

Formation of Interorganizational Relational Behavior in Megaprojects: Perspective of the Extended Theory of Planned Behavior

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Abstract: Current literature on relationship management has focused on formal mechanisms such as contracts but has neglected the inter-organizational behavior that determines the effective adoption of relational mechanisms in the context of megaprojects. This study examines the antecedents and consequences of relational behavior of participating organizations in megaprojects based on the theory of planned behavior (TPB). A sample of 285 senior managers working on China's megaprojects was surveyed, and the results were analyzed using partial least square structural equation modeling (PLS-SEM), revealing that: (1) the adoption of relational behavior is equally motivated by an organization's behavioral intention and perceived behavioral control (PBC), and (2) relational behavior, especially information exchange, contributes the most toward achieving a high project relationship quality. A closer examination of the data found that two moderating effects, namely project culture and prior experience with other participating organizations, were particularly important. These findings contributed to four implications for project participating organizations to cultivate relational behavior and improve relationship quality in megaprojects, including identifying potential behavioral benefits, enhancing relational competence, establishing collaborative culture, and reinforcing information sharing. **DOI:** [10.1061/\(ASCE\)ME.1943-5479.0000560](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000560). © 2017 American Society of Civil Engineers.

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Introduction

Megaprojects involve complex design and construction procedures that require careful timetabling and a wide range of expertise from multiple parties. All project stakeholders therefore need to develop an extensive web of intraorganizational and interorganizational relationships among themselves that extend right across the lengthy project lifecycle. The nature of the working relationships that evolve among the project stakeholders is known to have a major

effect on project performance in megaprojects (Drexler, Jr. and Larson 2000; Meng 2012; Miller et al. 2001). Good project relationships facilitate efficient and harmonious operations among these highly skilled project teams, making the best use of the project stakeholders' resources and skills to deliver a high-quality product. In contrast, poor relationships, which are characterized as cool, impersonal, and autonomous, with actors being driven solely by the need to make a profit (Uzzi and Lancaster 2003), lead to unnecessary conflicts, indecisiveness, and inadequate coordination of the megaproject's stakeholders, all of which have a major adverse impact on performance (Jha and Iyer 2007).

While an increasing number of scholars and practitioners have begun to study interorganizational relationship management among stakeholders, most have done so by applying one of two prevailing perspectives: formal control and relational governance (Poppo and Zenger 2002). Formal controls consist of a set of contractual and management-initiated mechanisms designed to guide behavior toward the desired objectives. A formal contract specifies fairly explicit stipulations of proscribed and prescribed behaviors and risk allocation (Macneil 1977; Zhang et al. 2016), while relational governance is instead based on relational exchange theory, which offers a less explicit set of terms, for example trust, that are designed to create a more value-enhancing relationship (Macneil 1980) and to facilitate project success (Jiang et al. 2016; Lu et al. 2015). In this context, relational contracting is a new tool that can be applied to improve the effectiveness of relational governance and support its crucial role in building, sustaining and strengthening the relationships between two contracting parties through a relation-oriented contract (Baker et al. 2002; Macneil 1977).

Although all the aforementioned mechanisms can be effective ways to improve interorganizational relationships, most previous studies have focused on developing regulatory and formal controls that require an organization to adopt a relational management

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approach, ignoring the behavioral and psychological aspects that would be expected of an organization that was actively seeking to contextualize formal control into their practice. In particular, the behavioral aspects of relationship management involve relational behaviors, which are defined as the desired actions involved in the exchange that promote the development of a collaborative relationship (Heide and John 1992; Hewett and Bearden 2001; Lusch and Brown 1996). Relational behavior reflects the effectiveness with which the formal controls that have been developed can be implemented, thus determining the eventual quality of the relationship management achieved. Li et al. (2000) highlighted the importance of relational behavior, pointing out that the cooperative requirement required in a contract remains mere lip service if the attitude and behavior of the participants continues to be adversarial and non-cooperative.

The aim of this study was therefore to improve project relationship quality by examining the factors that motivate and support the formation of relational behavior. The specific objectives were to (1) examine the impact of the different motivators and influencing paths that contribute to relational behavior in megaprojects; (2) quantify the effect of relational behavior on relationship quality in megaprojects; and (3) compare the strength of the aforementioned influencing paths under different contexts, focusing particularly on projects under high/low collaborative project culture (hereinafter collaborative culture) and project participating organizations with/without prior collaborative experience (hereinafter prior experience). To achieve these objectives, the authors first reviewed the relevant literature on the Theory of Planned Behavior (TPB) to develop a conceptual model with seven hypotheses to examine the motivators and outcomes of relational behavior. The authors moved on to conduct a questionnaire-based survey and then perform partial least squares (PLS) and moderating effect analyses on the data gathered to validate the proposed model. In the final sections of this paper, the authors discussed the findings, their implications, and considered the limitations of this study before concluding with suggestions for future research.

Literature Review

Interorganizational Relationship in Megaprojects

Megaprojects are expected to accomplish a challenging goal that cannot be completed by any of the parties involved working alone, resulting in multiple stakeholders with complex interrelationships and a dense network of interdependent interests (Van Marrewijk et al. 2008). High-quality project relationships help overcome the turbulence that is bound to arise in the course of any megaproject (Chi et al. 2011). When project parties can align their interests and develop a collaborative working relationship, this enables potential conflicts to be managed better and settled quickly. Knowledge is freely exchanged, allowing any problems that arise to be solved more readily, with all the parties involved integrating their specific capabilities to complete the project. Successful projects tend to involve active collaboration and high relationship quality among project organizations; for example, Morris and Hough (1987) highlighted the importance of excellent teamwork for a number of successful projects in the UK, such as the Thames Barrier and the Heysham 2 Nuclear Power Station.

In contrast, adversarial or deteriorated relationships among project parties have been shown to generally lead to poor project performance (Black et al. 2000; Meng 2012). The poor relationships between public bodies and their private sector partners have been reported to be the main reason causing hold-up problems in large infrastructures (Ping Ho et al. 2015) and even the failure of major

transportation projects (El-Gohary et al. 2006). Taking the frequently adversarial relationship between owners and contractors as an example, owners are likely to challenge requests for approval, force compliance by withholding funds, and seek to overly control the contractors' work, while contractors may exploit potential claims by aggressively negotiating change orders and withholding vital information (Suprpto et al. 2015a). Once a poor relationship has developed, small issues easily escalate into major disputes, causing costly delays and often ending up in formal litigation.

Despite the importance of good interorganizational relationships in megaprojects, the project stakeholders may show less interest in cultivating high-quality relationship with others than in maximizing their own interests. Generally, parties in formal contracts act in an atomized manner, prioritizing their own interests over those of their partners (Williamson 1975). Based on rational choice theory, which understands individuals as self-interested, short-term maximizers, contracting parties tend to protect and enforce their own rights and minimize their liabilities due to the limits of cognition (Eisenberg 1995). To overcome this weakness, researchers are increasingly resorting to relation-based methods such as relational contracting in which project partners are encouraged to practice relational behaviors (Ning and Ling 2013a). However, an examination of the literature shows that even when a project adopts a formal relational contract, project partners may still encounter behavior issues such as the lack of a cooperative mindset and insufficient interest in establishing a shared culture at the outset (Bresnen and Marshall 2000; Smyth and Edkins 2007). Memon et al. (2014) also suggested that to have successful relational contracting, clients and contractors must identify motivational factors, develop collaborative culture, and establish structured interactions. By focusing on the relational behaviors of project participating organizations, this study intends to facilitate a mutually engaged and collaborative relationship among prospective partners in megaproject.

Relational Behavior

The concept of relational behavior is drawn from the relational exchange norms framework proposed by Macneil (1980) that identified 28 overlapping relational exchange norms, each of which refers to a set of shared expectations regarding a particular type of exchange behavior that reflects the parties' mutuality of interests and a common long-term orientation (Sezen and Yilmaz 2007). This concept was developed further by Heide and John (1992), who proposed that the three most commonly observed relational behaviors are those pertaining to the norms of flexibility, information exchange, and solidarity. This conjecture has now been supported by a variety of reports in the literature (Hoppner and Griffith 2011; Lusch and Brown 1996) and these relational behaviors were thus selected as the components of relational behavior for this study. Specifically, *flexibility* refers to the shared expectations between the partners regarding the way they will behave when unanticipated changes in the contractual environment occur, *information exchange* is the shared expectation that information will be continually and freely exchanged, and *solidarity* is defined as the shared expectation that each partner will behave in a manner that benefits the collaboration as a whole rather than simply protecting their own interests (Heide and John 1992).

The extant literature on relational behavior in the construction industry has for the most part concentrated on its drivers, hindrances, and consequences (Williams et al. 2015). For example, Ning and Ling (2015) found that the project complexity and client type influenced the adoption of relational transaction practices, while other scholars compared the different drivers of and barriers to relational transactions faced by public clients, private contractors, and

consultants in public projects (Ning and Ling 2013b). In terms of consequence, there has also been some research into the influence of relational transactions on project performance and relationship quality and how this can vary in different countries or regions such as Hong Kong, Beijing, and Sydney (Ling et al. 2013; Ling et al. 2014). Ke et al. (2013) examined the effects of various relational behaviors on project outcomes and relationship quality through different contract strategies. Osipova (2014) argued that strategies to foster collaborative relationships and behaviors underpinned effective joint risk management.

Relational behavior has also been widely discussed in the relational-contracting-related literature. Based on a review prepared by Ling et al. (2014), many success factors of relational contracting are determined by behavioral or attitudinal aspects, including trust, cooperation, and commitment. Phua (2004) argued that efforts to improve performance relied on the premise that interorganizational relationships were actively enhanced by collaborative behaviors. Cheung et al. (2003) examined the behavioral aspects of the participants in partnering on a major railway project in Hong Kong. Practically, relational behavior can only be encouraged and facilitated and cannot be forced. To promote such behavior, it is important to examine the motivators and influencing paths of each organization when seeking to coordinate the actions of multiple participating organizations.

Although various theories have been proposed to predict the contextual antecedents of relational behavior in the construction field, such as relational contracts theory and network embeddedness theory (Ning and Ling 2015) from social and contractual perspectives, the psychological interpretation of an individual's behavior, such as their attitude and intention, has received limited attention. Classical behavioral theories have been applied to investigate psychological factors of human behavior, such as the Theory of Reasoned Action (Ajzen and Fishbein 1975), and TPB (Ajzen 1991). The Theory of Reasoned Action posits that both individual attitude and subjective norm can explain most behaviors (Ajzen and Fishbein 1975). Followed by that, scholars suggested a broader perspective by incorporating more components to explicitly explain human behaviors. TPB is an improved model based on the Theory of Reasoned Action and incorporates a construct of perceived behavioral control (PBC), which is the extent to which a person feels able to enact the behavior. Madden et al. (1992) proved that the inclusion of PBC enhances the prediction of behavior.

Regarding relational behavior, scholars have verified that it can be effectively predicted by different motivators in the TPB model, such as an individual's cooperative attitude (Lusch and Brown 1996), long-term oriented attitude and the relational competence (Paulraj et al. 2008). In recent years, TPB has been used as an effective framework by other industries to explain certain types of relational behavior such as information-sharing (Kolekofski and Heminger 2003) and knowledge-sharing behavior (Bock et al. 2005; Koka and Prescott 2002). Inspired by these studies, TPB has been selected as the basis in this study to investigate psychological motivators of relational behavior in megaprojects.

Theory of Planned Behavior

TPB is a well-known model that has been used extensively for predicting human intentions and behavior through identifying important predictors, including attitudes, subjective norms, and PBC. Here, *intention* indicates the probability that a person will behave in a certain way (Ajzen and Fishbein 1975); *attitude* describes positive or negative individual perspectives and comments regarding people, objects, and events (Ajzen and Fishbein 1975); *subjective norm* indicates the agreement of a reference group with a behavior; and

PBC represents individual perceptions of the availability of the ability, resources, and opportunity to perform a certain behavior; with these, actors feel themselves to be more in control, and their behavioral intention will increase, which in turn influences their behavior. In recent years, TPB has become one of the most influential theories for understanding, predicting, and changing a wide range of behaviors, finding applications in areas such as environmental sustainability (Swaim et al. 2014), technology acceptance (Al-Debei et al. 2013), and health sciences (Gallagher and Updegraff 2012).

Although TPB was originally developed for the study of individual behaviors, it has been extended to understand organizational behavior in recent years. For instance, Koropp et al. (2014) used TPB to examine family firms' financial choices. Dodor and Rana (2009) investigated schools' intentions in offering e-commerce education based on TPB. In situations where TPB has been used to explain organizational behavior, each organization represents an independent entity where the management's decision made either personally or collectively, governs the organizational behavior (Gavetti et al. 2012). Thus, researchers generalized the application of TPB by using the more inclusive terms like *actor* and *entity* to substitute for *individual*. In the construction field, many scholars have attempted to apply TPB to explore organizational intentions and behaviors in the construction field. For example, Aibinu and Al-Lawati (2010) developed a TPB-based theoretical structural model to identify key variables determining the willingness of a construction organization to participate in e-bidding. Cheng (2016) constructed a TPB framework to predict an owner's intention of adopting partnering contract. More recently, TPB was recommended to use in summarizing the influencing factors of alternative dispute resolution among project organizations (Lee et al. 2016).

If current studies are examined, two research gaps have been identified. First, the extant literature on megaproject relationship management mainly focuses on formal control such as legal contracts but seldom considers the cooperative relationship behavior that collectively shapes and restructures the relationships of the parties involved. Second, scholars explained the organizational behavior from external drivers, motivators, and hindrances but ignored the psychological factors that may intrinsically influence an organization's relational behavior, such as attitude and intention, especially within a holistic framework. Nor have past studies considered the effect of different project characteristics that may moderate the linkages between psychological motivators and organizational behavior. To fill these gaps, the authors proposed to use TPB as an integral framework incorporating both psychological and social influences to examine interorganizational relational intention and behavior for construction megaprojects.

Hypothesis Development

Intention and Relational Behavior

In an interorganizational relationship, each participating organization will have a different attitude regarding the adoption of relational behavior that is determined by the perceived outcomes and a trade-off between their perception of the benefits that will be gained and the potential risks that will be suffered to achieve those benefits. Thus, this study decomposed the attitude into two separate roles, the benefit perception attitude and risk perception attitude. The former derives from the perceived benefits involves a combination of economic, technical, service, strategic, behavioral, and social gains (Anderson et al. 1992), while the later results from perceived risks consisting of a combination of the monetary terms (Anderson et al. 1992) and relationship-related costs (Groönroos 1997).

In a megaproject, the participating organizations tend to possess positive attitudes once they perceive the benefits of relational behavior. Prior studies have found that relational behavior can generate both short-term and long-term benefits. The short-term benefits comprise low cost (Akintoye and Main 2007), short duration, premier quality (Black et al. 2000), and conflict avoidance (Chan et al. 2003), as well as contributing to improved project efficiency and stakeholder satisfaction, while the long-term benefits consist of increased organizational competitiveness (Love et al. 2002) and improved organizational competence and reputation, as well as the achievement of possible future relationships and business opportunities (Lu and Yan 2007). Phua (2004) described the long-term benefits gained as the “shadow of the future,” where a project participating organization collaboratively engages in current business with the expectation of improving its future opportunities. Therefore, possessing a benefit perception attitude encourages participating organizations with more willingness to engage in relational behaviors.

Hypothesis 1 (H1). Benefit perception attitude is positively related to the intention of a participating organization.

Although the adoption of relational behavior contributes to many, if not all, of the aforementioned benefits, it may also lead to risks. First, the additional cost and time incurred in establishing, developing and maintaining relational transactions may impede the adoption of relational behavior (Bresnen and Marshall 2000). Second, clients in megaprojects might only have an occasional need for project development, discouraging the contracting parties from adopting relational approaches as a long-term business model. Such discontinuities in relationships inevitably undermine attempts to secure the full benefits of relational transactions (Bresnen and Marshall 2000) and the resulting relationship instability is costly for all the parties involved that are seeking to maintain a relationship (Heide and Miner 1992; Ng et al. 2002). Third, excessively close relationships may lead to allegations of corruption, resulting in a risk-perception attitude of project participating organizations toward efforts to engage in relational behavior (Ning and Ling 2013b). When these risk perception attitudes predominate, the participating organizations will be less willing to adopt relational behaviors.

Hypothesis 2 (H2). Risk perception attitude is negatively related to the intention of a participating organization.

The subjective norm measures an organization's compliance with its perceptions of what external influencers expect of them (Ajzen 1991). In this study, it refers to a participating organization's willingness to conform to the cooperative beliefs imposed by key stakeholders of a project. First, the subsidiaries participating in a megaproject are predominantly influenced by the strategies of their parent corporations (DiMaggio and Powell 1983). As parent corporations generally have a long-term strategy regarding the pursuit of future relationships, they may require their subsidiaries to engage in relational behaviors and build relationships with other participating organizations. Second, the relational behavior of organizations in megaprojects is also greatly influenced by industrial associations, which issue standards, guidance, and code of practice to regulate their behaviors (Phua 2006). Third, due to the social and economic influence of megaprojects, the relational behavior of participating organizations will also be influenced by frequent media reports regarding the project's progress, with frequent updates and previews of upcoming project-related events (Chi et al. 2011). Fourth, a project participating organization is inevitably subject to pressure from competitors who are also conducting relational behaviors and achieving the associated benefits (Phua 2006). Therefore, the intention of a project participating organization to conduct relational behavior may be influenced by important stakeholders.

Hypothesis 3 (H3). Subjective norms are positively related to the intention of a participating organization.

PBC indicates an organization's competence, which comprises elements such as knowledge, ability, and control, to actually implement relational behavior (Ajzen 1991). The more an organization believes it possesses the necessary resources or abilities to enact a given behavior, the more likely it will be to intend to and later perform that behavior (Ajzen 1991). In the context of interorganizational relationship evolving into a network, the definition of PBC is similar to that of several other competence-related constructs, including relational competence (Mazur et al. 2014), network competence (Ritter and Gemünden 2003), network capability (Walter et al. 2006), and relational capability (Lages et al. 2009). Among these, the authors selected relational competence to represent PBC due to its generality. Relational competence is defined as the ability to purposefully build, maintain and develop relationships (Pauget and Wald 2013). A participating organization with relational competence may manifest its ability to play different roles, for example by coordinating with a temporary organization and developing a social network (Bechky 2006). In addition, relational competence is critical for the creation of a sustainable competitive advantage that is difficult for competitors to replicate (Lages et al. 2009). Therefore, a participating organization with PBC is likely to have the confidence to express behavioral intention.

Hypothesis 4 (H4). PBC is positively related to the intention of a participating organization.

The TPB also predicts that PBC, in addition to influencing intention, may directly impact behavior (Ajzen 1991). The PBC of a project participating organization is made up of a set of intangible competences, including the ability to share knowledge and develop long-term relationships with other project stakeholders (Lages et al. 2009). Collins and Hitt (2006) contended that firms must build effective relational capabilities if they are to acquire external knowledge and diffuse knowledge across different organizations (Lane et al. 2006), while Paulraj et al. (2008) verified that long-term orientation capability contributes to interorganizational communication. Enhanced knowledge sharing and communication is thus essential for the formation of an organization's relational behavior; thus, organizations with stronger PBC will be more likely to engage in relational behavior.

Hypothesis 5 (H5). PBC is positively related to the relational behavior of a participating organization.

As noted earlier, the effect of behavioral intention on actual behavior has been well established in a number of different areas, including environmental sustainability (Swaim et al. 2014) and technology adoption (Pavlou and Fygenson 2006). Armitage and Conner (2001) verified the intention-behavior path based on a meta-analysis of 185 published studies. Focusing specifically on research into interorganizational relationships, the impact of intention on behavior has been found to be significant for both organizational knowledge sharing (Bock et al. 2005) and information sharing (Kolekofski and Heminger 2003). In line with the extant research on TPB, this study therefore developed the following hypothesis.

Hypothesis 6 (H6). Intention is positively related to the relational behavior of a participating organization.

Relational Behavior and Relationship Quality

Relational behavior, as described earlier, comprises information exchange, flexibility, and solidarity, while project relationship quality refers to the strength of the relationships among the contracting parties (Ning and Ling 2013a). In a megaproject where participating organizations exhibit relational behaviors, the greater the information exchange among stakeholders, the better they are able to anticipate

and respond to each other's needs. When this is achieved the participating organizations become more satisfied with the relationship (Griffith et al. 2006). Greater flexibility among the stakeholders enables them to appraise situations more quickly and adapt to environmental changes more readily. Such quick responses can help minimize any conflict that arises during stakeholders' interactions (Gundlach et al. 1995). When solidarity is present, project organizations solve problems jointly, gradually building trust and improving the relationship as a whole. Thus, by freely exchanging information, remaining flexible in unexpected situations, and acting with solidarity among one another, project participating organizations can achieve a high project relationship quality.

Hypothesis 7 (H7). Relational behavior of participating organizations is positively related to project relationship quality.

Moderating Variables

The development of a supportive project relationship is crucial but challenging in the context of cross-functional project teams. Engwall (2003) stressed that as no project is an island, the historical and contextual linkages among project participants can be vital for building coordinative relationships and project success. Lu et al. (2015) concluded that most project participating organizations in a megaproject will have prior experience with other stakeholders. Since most megaprojects are government invested projects and are thus likely to be performed or supported by a state-owned enterprise, the owners of government-invested projects will often work with the same companies they have worked with on previous projects and who they will also work with in the future on other projects. Thus, extant behavioral research has started exploring the significant moderating effect of prior experience (Lin and Ding 2005; Southwell et al. 2007). Project culture has also been reported as an important contextual factor that exerts a moderating effect. For instance, Wang and Yen (2015) investigated the moderating effect of safety climate between safety leadership and turnover intentions and Cheung and Rowlinson (2011) examined the moderating effect of project culture on different kinds of contract strategies. The authors therefore decided to examine the moderating effects of both prior experience and project culture on the seven hypotheses presented above.

Prior Experience

Project-relationship quality is influenced by the historical interactions among participating organizations since the prior experience determines their familiarity and trust development (Buvik and Rolfsen 2015; Zhang et al. 2009). For instance, prior experience builds mutual understanding and helps to establish clear expectations of others since they are familiar with each other's preferences and routines (Gulati 1995). Organizations with prior experience may also have a better mutual understanding of each other, willingness to build trust, so as to create opportunities to conduct more relational behaviors, such as information and knowledge exchange (Mayer and Argyres 2004). These knowing partners are also familiar with the appropriate means and channels to share information among one another, improving the efficiency and effectiveness of relational behavior (Buvik and Rolfsen 2015). Furthermore, organizations with prior experience will have more accumulated experience in dealing with potential conflicts and disputes than those without prior experience (Mesquita and Brush 2008), since they have built up norms that specify permissible behavioral limits and facilitate the predictability of each other's behavior (Gulati 1995). In addition, having prior experiences with a client will also make organizations more confident in making specific investments (Wagner and Bode 2014) on resources to improve the relational behavior. In recent research, scholars have suggested that historical

relationship between participating organizations may moderate the effect of relational behaviors on relationship outcome (Heide 2003). Based on previous studies, the authors posited that prior experience might interact with organizational intention, behavior, and all predictors, and therefore proposed the following hypothesis to test the moderating effect of prior experience on the whole research framework.

Hypothesis 8 (H8). Prior experience positively moderates the relationships assumed in most of the above hypotheses (H1, H3, H4, H5, H6, H7), but negatively moderates the relationship assumed in hypothesis H2.

Project Culture

Korzilius (1988) stressed the importance of establishing a unified, strong project culture for successful projects, as the lack of a unified culture can be detrimental to the attainment of the overall project objectives. Project culture is also known to have a significant impact on organizational attitude and intention to conduct collaborative behavior at both the intraproject and interproject levels (Ajmal and Koskinen 2008; Lau and Rowlinson 2009). De Long and Fahey (2000) argued that values, rules, and practices determine the culture within which people communicate, interact and exchange information. "Good" cultural values, such as information sharing and communication openness, will lead to positive behaviors (Alavi et al. 2005). For instance, Keskin et al. (2005) contended that clan culture, which emphasizes teamwork, participation, and cohesion, has a positive effect on a tacit knowledge-sharing behavior. The concept of teamwork, however, relies on the existence of synergies among the various team members to collectively and individually contribute to the creation of an effective team environment. Furthermore, project stakeholders have to be flexible in both roles and functions in order to adapt to working in a cooperative atmosphere where goals are achieved collaboratively rather than through competition (Tarricone and Luca 2002). It has also been argued that the adversarial culture in the construction sector is the main barrier hindering the adoption of relational behavior. Such culture is expected to introduce individual objectives that may be opposed to one another rather than establishing a joint objective (Bresnen and Marshall 2000). This would suggest that adversarial cultural values will lead to dysfunctional behaviors, such as information hoarding and, hence, undesirable outcomes (Alavi et al. 2005).

Following previous studies, the authors posited that the megaproject culture might interact with organizational intention, behavior, and all predictors, and therefore proposed the following hypothesis to test the moderating effect of project culture on the whole research framework.

Hypothesis 9 (H9). Project culture positively moderates the relationships assumed in some of the above hypotheses (H1, H3, H4, H5, H6, H7), but negatively moderates the relationship assumed in hypothesis H2.

Research Method

To test the research model and hypotheses, the authors first developed a survey based on a comprehensive literature review, which was then refined through a pilot study, and the final version was used for data collection.

Unit of Analysis

The unit of analysis in this research focused on the participating organizations who involve in the design and construction phases of a megaproject, such as owners, designers, and contractors. For each

organization, the authors collected questionnaires from key informants, such as the project director and managers, to represent the perspective of an organization, since they were more knowledgeable about interorganizational exchange relationships. The use of key informants as data sources has been widely adopted in the past studies on the interorganizational relationship (Paulraj et al. 2008; Shiu et al. 2014).

Measurements

The process of measurement development began with an investigation of the theoretical and empirical literature on relationship management and megaprojects. The measurement items used for the constructs were primarily developed based on existing scales from the extant literature that have been proven reliable and were modified to fit the context of megaprojects. It is worth noting that in line with

existing studies (Hoppner and Griffith 2011; Lusch and Brown 1996), relational behavior was operationalized as a second-order construct composed of three sub-constructs: solidarity, flexibility, and information sharing. Table 1 presents all the constructs, along with the scales and their source references. All constructs were measured reflectively with multiple items on five-point Likert scales except for prior experience, which was determined by a binary variable (0 = without prior experience, 1 = with prior experience).

Sampling and Data Collection

The scope of sampling was focused on megaprojects in China. The number of megaprojects in China has increased exponentially in recent years due to rapid urbanization (Hu et al. 2013). Researchers have investigated a variety of issues concerning megaprojects in China, including cost overruns for mega-dams (Ansar et al. 2014),

Table 1. Measures of Constructs

Construct	Description of measurement items	Key source(s)
Benefit perception attitude (BPA): 3 items ^a	BPA1: Improving project performance BPA2: Tackling conflicts BPA3: Building long-term relationship	(Black et al. 2000; Dubois and Gadde 2000)
Risk perception attitude (RPA): 4 items ^a	RPA1: Effort to build or maintain relationship RPA2: Losing short-term interest RPA3: Discontinuity of relationship RPA4: Allegation of corruption	(Glagola and Sheedy 2002; Ling et al. 2014)
Subjective norm (SN): 4 items ^a	SN1: Influence of parent firms (for clients, this refers to the government) SN2: Influence of competitors SN3: Influence of industry associations SN4: Influence of the media	(Liang et al. 2007; Wong and Boon-itt 2008)
PBC: 4 items ^a	PBC1: Competence in building relationships PBC2: Competence in knowing others well PBC3: Competence in communication PBC4: Competence in solving problems	(Lages et al. 2009; Mazur et al. 2014; Walter et al. 2006)
Intention (IN): 3 items ^a	IN1: Intention at the beginning IN2: Intention for the future IN3: Intention to continue	(Ajzen 1991; Liu et al. 2009)
Relational behavior (RB)	1) Solidarity (RBS): 3 items ^a RBS1: Addressing problems jointly RBS2: Helping others RBS3: Committing to improving project relationships 2) Flexibility (RBS): 2 items ^a RBS1: Flexible to changes RBS2: Flexible to conflicts 3) Information sharing (RBI): 3 items ^a RBI1: Providing proprietary information RBI2: Updating others' information RBI3: Providing information frequently	(Hoppner and Griffith 2011)
Project relationship quality (PRQ): 6 items ^b	PRQ1: Knowledge sharing PRQ2: Mutual trust PRQ3: Communication PRQ4: Problem solving PRQ5: Project commitment PRQ6: Common goals	(Meng 2012; Walter et al. 2006)
Project culture (PC): 4 items ^a	PC1: Goal-oriented culture PC2: Information-sharing culture PC3: Team-oriented culture PC4: Flexible culture	(Cheung and Rowlinson 2011; Zuo et al. 2009)

^aThe scale of the measure is as follows: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree.

^bThe scale of the measure is as follows: 1 = very bad; 2 = bad; 3 = neutral; 4 = good; 5 = very good.

trade corruption and safety in high-speed rail projects (Flyvbjerg 2014), and the economic impact of megaproject investment (Ansar et al. 2016). As the survey was administered in Chinese, the authors used a parallel-translation method, translating the survey between English and Chinese to ensure the accuracy of expression. Following the reconciliation of the different versions, the Chinese survey was vetted by two experts and sent out for pilot study by 26 experienced practitioners, consisting of 6 owners, 4 supervisors, 7 designers, 5 contractors, and 4 subcontractors. An examination of the results of the pilot study led to further refinement, including removing two redundant items, combining two that overlapped, and rephrasing items that were deemed confusing. The final version of measurement items is provided In Appendix S1 in the Supplemental Data.

A snowball sampling technique was utilized in this study to maximize the number of qualified respondents. Large companies that often participated in megaprojects were approached to fill in the survey, including China Construction Three Engineering Bureau Co., Ltd., China Construction Eighth Engineering Division Co., Ltd., and China Railway Seventh Group Co., Ltd. Two criteria were adopted to identify qualified participants, namely, those who have worked or are working on projects costing over 1 billion RMB (He et al. 2015) and those holding senior level positions in their firm such as directors or managers. All respondents to the survey were then asked to refer other eligible individuals who might be interested in participating.

The survey was completed between January and July 2016. A total of 352 responses were collected from 884 respondents, representing a response rate of 39.8%. After cleaning out the responses that contained incomplete key information or repeated answers throughout the questionnaire (this means a respondent selecting the same scale for all items in a questionnaire), a total number of 285 of 352 responses remained for the analysis. The

surveyed megaprojects included 70.1% costing from 1 to 5 billion RMB and 29.9% costing over 5 billion RMB. Regarding project duration, 57.0% took between 2 to 3 years, and 43% took longer than 3 years. Furthermore, 82.5% of the projects were public and 17.5% private projects. A majority of the megaprojects (85.6%) adopted design-bid-build as the delivery method, while the remaining 14.4% employed engineering, procurement, and construction, design-build and other methods. The rest of the demographic characteristics for these projects and the survey respondents are shown in Fig. 1.

Among the 285 responses, 38.9% were collected on the spot, and the remaining 38.2% and 22.8% were collected via an online survey and by email, respectively. The answers from the three types of responses were compared through a one-way analysis of variance (ANOVA), revealing no significant differences at the 0.05 significance level. Hence the data from all three sources were used for the analysis without distinction. The common method bias of the collected data was also tested by Harman's single factor approach (Podsakoff et al. 2003) and the result satisfied the required threshold value ($25.55\% < 50\%$) regarding the ratio of the first factor accounting for overall variance.

Data Analysis and Results

PLS, a component-based structural equation modeling technique (SEM), was used to evaluate the measurement scales and to test the research hypotheses proposed in this study. PLS is a useful way to model the relationships among multiple latent variables (Hair et al. 2014). Compared with other SEM techniques such as Amos, PLS is more appropriate for analyzing relatively small numbers of samples and for exploratory research (Gefen et al. 2000; Le et al. 2014). In this study, the authors opted to utilize PLS analysis for two reasons.

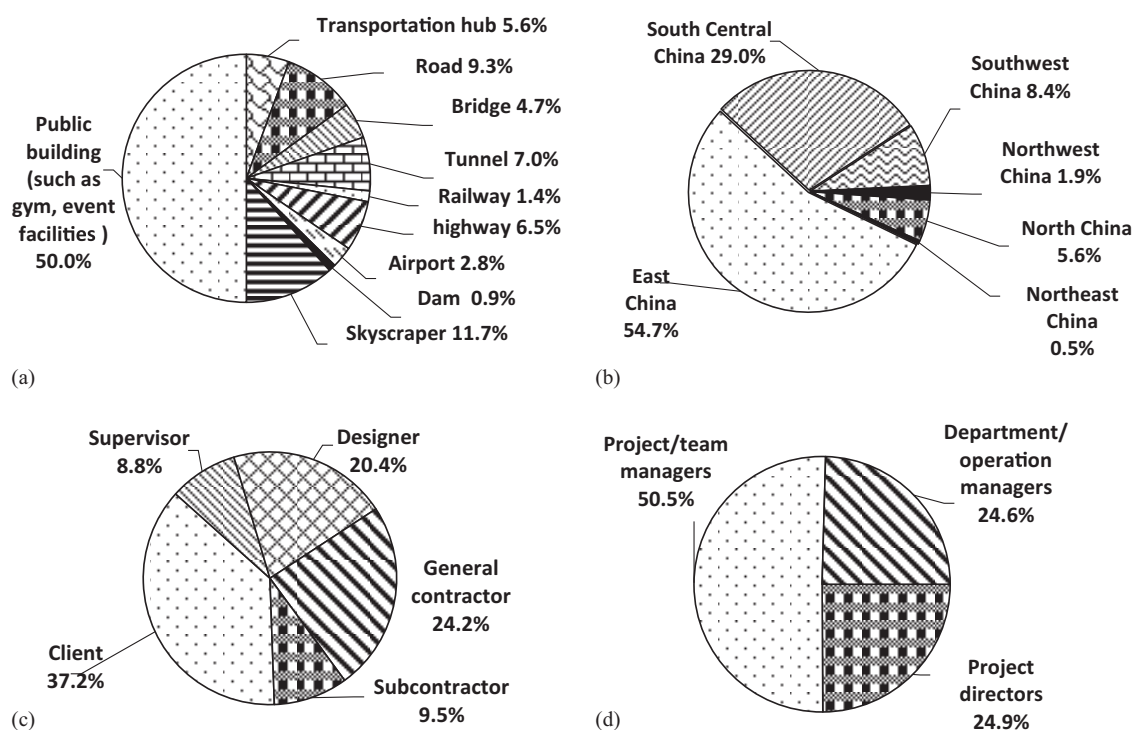


Fig. 1. Demographics of surveyed projects and respondents: (a) project type; (b) project location; (c) types of respondent firms; (d) designations of respondents

First, this study was examining new variables (such as risk perception attitude) that extended an existing theoretical framework and was thus considered an exploratory study. Second, the multi-group analysis used for the moderating effect involved a small sample size of less than 100. Both these considerations justified the use of PLS for the data analysis.

The authors performed a three-step analysis to test all hypotheses. First, a measurement model was designed to verify the reliability and validity of the measurement items and constructs. Second, the structural model was analyzed to assess the research model and hypotheses. The third step was to examine the moderating effects of the project culture and prior experience on all the proposed hypotheses. The software Smart PLS 2.0 M3 was employed for all the PLS analyses.

Measurement Model

The validity of the measurement model was assessed in terms of its internal consistency, indicator reliability, convergent validity, and discriminant validity (Hair et al. 2011; Le et al. 2014; Ning and Ling 2013a). Internal consistency was tested by estimating the composite reliability and the results (Table 2) exceeded the requirement of 0.7 (Hair et al. 2014). The indicator reliability was assessed by examining the loadings of the various measurement items on their corresponding constructs. Each item for all the constructs produced a satisfactory loading greater than 0.4. (Hair et al. 2011; Le et al. 2014; Ning and Ling 2013a). Convergent validity measures the extent to which the items underlying a particular construct actually refer to the same conceptual variable. It is tested by examining the values of the average variance extracted (AVE); here, the AVE values of all the constructs were greater than the minimum requirement of 0.5 (Cao et al. 2014). The discriminant validity was confirmed to be satisfactory from two aspects. First, the square root of AVE for each construct in the diagonal of Table 3 was greater than its highest off-diagonal correlation with any other construct (Hair et al. 2014). Second, the authors examined the cross-loadings of the items on other constructs and found that each item loaded onto a construct that was higher than any of its cross loadings with other constructs (the bold numbers in Table S1 of the Supplemental Data) (Gefen and Straub 2005).

Structural Model

The primary evaluation criteria for the structural model are the significance of the path coefficients, coefficients of determination (R^2 values) and Predictive relevance (Q^2 values).

In PLS, the data are not necessarily required to be normally distributed. Therefore, PLS needs to rely on a nonparametric bootstrap procedure to test coefficients for significance (Hair et al. 2014). In this study, the bootstrapping was set based on a total of 285 cases, 5,000 subsamples, with the choice of the no sign changes option in Smart PLS 2.0. The results of the model are presented in Fig. 2 and summarized in Table 4. Based on the significance of the path coefficients (β), all hypotheses were supported except for H2. Benefit perception attitude ($\beta = 0.176, p < 0.01$), subjective norm ($\beta = 0.293, p < 0.001$), and PBC ($\beta = 0.273, p < 0.001$) all had positive effects on intention. Mean-while, both PBC ($\beta = 0.400, p < 0.001$) and intention ($\beta = 0.387, p < 0.001$) significantly facilitated the formation of relational behavior that enhanced project relationship quality substantially ($\beta = 0.612, p < 0.001$). On the other hand, risk perception attitude was found to have no significant effect on influencing the intention.

The central criterion for the structural model's assessment R^2 is a measure of the model's predictive accuracy and explains the variation in the endogenous constructs. The structural model accounted

Table 2. Evaluation of Measurement Models

Construct/item	Loading	<i>t</i> value	AVE	CR
BPA	—	—	0.736	0.893
BPA1	0.861	29.450	—	—
BPA2	0.878	41.387	—	—
BPA3	0.834	25.192	—	—
RPA	—	—	0.552	0.830
RPA1	0.671	2.842	—	—
RPA2	0.860	4.413	—	—
RPA3	0.738	3.315	—	—
RPA4	0.688	2.919	—	—
SN	—	—	0.556	0.833
SN1	0.660	16.095	—	—
SN2	0.785	19.931	—	—
SN3	0.770	21.988	—	—
SN4	0.721	18.752	—	—
PBC	—	—	0.658	0.885
PBC 1	0.808	31.557	—	—
PBC 2	0.776	27.031	—	—
PBC 3	0.859	47.207	—	—
PBC 4	0.801	21.785	—	—
IN	—	—	0.559	0.791
IN1	0.661	13.407	—	—
IN2	0.780	24.317	—	—
IN3	0.796	29.768	—	—
RBS	—	—	0.675	0.861
RBS1	0.858	46.986	—	—
RBS2	0.751	22.439	—	—
RBS3	0.852	50.088	—	—
RBF	—	—	0.861	0.925
RBF1	0.925	82.950	—	—
RBF2	0.930	102.864	—	—
RBIE	—	—	0.664	0.855
RBIE1	0.765	23.921	—	—
RBIE2	0.859	44.004	—	—
RBIE3	0.819	32.217	—	—
PRQ	—	—	0.568	0.887
PRQ1	0.756	26.514	—	—
PRQ2	0.776	31.523	—	—
PRQ3	0.818	37.496	—	—
PRQ4	0.743	23.969	—	—
PRQ5	0.721	22.179	—	—
PRQ6	0.702	21.000	—	—

Note: BPA = benefit perception attitude; RPA = risk perception attitude; SN = subjective norm; PBC = perceived behavioral control; IN = intention; RBS = solidarity in relational behavior; RBF = flexibility in relational behavior; RBIE = information exchange in relational behavior; PRQ = project relationship quality; CR = composite reliability; AVE = average variance extracted.

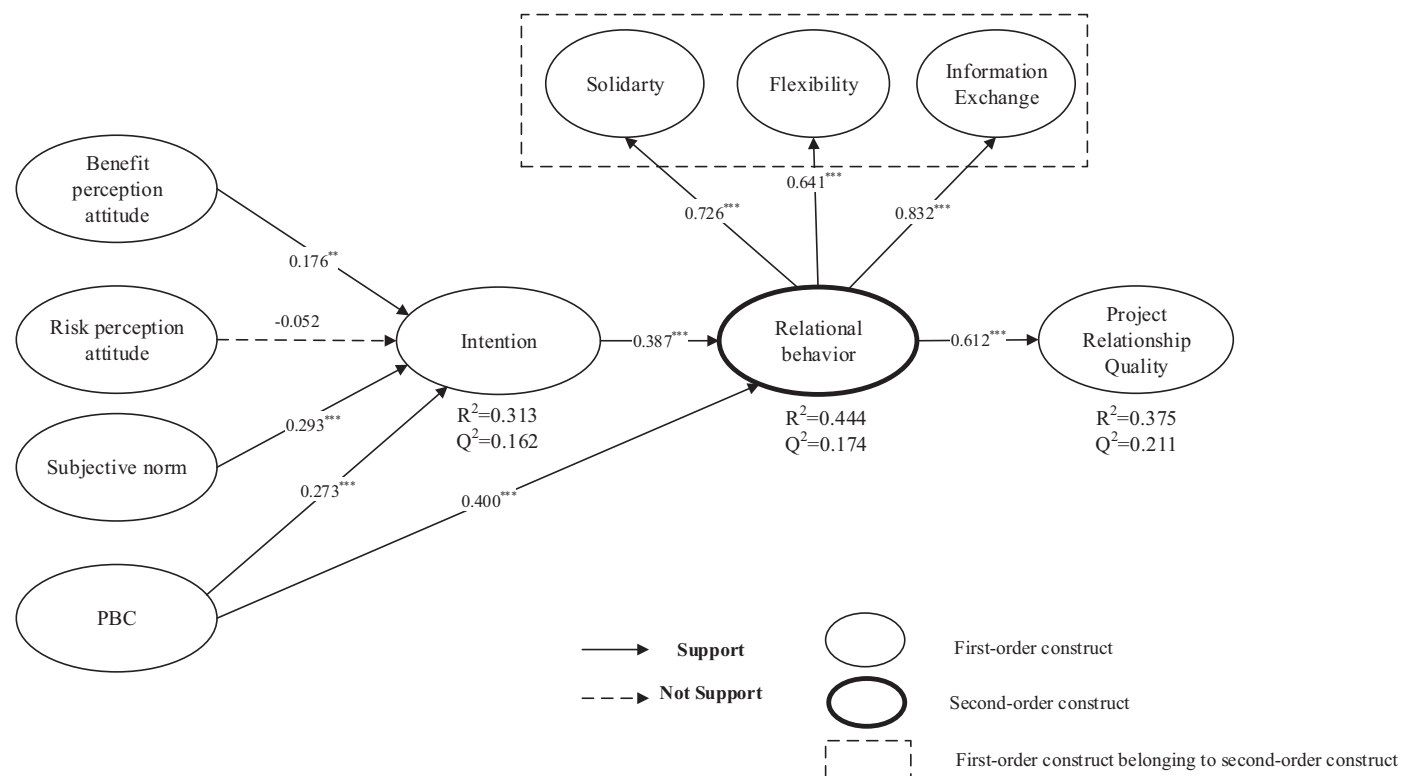
for 31.3% of the variance in intention, 44.4% of that in relational behavior, and 37.5% of that in project relationship quality. Of these, the first two R^2 values satisfied the normal range (27–39%) of the predictive accuracy of TPB studies (Armitage and Conner 2001). The study also assessed the model's predictive relevance using Stone–Geisser's Q^2 value (Geisser 1974; Stone 1974). The Q^2 value was obtained by using a blindfolding procedure in which the omission distance was set at 7.0, as recommended by Chin (1998). The results for the Q^2 value, measured by cross-validation redundancy, showed that each of the dependent latent variables was greater than zero (Chin 1998), suggesting that the model does indeed have predictive relevance.

Table 3. Correlations of Latent Variables and Evidence of Discriminant Validity

Construct	BPA	RPA	SN	PBC	IN	RBS	RBF	RBIE	PRQ	PC	PCE
BPA	0.86^a	—	—	—	—	—	—	—	—	—	—
RPA	−0.06	0.74	—	—	—	—	—	—	—	—	—
SN	0.29	−0.09	0.75	—	—	—	—	—	—	—	—
PBC	0.33	−0.05	0.33	0.81	—	—	—	—	—	—	—
IN	0.35	−0.10	0.44	0.43	0.75	—	—	—	—	—	—
RBS	0.30	0.05	0.41	0.40	0.42	0.82	—	—	—	—	—
RBF	0.21	−0.04	0.31	0.34	0.38	0.18	0.93	—	—	—	—
RBIE	0.28	−0.16	0.33	0.50	0.44	0.38	0.38	0.81	—	—	—
PRQ	0.20	0.03	0.38	0.41	0.32	0.46	0.40	0.49	0.75	—	—
PC	0.43	0.03	0.38	0.37	0.36	0.40	0.29	0.33	.34	0.79	—
PCE	0.02	−0.02	0.07	.181	0.08	0.06	−0.04	0.11	0.03	0.04	—

Note: BPA = benefit perception attitude; RPA = risk perception attitude; SN = subjective norm; PBC = perceived behavioral control; IN = intention; RBS = solidarity in relational behavior; RBF = flexibility in relational behavior; RBIE = information exchange in relational behavior; PRQ = project relationship quality; PC = project culture; PCE = prior collaborative experience.

^aBold values on the diagonal represent the square root of the average variance extracted (AVE). This value is not applicable to PCE, as it is a single-item construct.



Note: *** $p < 0.001$ ($t > 3.29$); ** $p < 0.01$ ($t > 2.58$); * $p < 0.05$ ($t > 1.96$).

Fig. 2. Results of PLS analysis for structural model

Moderating Effect

The moderating role of prior experience was assessed with two subsets, categorized by whether a project participating organization had a historical relationship with other stakeholders involved in the same project. Among the 285 surveys, most of the project participating organizations (206 of 285) had prior experience with others, with the remaining (79) reporting no prior experience with other partners. The authors then compared the path coefficients between

these two subgroups by using a parametric procedure proposed by Keil et al. (2000) [Eq. (1) below].

$$t = \frac{path_{sample1} - path_{sample2}}{\left[\sqrt{\frac{(m-1)^2}{(m+n-2)} * S.E.^2_{sample1} + \frac{(n-1)^2}{(m+n-2)} * S.E.^2_{sample2}} \right]} * \sqrt{\frac{1}{m} + \frac{1}{n}} \quad (1)$$

where $path$ = path coefficient; $S.E.$ = standard error; m = sample1 size and n = sample2 size. This determines the t value with $m + n - 2$ degrees of freedom, which is dependent on the standard error of the estimated path coefficients from bootstrapping as well as the sample size.

The result of the comparison (Table 5) shows that the path coefficients for H1 and H4 exhibit significant differences between the two subgroups. Prior experience had a positive moderating effect on the relationship between PBC and intention, while a negative moderating effect on the relationship between benefit perception attitude and intention. This result suggests that H8 is partially supported, since prior experience positively moderates the assumed relationship in H4.

The moderating role of project culture was also assessed by performing PLS analysis on two subsets of the data by splitting the data at the median of the average score of project culture to produce 143 samples with low collaborative culture and 142 samples with high collaborative culture. The results are presented in Table 6.

For the majority of the hypotheses (H1, H3, H4, H5, and H6), the path coefficients were not significantly changed except for two results (Table 6). There was, however, a significant difference for H7, suggesting that project culture has a positive moderating effect on the relationship between relational behavior and project relationship quality. Another significant difference exists for H2 in that the risk perception attitude has a significant effect on intention under low collaborative culture but not under high collaborative culture, indicating that high collaborative culture substantially mitigates the

effect of risk perception attitude on intention. This result suggests that H9 is partially supported due to project culture positively moderating the assumed relationship in H7.

Discussion

By empirically documenting the antecedents and outcomes of relational behavior in the context of megaprojects, this study sought to examine the explanatory power and predictive scope of the emerging models of relationship management from the perspective of interorganizational behavior. The findings of this study support the hypotheses linking these antecedents with both intention (H1, H2, and H4) and relational behavior (H5 and H6), providing significant evidence concerning the determinants of benefit perception attitude, subjective norm, PBC and intention in fostering relational behavior, which in turn facilitates high-quality project relationships (H7) in megaprojects.

Effect of Intention on Relational Behavior

These results indicate that benefit perception attitude can predict intention of relational behavior (H1 in Table 4), which supports Suprpto et al. (2015b), who demonstrated that consciously pre-established relational attitudes at the interfirm level are perceived as an effective way to govern a working relationship. A participating organization with a strong benefit-perception attitude is willing to collaborate with other stakeholders who, in turn, will be proactive when resolving contingencies, thus smoothing some of the inevitable kinks in the organizational interface among parties (Ling et al. 2013). Besides, when an organization's attitude supports achieving long-term benefits, for example by deepening relationships, building up a good reputation and achieving business continuity, this tends to enable them to work through areas of disagreement more effectively to maintain the mutually beneficial outcomes of the relationship (Griffith et al. 2006). From this perspective, a participating organization should consider both the short-term and long-term benefits to be gained through improving intention toward relational behavior.

However, the result for H2 is not consistent with the findings reported by Ning and Ling (2013b), who reported that a risk perception attitude discourages the adoption of relational behavior due to the additional cost and time involved. This discrepancy might be explained by the inclusion in the current study of high profile megaprojects, where participating firms are incentivized to build their

Table 4. Results of Hypothesis Testing

Hypothesis	Path coefficient (β)	t value	Result
H1: BPA \rightarrow IN	0.176 ^a	3.250	Supported
H2: RPA \rightarrow IN	-0.052	0.933	Not supported
H3: SN \rightarrow IN	0.293 ^b	6.106	Supported
H4: PBC \rightarrow IN	0.273 ^b	5.561	Supported
H5: PBC \rightarrow RB	0.400 ^b	7.493	Supported
H6: IN \rightarrow RB	0.387 ^b	6.938	Supported
H7: RB \rightarrow PRQ	0.612 ^b	17.187	Supported

Note: BPA = benefit perception attitude; RPA = risk perception attitude; SN = subjective norm; PBC = perceived behavioral control; IN = intention; RB = relational behavior; PRQ = project relationship quality.

^a $p < 0.01$ ($t > 2.58$).

^b $p < 0.001$ ($t > 3.29$).

Table 5. PLS Analysis of Different Prior Experience

Hypothesis	With PCE ($m = 206$)		Without PCE ($n = 79$)		Difference in path coefficient	t value
	Path coefficient	t value	Path coefficient	t value		
H1: BPA \rightarrow IN	0.103 ^a	1.964	0.396 ^c	9.459	-0.293 ^c	3.316
H2: RPA \rightarrow IN	-0.071	1.345	-0.056	0.611	-0.015	0.664
H3: SN \rightarrow IN	0.281 ^c	5.797	0.323 ^c	7.403	-0.042	0.439
H4: PBC \rightarrow IN	0.319 ^c	6.403	0.126 ^b	2.613	0.193 ^a	2.324
H5: PBC \rightarrow RB	0.423 ^c	8.561	0.340 ^c	5.895	0.083	0.946
H6: IN \rightarrow RB	0.386 ^c	8.044	0.407 ^c	5.897	-0.021	0.249
H7: RB \rightarrow PRQ	0.588 ^c	16.949	0.684 ^c	20.084	-0.096	1.579

Note: PCE = prior collaborative experience; BPA = benefit perception attitude; RPA = risk perception attitude; SN = subjective norm; PBC = perceived behavioral control; IN = intention; RB = relational behavior; PRQ = project relationship quality.

^a $p < 0.05$ ($t > 1.96$).

^b $p < 0.01$ ($t > 2.58$).

^c $p < 0.001$ ($t > 3.29$).

Table 6. PLS Analysis of Different Levels of Collaborative Culture

Hypothesis	Low CPC (m = 143)		High CPC (n = 142)		Difference in path coefficient	t value
	Path coefficient	t value	Path coefficient	t value		
H1: BPA → IN	0.115 ^b	2.069	0.201 ^c	3.919	−0.086	1.017
H2: RPA → IN	−0.108 ^a	2.006	−0.020	0.315	−0.088	1.006
H3: SN → IN	0.259 ^c	4.555	0.283 ^c	6.594	−0.024	0.393
H4: PBC → IN	0.289 ^c	5.219	0.271 ^c	6.160	0.018	0.237
H5: PBC → RB	0.335 ^c	6.002	0.437 ^c	8.317	−0.102	1.365
H6: IN → RB	0.393 ^c	7.858	0.346 ^c	6.297	0.047	0.627
H7: RB → PRQ	0.505 ^c	13.783	0.622 ^c	16.906	−0.117 ^a	2.225

Note: CPC = collaborative project culture; BPA = benefit perception attitude; RPA = risk perception attitude; SN = subjective norm; PBC = perceived behavioral control; IN = intention; RB = relational behavior; PRQ = project relationship quality.

^a $p < 0.05$ ($t > 1.96$).

^b $p < 0.01$ ($t > 2.58$).

^c $p < 0.001$ ($t > 3.29$).

reputation by demonstrating good project performance even when this requires short-term sacrifices, such as assuming inequitable risk allocation due to absence of related contract clauses (Poppo and Zenger 2002; Meng 2012). Such sacrifices are expected to be compensated by winning more business opportunities in the future. In addition, Chinese project participants share a traditional culture of collectivism (Eckhardt 2002), especially for megaprojects with enormous numbers of stakeholders. Priority will thus be directed toward completing predefined project objectives collaboratively to facilitate the progress of others. Otherwise, non-collaborative behaviors might cause inconvenience to others' work or affect the whole project's progress (Cheung et al. 2013). Taking Beijing Capital International Airport Terminal 3 as an example, Chi et al. (2011) found that although many claims or disputes were induced as a result of design changes under fast-track project delivery, this project was fulfilled on time with collaborative participants.

Among the three positive determinants of intention, subjective norm exhibits the strongest influence. This indicates that social fitness is perceived as a key factor by megaproject participating organization seeking to achieve high performance and profitability. Especially in recent studies, more scholars are beginning to regard the construction industry as an organizational network (e.g., quasi-firms) in which project participating organizations are embedded in networks of social, professional, and exchange relationships with other actors (Eccles 1981). Therefore, relational behavior adopted by participating organizations is inevitably determined by the norm from institutions, industries, and projects. Based on the research of Phua (2006), firms' perceptions of strong industry norms supporting the adoption of partnering are twice as likely to use partnering as firms that do not have such a perception.

Consistent with TPB-based studies in other fields (De Bruijn et al. 2007; Sheeran et al. 1999; Whitmarsh and O'Neill 2010), PBC is identified here as a significant motivator facilitating behavioral intention and organizational behaviors (Lages et al. 2009). For instance, Cheung et al. (2013) confirmed that relational competence is positively related to team orientation, while Ling and Ma (2014) found that a lack of competence hinders trust between clients and consultants. However, the extant literature on construction relationship management ignores the possible function of intention as contributing to relational behaviors. This study bridges this gap by verifying the role of intention toward relational behavior.

In terms of the motivators supporting relational behaviour, both PBC and intention promote the adoption of relational behavior, which is echoed in the TPB-based literature. For instance, Hameed et al. (2012) contended that both PBC and intention predict IT

innovation adoption. Relational behavior has also been shown to depend on relational competence, which enables an organization to connect its own resources to those of other firms by building relationships (Walter et al. 2006). Ning (2014) also supported this finding, arguing that a lack of capability inhibits information sharing among project stakeholders.

It worth mentioning that intention shows different mediating effects on the relationship between four predictors (i.e., benefit perception attitude, risk perception attitude, subjective norm, and PBC) and relational behavior. Based on the Sobel (1982) test, the results suggested that the effect of benefit perception attitude on relational behavior was fully mediated by intention, while the effect of subject norms and PBC on relational behavior was partial mediated by intention. The detailed Sobel test results can be found in Appendix S2 in the Supplemental Data.

Effect of Relational Behavior on Project Relationship Quality

Through conducting relational behaviors, project stakeholders expect to establish beneficial project relationships in a megaproject that is one of the primary premises of project success (Suprpto et al. 2015b). The results shown in Table 4 confirm this hypothesis (H5). Specifically, to enforce good project relationships in a megaproject, project stakeholders should engage in frequent information exchange (Fig. 2, loading = 0.832), solidarity (loading = 0.726), and flexibility (loading = 0.641) interactions.

Information exchange makes the greatest contribution to establishing a high level of project relationship quality. The strong link between the two constructs—information exchange and project relationship quality—is evident in the literature (Ning and Ling 2014). Megaproject development involves extensive information exchange among multidisciplinary teams (Cheung et al. 2013). The timely transfer of relevant information helps to entail mutual understanding and open communications, as well as nurturing relationships among participating organizations. An effective flow of project information provides participating organizations with frequent accurate updates on project progress and knowledge of how to solve potential problems (Ling et al. 2013). The positive results of information exchange are also supported by the literature, as it clarifies the cause of conflicts (Ning 2014) and mitigates disputes (Wong et al. 2005). Another perspective needs to be considered is that the adoption of relational behavior is a dynamic process that has been developed over time. The influence of information exchange on relationship quality at one stage may be

different from its impact at prior stages. Thus, organizations should continuously adapt their behaviors to effectively copy with different contingencies.

Moderating Effect of Prior Experience

Most project participating organizations had prior experience with other stakeholders in the surveyed megaprojects (207 of 285). Such prior tie positively moderates the relationship between PBC and intention (H4 in Table 5). A pre-existing relationship with other stakeholders promotes a better relationship ($\beta = 0.319$) than is immediately possible without prior experience ($\beta = 0.126$), at a significance level of 0.05. This can be explained by the research of Engwall (2003), who stated that a participating organization with prior experience was able to make use of their experience with identical stakeholders from earlier projects in the management of subsequent projects. Such experiences provide the participating organizations with more confidence in their capability for conducting relational behavior.

Another result suggested that the prior experience negatively moderates the relationship between benefit perception attitude and intention. When there are no prior collaborations, the relationship is much stronger ($\beta = 0.396$) than that with prior experience ($\beta = 0.103$), at a significance level of 0.001. This indicates that knowing organizations diminishes the influence of their benefit perception attitude. One possible explanation for this finding is that the perceived benefits from a known organization may be internalized once the collaboration is established. For instance, one of the benefits of knowing an organization is the opportunity to build social relations for the achievement of future business collaborations. Such a benefit becomes internalized after the first collaboration and remains constant in the long term. This is similar to findings reported in the literature that alliance experience may exhibit diminishing marginal returns for alliance performance (Hoang and Rothaermel 2005).

Moderating Effect of Project Culture

The results in Table 6 suggest that project culture positively moderates the relationship between relational behavior and project relationship quality, indicating that relational behaviors interact with high collaborative culture to contribute to higher project relationship quality. This finding echoes the argument of Suprpto et al. (2015b), who found that project relationship quality can be improved by the creation of an effective teamwork climate in which project participants engage with a common vision involving collective responsibility, support, and trust. Furthermore, prior research regarding relational contracting has also highlighted the utility of creating a culture of open communication and trust to generate high quality relationships among project participants (Kumaraswamy et al. 2005; Rahman and Kumaraswamy 2004).

Another notable finding is that risk perception attitudes can decrease the intention of relational behavior only when low collaborative culture exists (H2 in Table 6). This is evident in the existing literature, where an adverse culture with mutual blame is likely to raise barriers preventing team collaboration, with potential conflicts and litigation (Phua 2004). Under such circumstances, participating organizations tend to achieve their own objectives rather than the project's, limiting their intention of investing in resources that support long-term collaborations. Neither will they actively exchange information with other organizations, suspiciously protecting themselves from being taken advantage of by others.

Managerial Implications

The findings of the present study offer four effective implications for managers seeking to promote the adoption of relational behavior in megaprojects.

First, participating organizations need to identify respective benefits of relational behavior at the outset of a megaproject. As relational behavior is influenced by a benefit perception attitude toward economic benefits, project participating organizations should explicitly recognize the value of relational behavior, including both short-term benefits such as improvement of task performance and long-term benefits such as continuity of relationship. These benefit perception attitudes should then be reinforced and monitored throughout the whole project lifecycle by top management to ensure that the collaboration is being practiced, not just espoused (Lazar 2000).

Second, it is recommended to incorporate relational competence as a key criterion of the bidding evaluation in megaprojects. As PBC is crucial to both intention and the actual adoption of relational behavior, relational competence, such as firms' collaborative abilities and knowledge (Osipova 2014), should be included as an important criterion to select appropriative bidders (Ling and Ma 2014). Specifically, bidders having prior experience with the tender should be favorably considered, as prior experience positively moderates the relationship between PBC and intention. During the project implementation, project managers possessing high relational competence are expected to develop high-quality and effective relationships with other project stakeholders, thus contributing to project success (Mazur et al. 2014).

Third, collaborative culture is a key for the development of relational behavior needed to realize high project relationship quality. In a megaproject, project participating organizations should seek to establish a no-blame, win-win culture, with open communication at the interfirm level (Suprpto et al. 2015a). It is worth noting that project culture is primarily oriented by public clients in megaprojects, so their support for the adoption of relational behavior is of the utmost importance if firms are to cultivate collaborative culture that positively influences the behavior of other participating organizations.

Last but not least, interorganizational information exchange should be reinforced to facilitate a high level of project relationship quality. All participating organizations seeking to enhance their relationships with others should share information through effective channels by setting up regular workshops, developing a centralized database to decrease information asymmetry, and utilizing the most up-to-date information and communication technology, such as Building Information Modeling (BIM) (Cao et al. 2015; Chung et al. 2009).

Conclusions

Relationship management is a beneficial way to support project success in the construction field (Solis et al. 2013), especially in megaprojects that involve numerous stakeholders, complex stakeholder interrelationships, conflicting interests, and considerable uncertainty. High levels of relational behavior between project participating organizations are a vital ingredient for success in relationship management. Focusing on the behavioral perspective, this paper examined the motivators, driver paths, and effects of relational behavior on project relationship quality in megaprojects. After developing a TPB-based theoretical model that includes seven proposed hypotheses regarding the social-psychological predictors and outcome of relational behavior, a sample of 285 managers in Chinese megaprojects were collected and analyzed by PLS-

SEM. Once the measurement and structural models had been verified, the results were discussed, along with a detailed analysis and a consideration of the managerial implications.

Overall, the adoption of actual relational behavior was confirmed to be motivated by both PBC and behavioral intention, which can be significantly predicted by subjective norm, PBC, and benefit perception attitude, from high to low influence. A high level of relational behavior, especially information exchange, can significantly enhance project relationship quality. In addition, the moderating effect of two variables—project culture and prior experience with other participating organizations—were particularly important. Project culture is found to positively moderate the relationship between relational behavior and project relationship quality, while prior experience exhibits a mixed effect in two different scenarios—positively moderating the relationship between PBC and intention yet negatively moderating the relationship between benefit perception attitude and intention. These findings lead to four implications as identifying potential benefits of relational behavior, enhancing relational competence, establishing collaborative culture, and reinforcing information sharing during the megaproject lifecycle. They can be adopted by project managers to improve the level of participant engagement over the process of relationship establishment, refinement, and management.

This study contributes to the body of knowledge by integrating TPB and relationship management in megaprojects. Three theoretical contributions on TPB are made regarding the social-psychological factors motivating the adoption of relational behavior. First, while the TPB delineates the factors that predict behaviors, it does not explicitly indicate that contextual factors moderate the proposed relationships in the TPB model. In this paper, the authors argued that in the specific context of megaprojects, project culture and prior experience among project stakeholders are the two important moderating roles influencing the relationships between two or more variables in TPB, relational behavior, and project relationship quality. Secondly, compared to the traditional TPB model in which attitude is a single construct, this study decomposed the attitude into two separate roles, the benefit perception attitude and risk perception attitude, collectively leading to relational intention. The findings reinforced the previous study of Cheng (2016) by showing that the benefit-based attitude positively affected the intention, while the risk-based attitude had insignificant effect. Thirdly, previous research suggested different behavioral motivators in improving interorganizational relationship, but lacked an integrated framework incorporating various social-psychological motivators to predict relational behavior. This research extended the application of TPB to explain the relational behavior of participating organizations in the context of megaprojects. The empirical results demonstrated that benefit perception attitude, subjective norm, and PBC collectively influence organizational intention, which in turn facilitates relational behavior.

It is important to bear in mind three limitations of the present study, however, that must be addressed in future endeavors. The first limitation is the use of a one-time survey, which ignores the dynamic process of relational behavior that develops over a megaproject during which participating organizations may change their collaborative decisions, resulting in constantly evolving project relationships. Future research should consider a longitudinal analysis to understand how relational behavior evolves over time, particularly the identification of events that trigger changes. The second limitation is that this study used a self-reporting survey to collect behavior information from one key informant to represent the

perspective of an organization, which is inevitably subject to the bias perceived by individuals. Future research should consider gathering matched data from multiple or paired informants in the same organization to assess interrater agreement so as to improve reliability of responses. The third limitation is that the empirical data in this study were all collected from megaprojects in China, so the application of the findings to other countries should be performed with cautious and appropriate adjustments. A wider scope of data collection across other countries and regions could provide valuable information that would enable researchers to expand the generalization of the research results.

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Supplemental Data

Appendixes S1 and S2, Figs. S1 and S2, and Table S1 are available online in the ASCE Library (www.ascelibrary.org).

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