a given group as it learns to cope with problems of external adaptation and internal integration. They have worked well enough to be considered valid and, therefore, are taught to new members as the correct way to perceive, think, and feel in reference to problems. In addition, according to Martin (1992), organizational culture is a collection of elements with which individuals come into contact within organizations. These elements include dress norms, stories people tell about happenings, the organization’s formal rules and procedures, its informal codes of behavior, rituals, tasks, pay systems, jargons, and jokes only understood by insiders.

Throughout the last twenty years, a number of researchers have identified elements of culture that are believed to be critical to the success of an organization. Pfieffer and Viega (1999) identified high-involvement human resource practices, such as sharing information, careful hiring, and employing self-managed work teams that reflect successful organizational cultures.

Research suggests strong organizational culture enables people to identify what an organization expects and how they must perform to get the work done (Deal and Kennedy, 1982). Research also suggests organizational culture develops within
the context of national culture and executive leadership (Shore, 2008). It represents the particular ways of conducting organizational business and is critical in establishing the competence of the organization (Belassi et al., 2007). Because of this, it can be theorized that organizational culture, rather than national culture, can have more direct effects on project performance. This is supported by several studies on organizational culture. These studies share a key message that an appropriate organizational culture delivers positive performance (Belassi et al., 2007). For example, Nahm et al. (2004) revisited the impact of organizational culture on time-based manufacturing and performance. Based on a sample of 224 firms, they found a positive relationship between customer orientation and beliefs, between beliefs and time-based manufacturing, and between time-based manufacturing and performance. Ajmal and Koskinen (2008) studied the role of organizational culture on knowledge transfer in project-based organizations. They emphasized the importance of organizational culture awareness in the creation, sharing and utilization of knowledge.

It can also be argued that cultural factors specifically impact IT project performance. For example Akgun et al. (2011) found that a positive work environment creates the emotional security needed to enhance IT project success. King and Bu (2005) also found in a comparative study between Chinese and US IT hires that institutional collectivism had a significant impact on the IT hires perception and their eventual performance when working on IT projects. Additionally, Thamhain (2004) reported that leadership teams in IT projects lead to greater performance outcomes in their projects. Thus, organizational culture does appear to make a direct impact on IT project performance.

In order to measure organizational culture Belassi et al. (2007) created a set of questions based on various definitions of organizational culture available in the literature. Cultural dimensions that Belassi et al. (2007) used in their study include positive work environment, management leadership, and results orientation. Results from Belassi et al. (2007) found that positive work environments and management leadership are strongly correlated with each other such that strong management leadership and positive work environments go hand-in-hand. Results also suggest that companies with positive work environments and strong management leadership have better commercial success with new products, enjoy better customer satisfaction and have greater technical success than those with less positive work environments and weak leadership. Based on these findings, it can be theorized that organizational culture has a direct impact on IT project performance.

2.2. Environmental pressures and project performance

A wealth of research also suggests that the firm’s external environment is theoretically and empirically linked to performance (McGahan and Porter, 1997). The environment includes the industry context, the macroeconomic context, along with other national and cultural factors (Chan and Reich, 2007). Organization theorists generally agree that organizations with greater power over their environments are better able to function and survive than their less powerful counterparts (Perrow, 1986).

When exploring critical risk factors in project performance, several studies have identified that the environment plays an influencing role. Ling et al. (2009) suggested foreign project management practice can be affected by an operating environment in a different country, thus leading to different project performance outcomes. In another study Schmidt et al. (2001) found an unstable corporate environment, caused by such factors as competitive pressure, can radically alter user requirements and at times can make an entire project obsolete.

Badri et al. (2000) pointed out that in addition to competitive pressures, different government regulations or policies are part of the business environment that can affect firms. Thus, when comparing project performance in different countries, this aspect of business environment should be considered. This research is supported by Darnall (2009) who found regulatory pressures constrain an organization’s financial opportunities, while other regulations spur product and technology innovations, as well as encourage greater operational efficiencies.

In the current study we examine how environmental pressures moderate the relationship between organizational culture and IT project performance. Hypotheses involving the relationships between organizational culture, environmental pressure, and IT project performance are developed below.

3. Hypotheses

3.1. The alignment between organizational culture and environmental pressures on project performance

Alignment is a broad topic and has been a focus of researchers in the fields of business strategy, operations management, and information systems for a number of years. The concept of alignment originally developed from the idea that businesses should strive to “match” or “align” their business resources to the competitive context in which the business is situated (Venkatraman and Prescott, 1990).

Over the years several operations management studies have found a connection between alignment and business performance (Cao and Hoffman, 2011; Cao and Schniederjans, 2004; Joshi et al., 2003; Schniederjans and Cao, 2009; Tarigan, 2005). Research pertaining to how the alignment between organizational culture and environmental pressures affects IT project performance indicates the environment may influence the relationship between organizational culture and performance in several ways. For example, in a field study of 76 technology-based project teams, Thamhain (2004) found the environment in which the project team operates can influence team performance. Additionally, Barua et al. (1996) found that project processes need to be modified in order to meet changes in a business environment. Conversely, if processes are left unchanged, the organization will not perform as well in a volatile competitive environment. In a case study Clark (1999) observed that competitive pressure requires changes in project processes in order to improve the “bottom line” in the performance of contracted project services. They also found
competitive pressure modifies the performance outcomes of projects.

In another study, Hong and Schniederjans (2000) empirically demonstrated the impact that global competitive pressure can have on new product development performance. They also found the size of the project is less important than factors such as balancing technology and human resources. More recently, Gupta et al. (2007) found competitive pressure is actually an enabler of IT in organizations. They found a positive relationship between competitive pressure and business performance. It has also been theorized the competitive environment becomes more important when environmental uncertainty exists (Chan et al., 2006; Choe, 2003; Luo and Park, 2001); in highly-competitive industries (Peak et al., 2005); when government regulations alter competition (Peak et al., 2005); and when a strong corporate culture is present (Chan, 2002).

It should be noted however, that there is a research gap in examining how the environment should be included in research models, and the question as to whether environmental pressures serve as a mediating or moderating variable in the relationship between organizational culture and IT project performance. Neither of these questions has been thoroughly addressed in the prior literature. Focusing on the context of the second question, we view a moderating variable as affecting the direction and/or strength of the relationship between an independent variable and a dependent variable. Specifically, within a correlational analysis framework a moderator is viewed as a third variable affecting the zero-order correlation between two other variables (Venkatraman, 1989). We know from Baron and Kenny (1986) that a basic moderator effect can be represented as an interaction between a focal independent variable and a factor that specifies the appropriate conditions for its operation. Alternatively, a given variable functions as a mediator to the extent that it accounts for the relation between the predictor and the criterion. We know that mediating variables can explain how external factors take on internal significance (Fink and Neumann, 2007), whereas moderator variables specify when certain effects will hold while mediators speak to how or why such effects occur (Baron and Kenny, 1986). The difference between mediating and moderating variables can also be viewed from the perspective that a moderator variable influences the strength of a relationship between two other variables and a mediator variable is one that explains the relationship between the two other variables.

In our study, under the premise in the case of mediation, when the effect of environmental pressures is removed, the relationship between organizational culture and project performance would disappear. Based on the literature reviewed in our paper, we do not believe a case can be made for environmental pressures mediating the relationship between organizational culture and performance, thus we did not test for mediation. However based on the literature, we believe a strong argument can be made that environmental pressures moderate the relationship between organizational culture and performance, thus we test for moderation.

As mentioned above, in the current study we focus on four specific dimensions of organizational culture. These include institutional collectivism, results orientation, leadership risk tolerance and positive work environment. These dimensions were chosen because it is theorized each uniquely impacts IT project performance. Hypotheses regarding the relationship between each dimension and IT project performance, and how each of these relationships may be moderated by environmental pressures are developed below.

3.1.1. Institutional collectivism

Institutional collectivism has been defined as the extent to which organizations are perceived to encourage and reward collective distribution of resources and collective action (House et al., 2004). Institutional collectivism has its theoretical roots in institutional theory, which suggests expectations regarding appropriate organizational forms and behavior are expressed in the wider social environment, which in turn promotes development of an organization’s formal structure (Gupta et al., 1994).

Within the practice of project management institutional collectivism may take the form of a matrix organizational structure, support for cross-functional teams within the organization, or involvement of a wide-range of stakeholders in project tasks. Naor et al. (2010) found that institutional collectivism is positively related to manufacturing performance. Additionally, research by Gupta et al. (1994) on the institutionalization of the US government audit teams found that audit project performance improved when an organization relied upon collectivism modes. Hytter (2007) also found the greater the degree of institutional collectivism, the greater the chances of improving organizational performance through increased retention of employees.

Based on the literature reviewed above it can be reasoned that an organizational culture which is effective in terms of IT project performance in a low pressure environment may not be as effective in a high pressure environment. Thus, it can be theorized that environmental pressures may moderate the relationship between organizational culture and IT project performance. We also theorize organizations that have cultures with higher levels of institutional collectivism have higher IT project performance, which may be beneficial from a project performance perspective in an environment with higher levels of competitive and/or regulatory pressure. Specifically, the following hypothesis is put forth:

H1. Environmental pressures moderate the relationship between institutional collectivism and IT project performance (i.e., as environmental pressures increase, the relationship between collectivism and IT project performance becomes more positive).

3.1.2. Results orientation

Ideally, all businesses seek to possess a culture that is results orientated. An extensive survey of the literature on small and medium firms by Cigolini et al. (2008) revealed a results orientated organization can in many situations be productive. In terms of project management, Gillard and Price (2005) recommended project managers possess and instill a results orientated culture in their organizations as a prerequisite to enhancing business performance. In a product development project team case study, Sundstrom and Zika-Viktorsson...
(2009) showed a connection between a results orientated environment and a project team’s enhanced performance. Also, in a survey of 86 project professionals, Yazici (2009) found that in order for project-based companies to be successful, they have to create a results orientated culture in their organizations, and this relationship can result in improved project performance. Based on this research it can be theorized that given the lack of constraints, amount of flexibility, and amount of reinvention associated with IT projects, that organizations with more results orientated cultures have higher IT project performance. We also theorize that as environmental pressures increase, the relationship between being more results orientated and IT project performance becomes even more positive. Specifically, the following hypothesis is put forth:

**H2.** Environmental pressures moderate the relationship between results orientation and IT project performance (i.e., as environmental pressures increase, the relationship between results orientated and IT project performance becomes more positive).

### 3.1.3. Positive work environment

Similar to the positive relationship of results orientation and project performance, a positive work environment also translates into improved project performance. Howell and Shea (2001) found in a survey that project champions in product development projects can add to the creation of a positive work environment, and the environmental impact translates into improved project performance. More recently, Liberatore and Wenhong (2010) empirically found in a study of 324 projects that creating a positive work environment, which includes trust and goal congruence, has a positive effect on project performance. Based on this research it can be theorized that given the higher levels of complexity associated with IT projects that trust, goal congruence, and other aspects of a positive work environment can have a positive effect on IT project performance. We also theorize that as environmental pressures increase, the relationship between a positive work environment and IT project performance becomes even more positive. Specifically, the following hypothesis is put forth:

**H3.** Environmental pressures moderate the relationship between a positive work environment and IT project performance (i.e., as environmental pressures increase, the relationship between the positive work environment and IT project performance becomes more positive).

### 3.1.4. Leadership risk tolerance

Past research has found a link between leadership and project performance. Thamhain (2004) empirically tested the impact of work environments in project management and found a positive link between a work environment created by leaders and project performance. Specifically, results from Thamhain’s study suggest that many of the factors that drive project team performance, such as commitment and the ability to deal with risk, originate in the work environment that leaders create.

In addition to examining the link between leadership and project performance, recent research has also examined the link between leadership risk tolerance and project performance. Within the context of project management, risk tolerance can be defined as the willingness to take a risk during or with a project and the tolerance management allows in taking risks (Gupta and Govindarajan, 1982). Leadership risk tolerance can be defined as the way management communicates the organization’s tolerance to accept risk taking in projects (Thamhain, 2004). Recent research has examined the link between leadership risk tolerance and project performance, including a study by Ke and Wei (2008), which theorized how leadership should be used to develop a culture of tolerance for risk in ERP project implementations to ensure success. Newman (2009) has also suggested leadership in research and development (R&D) projects must include establishing a culture of risk tolerance if high performance is to be achieved. Given the lack of constraints, high amount of flexibility, complexity, and amount of reinvention associated with IT projects it can be theorized that risk tolerance may have a positive effect on IT performance. Specifically, the following hypothesis is put forth:

**H4.** Environmental pressures moderate the relationship between top leadership’s tolerance for risk and IT project performance (i.e., as environmental pressures increase, the relationship between tolerance for risk and IT project performance becomes more positive).

### 4. Methods

#### 4.1. Sample

Data was collected from the United States and China. These two countries were chosen due to their distinctive characteristics related to culture, capabilities and environment. The unit of analysis in this study is the organization, and as such, the subjects for this study are the project professionals within the organizations, including project managers, program executives, project coordinators, systems analysts, IT managers, and project consultants. For the US survey an initial sample of firms for inclusion in this study was randomly selected from the 2007 North American Industry Classification System (NAICS) Manual (2007). Surveys were mailed to firms in five different industries: retail trade; information; finance and insurance; professional scientific and technical services; and health care and social assistance. For the Chinese survey a random sample of firms in five industries was chosen based on the International Standard Industrial Classification (ISIC) codes.

A total of 1000 questionnaires were distributed in a single mailing in the US. Out of 198 responses 172 were usable, resulting in an actual response rate of 17.2%. A single mailing of 1000 questionnaires was also conducted in China. Out of 285 responses 261 were usable, resulting in an actual response rate of 26.1%. The unusable surveys were ones that did not contain sufficient data for further analysis. These response rates are not unusual when the unit of analysis is the firm, and the questionnaire involves extensive organizational level questions (Griffin, 1997).
To examine possible non-response bias, the companies that responded were compared with non-responding companies. Comparison of the distributions of the number of employees and the sales volumes showed no statistically significant differences at the $p < 0.1$ level (Flynn et al., 1994). Correlations appear in Table 1.

### 4.2. Variables and measurement

This study uses a two-part research design in order to increase the reliability and validity of the data collected. Part one involved constructing a questionnaire. This process began with reviewing and analyzing previous literature, and then moved to developing the theoretical framework. These steps have been reported in the previous sections of this paper. The next step involved constructing the questionnaire. In this study we examine three constructs: organizational culture, environmental pressures, and IT project performance. The manner in which each of these constructs is measured is discussed below.

Although several elements of culture have been identified, measuring organizational culture is still in its infancy, and there is no consensus on stable and definitive measures. Over the years only a handful of studies have investigated dimensions of organizational culture (Hofstede, 2001; Naor et al., 2010). Using a questionnaire based on the literature of organizational culture measures, Belassi et al. (2007) conducted a survey of organizations listed in the Mergent Online database to identify the dimensions of organizational culture within the context of new product development project success. Based on their study three dimensions were developed. These dimensions were adapted in the current study and include positive work environment, leadership risk tolerance, and results orientation. Most recently, Naor et al. (2010) explored the impact of organizational and national culture dimensions and their alignment with manufacturing performance. Only the impact of organizational culture dimensions (e.g., institutional collectivism) on manufacturing performance was found to be significant. The fourth dimension of organization culture, institutional collectivism, was adapted from their study.

Within the context of the current study, environmental pressures are viewed as being factors or conditions that can affect the health or life of an organization, or can affect an organization’s development or behavior. Based on prior literature (Choe, 2003; Luo and Park, 2001; Peak et al., 2005) we focus on competitive pressures and regulatory pressures. Questions pertaining to both competitive and regulatory pressures are included on our survey.

The dependent variable (i.e., project performance) items were adopted from (Nidumolu, 1995). Items included: projects met budget requirements; projects met expectations; project team members were satisfied to work together; benefits of projects to the organization were high; projects resulted in sales growth; projects helped the organization to increase market share; projects helped the organization improve its competitive position. It is important to note that not all of the Nidumolu (1995) items or dimensions were selected for this study. Those particular items selected from Nidumolu (1995) covered several dimensions from his study and were grouped into a unidimensional variable for this study. The items selected to represent project performance were those similarly found in other project management studies, such as Patanakul et al. (2010), Jha and Iyer (2007), and Jiang et al. (2002). In addition to the variables above, firm size and industry effects were controlled using dummy variables (Gujarati, 1970).

All items used to measure the constructs were adapted from previous studies and measured using a seven-point Likert Scale. A total of 31 items were used to measure the constructs in our proposed model (see Table 2).

After assembling a preliminary version of our instrument based on prior literature, we then conducted interviews with key project professionals. After completing these steps a series of questions addressing the key variables used in the study were developed. A pilot study was conducted by distributing the preliminary questionnaire to the project professionals of several companies in a Midwestern city located in the United States. They were asked to examine the degree to which the preliminary questionnaire captured the measured constructs and how easy or difficult the preliminary questionnaire was to complete. Based on feedback received in this pilot study minor adjustments were made in the instrument before conducting the survey.

### 4.3. Instrument validation

In this study overall instrument validity was assessed by evaluating the results of content, criterion-related, convergent, construct validities, and reliability tests (Boudreau et al., 2001). As noted earlier, the preliminary questionnaires were sent to and examined by a panel of project professionals in various organizations. The questionnaire was then modified based on

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<th>Table 1 Correlation matrix. a</th>
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<td>Mean</td>
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<td>1. Institutional collectivism</td>
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<td>2. Positive work environment</td>
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<td>3. Leadership risk tolerance</td>
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<td>4. Results orientation</td>
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<td>5. Competitive pressure</td>
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<td>6. Regulatory pressure</td>
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<td>7. Overall project performance</td>
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a On a scale of 1–7.
the input of the panel of experts. Content validity was thus established by carefully defining the topic of concern, describing items to be scaled, developing the scales to be used, and using a panel of experts to judge the quality of the instrument (Cooper and Schindler, 1998).

Criterion-related validity is the degree to which the survey instrument correlates with one or more criteria. The expected cross validity index (ECVI) is one measure for criterion-related validity (Kline, 1998). The ECVI values of all constructs (largest being 0.87) in this research were well below the value of 1 that has been described as “adequate”. This study employed confirmatory factor analysis (CFA) in linear structural relations (LISREL) to test the uni-dimensionality of the constructs. Standardized loadings for scale items ranged from 0.72 to 0.88. These CFA loading results were in the moderate-to-high range. Moreover, t-values for scale items ranged from 8.54 to 19.14, exceeding the 2.0 rule-of-thumb. As a result, all loadings for scale items were significant (p < 0.01).

Convergent validity concerns the degree to which multiple methods of measuring a variable provide the same results. Stand-alone indices (LISREL) are used to test convergent validity. They are based on the maximum likelihood function, which performs much better than indices derived from the generalized least squares approach (Hu and Bentler, 1998). Stand-alone indices include goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), incremental fit index (IFI), competitive fit index (CFI), root-mean-square-error of approximation (RMSEA), χ²/df; and Critical N. Hu and Bentler (1998) recommended a maximum cutoff value close to 0.06 for RMSEA (Hu and Bentler, 1998). A minimum cutoff value close to 0.9 is suggested for GFI, AGFI, IFI, and CFI.
Discriminant validity (Bollen, 1989). The $\chi^2$ value should be significant at the 0.05 level (Kline, 1998). Critical N allows research to assess the fit of a model relative to identical hypothetical models estimated with different sample sizes (Hoelter, 1983). Critical N is computed based on the Chi square ($\chi^2$) and its degrees of freedom. A Critical N that is lower than the actual sample size in CFA shows that CFA has sufficient power to detect problems causing poor fit (Jöreskog and Sörbom, 1993).

The CFA measures of the conceptual model for our data indicate the (RMSEA) (0.047) and the $\chi^2$ (significant at level of 0.01) values meet the requirements for good fit. All GFI, AGFI, CFI, and IFI values also exceeded the minimum cutoff value of 0.90. Critical N value (276) was lower than the respective sample sizes of 433, indicating the conceptual model is a good fit. All constructs and scale items used in this study thus meet the requirements for adequate validity.

Discriminant validity is the degree to which measures of different latent variables are unique (Hensley, 1999). That is, in order for a measure to be valid, the variance in the measure should reflect only the variance attributable to its intended latent variable and not to other latent variables. If a construct has discriminant validity, scale items measuring different constructs should have low correlations (Spector, 1992). CFA was employed to assess the discriminant validity ($\chi^2$ difference test using a significance of $p = 0.01$ level).

Results from a discriminant validity analysis using the $\chi^2$ difference test indicate that for each of these three pairwise comparisons, the $\chi^2$ difference between the unconstrained model and the constrained model was significant at the $p = 0.01$ level. As a result, all three constructs are related but conceptually they present distinct traits.

Cronbach’s alphas were calculated for all constructs and dimensions in the conceptual model (Flynn et al., 1990). Cronbach’s alpha is the most widely used method of reliability assessment in business research (Chau, 1999) and is based on the correlations among the indicators that comprise a measure with higher correlations among the indicators associated with high alpha coefficients (Pedhazur and Schmelkin, 1991). The Cronbach’s alpha values for the both US and China survey exceeded the suggested value of 0.70 generally considered adequate for assessing reliability in empirical research (Nunnally, 1978). The scale items used in this research can thus be considered reliable.

5. Analysis and results

5.1. Analysis

Before our research model was tested, an analysis was conducted to explore whether there are differences in the model’s two constructs between Chinese and US firms. In the analysis we examined the differences between the US and China in light of organizational culture (i.e., dimensions of institutional collectivism, results orientation, leadership risk tolerance, and positive work environment), and the firm’s environment (i.e., dimensions of competitive and regulatory pressure).

The first step of the analysis was to conduct a Hotelling’s T-square test in order to detect if there were significant differences at the construct level for each of these three constructs (Hotelling, 1931). This is a method for testing to see if there are differences between the (multivariate) means of different populations.

In the next step of our analysis we employed analysis of variance (ANOVA) to compare each dimension of the three independent constructs in order to determine if any of the specific dimensions of each construct differ between the US and China. To ensure our data set meet the ANOVA assumptions, we also examined the data for linearity, homogeneity of variance, and multicollinearity. The analysis indicated our data met the ANOVA assumptions.

ANOVA results for each specific dimension of the constructs reveal that both dimensions of the environmental pressures construct (i.e., competitive and regulatory pressures) were significantly different between the US and China. Results for the other organizational culture construct were mixed. Specifically, for the organizational culture construct, significant differences were found between the two countries for institutional collectivism, results orientation and leadership risk tolerance dimensions. However, no significant difference was found for the positive work environment dimension.

5.2. Results

The descriptive statistics and the correlation matrix for the variables examined in the study are shown in Table 1. Examination of the mean for the overall project performance variable indicates that the firms in our study have an average score of 4.08 which is close to the middle of the scale. The means for the independent variables all fall above the middle of the scale ranging from 4.35 for results orientation to 5.42 for positive work environment. An examination of the correlations between the variables examined in the study indicates that none of the variables are highly correlated.

Hierarchical regression (Vittinghoff et al., 2005) was used to test the hypotheses developed above. Hierarchical regression was chosen for two reasons. First, the firm level of data (n = 433) is nested within the country level of data (US and China), and as such, it is treated as an unbalanced panel. Second, a two-step testing process is needed to test the hypotheses that examine the moderating effects of environmental pressures.

The first step in the hierarchical regression analysis was to test for main effects, specifically, to test whether the individual dimensions of organizational culture are predictors of project performance. In step 2 of the hierarchical regression analysis, tests were conducted to determine if the relationships between organizational culture and project performance are moderated by environmental pressures.

Table 3 reports the results from the hierarchical regression analysis. In terms of direct effects, results indicate organizations that have cultures with higher levels of institutional collectivism have higher IT project performance. Results also indicate that organizations with cultures that are more results oriented have higher IT project performance. Additionally, results indicate organizations with cultures fostering more
positive work environments have higher IT project performance, however results indicate organizations with cultures that have top leadership exhibiting a higher tolerance for risk have higher project performance is not supported.

Results from the hierarchical regression analysis also demonstrate strong support for our proposed hypotheses. Hypothesis 1, which examines the moderating effects of environmental pressures on the relationship between institutional collectivism and IT project performance, is supported in the model. Results indicate that environmental pressures moderate the relationship between increased collectivism and IT project performance, such that as environmental pressures increase, the relationship between increased collectivism and IT project performance becomes more positive.

Hypothesis 2, which examines the moderating effects of environmental pressures on the relationship between being results orientated and IT project performance, is supported in the model. Results indicate that as environmental pressures increase, the relationship between being more results orientated and IT project performance becomes more positive.

Hypothesis 3, which examines the moderating effects of environmental pressures on the relationship between a positive work environment and IT project performance, is supported in the model. Results indicate that as environmental pressures increase, the relationship between a more positive work environment and IT project performance becomes more positive.

Hypothesis 4, which examines the moderating effects of environmental pressures on the relationship between top leadership’s tolerance for risk and IT project performance, is also supported in the model. Results indicate that as environmental pressures increase, the relationship between more tolerance for risk and IT project performance becomes more positive.

6. Discussion

6.1. Overview

This study has explored how the alignment of organizational culture and environmental pressures affect project performance. Specifically, the current study examined four dimensions of organizational culture and two dimensions of environmental pressures. Within the context of these variables the moderating effect of environmental pressures on the relationship between organizational culture and IT project performance was examined.

As mentioned earlier, our research model was empirically tested with data from the United States and China. Results from our analysis indicate there are differences between US and Chinese firms in terms of organizational culture (i.e., dimensions of institutional collectivism, results orientation, leadership risk tolerance, and positive work environment) and environmental pressures (i.e., dimensions of competitive and regulatory pressure).

6.2. Theoretical and managerial implications

Results from our study have theoretical and managerial implications. From a theoretical perspective these results support the idea that organizational culture affects project performance. Specifically, these results extend the work of several studies that
have examined the effect of organizational culture on project performance (i.e., Belassi et al., 2007; Shore, 2008; Wang and Liu, 2007; Yazici, 2009). In addition these results build on an empirical study by Naor et al. (2010) where the impact of national culture on manufacturing performance was examined in a comparative context of eastern countries (Japan and Korea) and western countries (Germany, US, Finland and Sweden). The results from Naor et al. (2010) provide support for the idea that national cultures of Eastern and Western manufacturing plants are significantly different. However, one limitation associated with their results is that the 2010 study grouped multiple nations together for comparison purposes possibly blurring cultural differences. Our results extend the work of Naor et al. (2010) by supporting the contention that national cultural differences become more discernible through comparisons of individual countries, like China and the US, whose political and cultural differences are well established in the literature on dimensions such as collectivism. Our results also support the work of Harrison et al. (1999) who found a significant difference between the US’ and China’s behavior regarding continuing unprofitable projects and who demonstrated national culture impacts project performance.

Results also indicate that environmental pressures moderate the relationship between organizational culture and IT project performance. Although prior studies have found that organizational culture affects IT project performance, our study is the first to examine the moderating effects of environmental pressures on this relationship. Our results suggest that environmental pressures moderate the relationship between all four dimensions of organizational culture and IT project performance. Specifically, environmental pressures moderate the relationship between organizational culture and IT project performance, such that as environmental pressures increase the relationship between increased collectivism and IT project performance becomes more positive; the relationship between being more results orientated and IT project performance becomes more positive; the relationship between a more positive work environment and IT project performance becomes more positive; and the relationship between more tolerance for risk and IT project performance becomes more positive.

These results underscore the importance of exploring moderating variables in project management research. Without exploring the moderating variables in this study, the unique relationships between different dimensions of organizational culture and environmental pressures would not have been revealed. It is only by exploring the impact of the one or more moderating variables that the significant relationships reflected in them are observed. This is especially true when environmental pressures increase, institutional collectivism becomes more important, and leadership tolerance for risk becomes more important.

In addition to extending prior research that has examined the effect of organizational culture on project performance, one of the primary goals of this paper was to provide IT project managers with insights that increase IT project performance. From a managerial perspective it appears dimensions of organizational culture and environmental pressures can interact in a manner that does impact IT project performance. For example, as environmental pressures like government regulation increase, there will be a tendency for project teams to exhibit increased collectivism which in turn appears to result in better project performance. This suggests that project managers might benefit by educating project teams on environmental pressures which in turn might actually improve project performance through increased collectivism behaviors. This research has also shown that project managers might find providing incentives or encouraging employees to keep trying during times of increased governmental pressure, may move project team members to achieve greater project performance outcomes.

Some of the practical implications of the analysis comparing the US and China reveal differences important to project managers. For example, our results indicate that having a positive work environment does lead to increased performance in project management situations. Additionally, our results indicate that organizations with cultures that have top leadership exhibiting a lower tolerance for risk do not lead to increased performance in project management situations. This suggests that when comparing US and Chinese operations, a conservative approach in leadership style can sometime hinder the project team in achieving their goals.

7. Conclusions and limitations

Our findings reveal environmental pressures moderate organizational culture and IT project performance. Based on the hypotheses testing we conclude that increasing environmental pressures that are competitive and regulatory in nature will moderate the relationship between organizational culture and IT project performance such that the cultural factors (i.e., collectivism, tolerance for risk, positive work environment, results orientated) and IT performance are positively related.

One limitation associated with the current study is that all measuring instruments used in this research were based on managers’ perceptions. Although this is a time-honored and valid operational process for measuring various constructs (Buchko, 1994), all questionnaire surveys are limited by the truthfulness of the respondents. It should be noted, however, that the validation and reliability analyses undertaken in this study do provide some level of assurance of the instrument’s ability to capture useful measures.

Another limitation of this study involves our use of a cross-sectional design. The rationale for the cross-sectional design was: (1) to examine the effect of organizational and environmental factors on project performance across industries and two distinct cultures, rather than in a specific industry, and (2) to obtain a sample size sufficient for analysis. Because the unit of analysis was an organization, the potential sample size was small, possibly as a result of the manner in which the questionnaires were distributed. Unfortunately, a cross-sectional design is limited and does not eliminate all of the external factors in obtaining industry-specific information (Sabherwal and Chan, 2001). Because of this limitation, if it is feasible, future research efforts might consider utilizing a longitudinal research design when examining the impact of organizational and environmental factors on project performance.
An added limitation is related to the issue of the origins of organizational culture versus project team culture. We recognize that small project teams may alter the usual organizational cultural dynamics on an IT project, potentially limiting the interpretation of this study where culture was defined at the organizational level. We believe that despite the occasional deviation from organizational culture a project team might exhibit, the pervasive and predominant culture of the organization will consistently pressure behavior to comply with the organization. Research has consistently shown that organizational culture is the ideal approach for behavioral compliance (Hu et al., 2012). To the extent that project team cultures might impact the findings of this study, they represent a possible limitation to our conclusions.

References


