

Research Article

Impact of Control and Trust on Megaproject Success: The Mediating Role of Social Exchange Norms

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Trust and control are the two main governance mechanisms in megaprojects. However, the role of social exchange norms in trust and control governance remains unclear. Based on social exchange theory, we explored the impact of control and trust on megaproject success by considering the mediating effect of social exchange norms, which include reciprocity, negotiation, and information sharing. Partial least squares structural equation modeling was used to test the hypotheses based on data collected from 155 respondents. Results show that control and trust have positive effects on megaproject success. Trust can promote social exchange norms. That is, the higher the level of trust is, the greater the likelihood that reciprocity, negotiation, and information sharing will increase. Control does not have a significant impact on social exchange norms. Social exchange norms have a mediating effect on the relationship between trust and megaproject success but not on the link between control and megaproject success. Our findings fill in the gaps in the literature on megaproject governance and contribute to the development of megaproject management theory, which can help project managers understand the motivation orientations of all parties to make decisions wisely and rationally under complex environments.

1. Introduction

Megaprojects play an important role in economic development; however, many megaprojects are considered failures or are inefficient in terms of time, schedule, and quality [1]. The complexity and uncertainty of targets, stakeholders, and the environment cause various interorganizational conflicts and low performance of megaprojects [2]. Inconsistent targets and the “hold up” problem result in high transaction costs and a lower level of opportunism in a megaproject [3]. Project failure is an unresolved problem that plagues academics and practitioners [4]. According to incomplete contracting theory, a contract cannot anticipate and plan for future events completely [5]. Unforeseen contingencies, the cost of writing contracts, and the cost of enforcing contracts are the three main reasons for incomplete contract [6]. These limitations will be amplified in the governance process of megaprojects because of the high degree of uncertainty and complexity involved. In this context, formal controls experience difficulty in curbing

opportunism. As a critical factor, trust can play a large role in the governance process.

Control and trust, two typical governance mechanisms, are used frequently to resolve interorganizational conflicts [7–9] and reduce opportunistic behaviors [10, 11]. Control and trust are the building blocks of interorganizational collaboration [12]. Controls are generally defined as practices based on formal contracts for stipulating the rights and obligations of all parties and for monitoring their work to achieve the desired objectives [13, 14]. As an informal governance mechanism, trust is generally defined as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” [15]. The relationship between control and trust, which mainly complements or substitute each other, is plagued with different opinions [12, 16, 17]. The complementary relationship between control and trust can promote interorganizational cooperation in strategic alliances [18] and the information from controls can promote the level of trust [19]. By

contrast, substitution views consider that detailed controls are redundant and even unnecessary in the presence of a high degree of trust [20].

Building and coordinating interorganizational collaboration is difficult because the parties of a megaproject come from different companies with various objectives, backgrounds, and interest demands. These aspects lead to diverse levels of relationship strength and high uncertainty and complexity [4]. Numerous parties form a “small-scale society.” According to social exchange theory, social exchange norms are considered the basics of cooperation. Cooperative parties need to follow social exchange norms; otherwise, they will be penalized by their social relationships [8, 21]. Consequently, social exchange norms play an important role in the control and trust governance of megaprojects. As such, social exchange theory may identify how control and trust affect megaproject success.

However, existing studies remain limited. First, the majority of them have used limited, incomplete, and sometimes inconsistent assumptions on the ways in which control and trust are implemented. In the context of megaprojects, the relationship between control and trust remains uncertain. No author has explored systematically the relative effectiveness of control and trust in megaprojects. Second, in some studies related to megaproject governance, control and trust are treated mainly as part of the contractual and relational governance mechanism [12, 16]. Moreover, the majority of related studies have ignored the importance of social exchange norms, thereby leading to an unclear and inconclusive clarification of the impact of control and trust on megaproject success. To fill these research gaps, we base the current work on social exchange theory to study the impact of control and trust on megaproject success, and this paper answers the following questions:

- (1) In megaproject governance, how do control and trust concretely influence megaproject success and what kind of relationship do they have?
- (2) Can social exchange norms mediate the effects of control and trust on megaproject success?

We divide the article into four parts. First, the studies related to the theoretical foundation are summarized and reviewed. Six hypotheses are then proposed, and the conceptual model is established for empirical testing. Next, the analytical results of the structural model are presented. Finally, the findings of this paper are discussed, and its conclusions and managerial implications are provided.

2. Literature Review

2.1. Relationship between Trust and Control. Many researchers view trust as a state of willingness to be vulnerable [15, 22, 23]. When a person chooses to trust others, he/she is taking the risk of dependence and expects others to act beneficially [24]. Control is the formal process by which managers influence others to achieve a goal [25]. The abundant extant research presents various ideas about the relationship between control and trust. Control can improve

or damage trust, and different implemented measures of control and trust can lead to various managerial results. On the one hand, control is positively related to trust. Managers can apply controls to promote mutual trust by increasing freedom, building new safeguards, or reducing the level of uncertainty [26]. If controls are used to codify collaboration modes, then they can increase mutual trust among all parties [27]. Controls can facilitate trust when parties need to develop cooperation [28, 29]. Owners cannot manage the progress of construction projects well through formal controls alone; hence, they must rely on trust [30]. Control is also negatively related to trust. Research within this stream proposes that the trust between managers will be compromised when they apply controls to monitor their subordinates because managers limit the freedom of value sharing and increase the social distance between them and their subordinates [31–33]. Zaghoul and Hartman [34] claimed that contractual relationships are based mainly on confrontation, which reflects the level of distrust in contracts. Therefore, contracts are always written as detailed as possible [30]. Chen and Lin [35] found the reason why the relationships between control and trust are different and concluded that controls would weaken trust if the former is used mainly to monitor and supervise the behavior of exchange partners to reinforce their work and evaluate their performance. By contrast, controls will enhance trust when the former is used primarily to develop cooperation mechanisms.

2.2. Social Exchange Norms. The social exchange process starts with a positive or negative treatment from an organizational actor to a target individual. A target individual may then respond to the treatment via attitude and behavior [21]. In social exchange, people need to follow social exchange norms to maintain stable social relationships. Social exchange norms focus on the voluntary actions of exchange parties motivated by the returns they are expected to obtain [36]. Social exchange relationships based on social exchange norms are also applicable to megaproject governance. Sha [4] distinguished projects into Type I and Type II projects, which represent inter and intrafirm organizations, respectively. As a typical Type I project, a megaproject is a loosely organized group with many organizations, and the formal relationship among them is generally temporary and unstable [37]. Under an incomplete contract, a collaborative relationship is generally based on long-term cooperation; all parties are cautious with regard to opportunistic behavior to maintain a good reputation and trustworthiness [38]. Clearly, the interactions in the interfirm organization of megaprojects can be considered management activities with typical social exchange characteristics. Combining the characteristics of social exchange among parties of megaprojects, we use reciprocity, negotiation, and information sharing as the three key factors of social exchange norms in megaprojects. Reciprocity is defined as interdependent exchanges, a folk belief, and a moral norm. Negotiation can be interpreted in such a way that transaction parties may negotiate rules to achieve beneficial arrangements [21] and the

negotiation between the parties could improve cohesion when they are in a cooperative organization [39]. Information sharing can help parties express their trust and confidence in others' abilities and also increases the level of work responsibilities for their partners [39–41]. Although many other social exchange norms were discussed in social exchange theory literature, reciprocity, negotiation, and information sharing were considered to be representative and can summarize most of the overlapping concepts. The characteristics of reciprocity, negotiation, and information sharing are consistent with the rules of maintaining interorganizational relationship and transactions in megaprojects. Hence, using the three factors to study the social exchange norms of megaproject organizations is appropriate and can help us obtain precise results.

Reciprocity is a basic social exchange norm; it has been discussed in detail in the previous studies. It has been described based on three aspects: (a) a sense that all exchanges reach a fair equilibrium over time; (b) those who are unhelpful will be penalized; and (c) those who are helpful will receive help in the future [21]. Emerson [42] proposed that reciprocity was a core characteristic of long-term transactions and that continuous transactions could be defined as relations in which a balance of power existed. In social exchange theory, cooperation is interdependent and contingent on the behavior of other parties [36]. These interdependent interactions can produce close relationships [21]. Negotiation is an important element of social exchange. To achieve the desired objectives, the participants will negotiate the details of arrangements [43]. Negotiations are part of transactions. A reasonable contract price can restrict opportunism and ensure project quality [44]. Negotiations can be regarded as social exchange relations, in which parties need to negotiate for a reasonable price for their jobs [21]. Information sharing is a critical factor that reflects the quality of collaboration, and it has characteristics that are typical of social exchange [45]. Information sharing should not be understood as a kind of reciprocity. Reciprocity is a moral norm, and it refers to an equal exchange in quantity among partners [46]; that is, reciprocal behavior can bring an equal interest in money to both parties. However, the amount of information sharing is difficult to measure quantitatively; as a kind of abstract exchange, it must be symmetrical, transparent, timely, and efficient [47, 48]. Knowledge and information sharing can promote the quality of the social exchange relationship [49]. Parties with a common objective are willing to share all their information with one another, thereby generating increased willingness to share information to facilitate the cooperation [50, 51].

2.3. Megaproject Success. In the construction industry, project performance is measured in terms of the agreed quality, timeliness, and staying within budget [52]. Megaprojects are plagued by many underperformance problems, such as cost overruns, delays, and unqualified construction quality [53]. Similarly, Giezen [54] proposed that megaprojects often face serious problems in terms of cost and time overruns, which result in trouble for megaproject

success. Therefore, a good performance is a critical criterion for achieving megaproject success. However, project success has become a broad concept alongside the increase in project function and number of stakeholders [55], and project success criteria vary from one project to another [56]. In comparison with ordinary projects, megaprojects gather more participating organizations, including multinational organizations and global financial capital. Cultural differences among regions reduce the efficiency of communication, while the coordination of interests becomes extremely difficult because of numerous stakeholders [57]. The diversity of stakeholder needs often leads to many uncertainties in the whole life cycle of megaprojects. The higher the complexity of the organization is, the greater the number of conflicts of interest between stakeholders and decision-making bodies would be in the presence of uncertainty, which may result in cost overruns, work postponement, and unsuccessful delivery [2]. Balancing the needs of stakeholders becomes the main challenge of managing megaprojects [58]. Stakeholder satisfaction is influenced by many factors. Wit [59] identified the satisfaction of the client, the contractor, and the project manager/team as the major component of project success. Zwikael and Smyrk [60] proposed a comprehensive criterion in which project success should be tested based on three dimensions: project management success, project ownership success, and project investment success, which represent the interests of the project's managers, owners, and investors, respectively. The criteria for megaproject success are diversity with different stakeholders, which depends on their expectations and how well these expectations are satisfied. Stakeholder satisfaction is one of the criteria of megaproject success [61]. In view of the abovementioned research state of the art, a successful megaproject should have a good performance in terms of quality, cost, and schedule and the potential of meeting the needs of stakeholders. Consequently, in the current work, we will measure megaproject success from the perspectives of project performance and stakeholder satisfaction.

3. Hypotheses

3.1. Effects of Control and Trust on Social Exchange Norms. In this paper, social exchange norms consist of reciprocity, negotiation, and information sharing. Control and trust play different roles in megaproject governance. The results of previous studies illustrate the positive relationship between control and social exchange norms. In organizational management, the interactions between controls and social exchange relations (such as reciprocity) may facilitate knowledge transfer and information sharing [62]. Ideally, controls can increase the overall quality of the cooperation, thereby promoting reciprocity and communication [7]. Naturally, negotiation is a bargaining process, and the participants in a transaction aim to seek a balance of interests through negotiation [63]. Negotiation usually occurs under a formal framework to avoid the rupture of the cooperation; this framework can improve the quality of negotiation and help all parties obtain a satisfactory negotiation result. As an informal mechanism, trust is used

mainly to improve the interpersonal or interorganizational relationship. Trust has been accepted widely as a key factor in reciprocity building [18]. Lawler et al. [64] proposed that the pleasure produced in several negotiations can improve trust and that this trust, in turn, will provide a friendly atmosphere for later negotiations. Knowledge and information sharing is a social and ongoing process that is dependent on trust [65]. If trust does not exist between parties, then no information sharing and cooperation would occur [66]. Thus, we hypothesize the following:

H1: The effect of control on social exchange norms is significant and positive.

H2: The effect of trust on social exchange norms is significant and positive.

3.2. *Effects of Control and Trust on Megaproject Success.*

The effects of control and trust on project performance or stakeholders are widely studied in the field of project governance. Project success is related to many factors, including control level and trust [67]. Trust has been viewed as a critical factor in achieving project success [68]. The collaboration between stakeholders can be enhanced by trust and communication, which further ensures the achievement of project success [69]. Cheung et al. [70] proposed that trust has relationships that affect communication and thus influence project performance and the interests of stakeholders. Trust is still important to megaproject success, and it can help facilitate collaboration in megaproject alliances and improve megaproject performance [65]. A lack of trust was considered to be one of the main factors that lead to inefficiency of megaprojects; mutual trust and collaboration could help megaproject success in performance and parties' satisfaction [65]. Trust between contractors and subcontractors contribute to substantial time and cost savings, thereby improving project performance [71]. The interrelationship based on good mutual trust can help achieve megaproject success. As a part of contractual governance, control plays a basic and critical role in the project management process. Unlike trust, control is a hard governance method; it constitutes the formal guideline for all participants to work to meet the contract requirements. Jiang et al. [30] classified control into three categories, namely, outcome control, behavior control, and social control. All these categories are viewed as positive for project success. The controls on organizational or megaproject direction can satisfy stakeholders' expectations for interests [72]. Effective controls on cost and time overruns can help megaprojects achieve success [54]. Maintaining controls of the project tasks can help attain the prescribed goals regarding cost, time, and quality to accomplish megaproject success [73]. In megaproject governance, controls ensure that all parties act legally because opportunism is considered one of the main obstacles to high megaproject performance [12]. Thus, we hypothesize the following:

H3: Control has a positive effect on megaproject success.

H4: Trust has a positive effect on megaproject success.

3.3. *Mediating Role of Social Exchange Norms.* Based on an extensive literature study, we have assumed that control and trust have a considerable direct impact on social exchange norms and megaproject success. In addition to direct effects, control and trust may also have indirect effects on megaproject success. Social exchange norms were considered an appropriate mediator between control, trust, and megaproject performance. Social exchange theory has been widely used to solve problems of relational governance and organizational management [74, 75]. Compliance with social exchange norms by all participants can effectively improve project performance [35]. Social exchange norms play a critical role in regulating social exchange behavior and ensuring all parties' self-enforcement ability. Violation of social exchange norms will result in damage to violators' reputation and the possibility of losing cooperation opportunities in the future [76]. The stakeholders of megaprojects need to comply with social exchange norms. Otherwise, they may experience serious management confusion and megaproject failure. Therefore, social exchange norms are crucial for megaproject success. The influence of social exchange norms, operationalized as negotiation, information sharing, and reciprocity on project success, is well established in previous research. Negotiation is viewed as a critical element for strengthening mutual understanding and communication, thereby providing an emotional foundation for cooperation by all parties. In the project governance process, all parties are always inconsistent with unanticipated events. To deal with this problem, project managers should organize several negotiations to make all parties obtain a satisfactory result [77]. Information sharing can help participants adopt consistent management actions, establish common goals, and understand each other's strategic intentions to improve project performance and achieve common interests. The collaborative performance of construction projects is mainly encouraged by knowledge and information exchange [78]. Information sharing is a social process that can promote the cooperation quality and management efficiency, which improves megaproject performance in restricting cost, overruns, and time delays [65]. Parties of megaprojects may face huge cognitive differences. The information sharing behavior can ensure accurate delivery of information and reduce the sense of distrust between parties [79], thereby strengthening cooperation to achieve megaproject success. As the main characteristic of social exchange norms, reciprocity is considered an essential factor for maintaining a long-term exchange relationship, and trust and reciprocity support each other, thereby helping exchange partners pursue common goals [45]. Reciprocal favor is related to the effectiveness of control-based contractual governance and trust-based relational governance. A high degree of reciprocity can improve mutual trust among parties in megaprojects, which contributes to megaproject success [12]. Another view is that the incentives for reciprocity may not necessarily be due to trust but, rather, commercial interests [80]. Observably, regardless of circumstances, reciprocity can promote cooperation, and it may help achieve megaproject success.

Linking the effects of control and trust to social exchange norms and megaproject success, we hypothesize the following:

H5: Social exchange norms have a positive effect on megaproject success.

H6: Social exchange norms mediate the effects of control and trust on megaproject success.

The structural model is shown in Figure 1, where a , b , c , d , and e represent the path coefficients.

4. Methodology

4.1. Sample Collection. According to the definition of megaprojects proposed by Flyvbjerg [53], the project cost threshold of USD 1 billion is accepted as the standard for megaprojects. Based on this standard, we randomly selected 40 megaprojects in Shandong Province, China, including state-owned megaprojects and large-scale exploitation of real estate. A total of 105 project managers were invited to complete the questionnaire via e-mail or interview. A snowball sampling technique was utilized to maximize the number of qualified respondents, when inviting the respondents to complete the questionnaires, we asked them to forward e-mails containing the questionnaires to colleagues or friends who have worked or are working on projects costing over 1 billion USD. The data collection took place from March 2018 and June 2018. Finally, we obtained 162 responses from six provinces. All respondents are owners or from construction firms, supervision firms, and engineering consulting firms for megaprojects. After cleaning out the responses that had more than 15% missing values, we had 155 valid responses, with an effectiveness rate of 89.8%. The respondents were classified based on three factors, namely, the degree of experience, organization, and region, as shown in Table 1. This classification shows the geographical diversity, experience diversity, and organizational diversity of our sample sources, thereby reflecting the views of respondents from different backgrounds to ensure the reliability and universality of the results.

4.2. Method. In this study, partial least squares structural equation modeling (PLS-SEM) is applied to analyze the data. PLS-SEM and covariance-based structural equation modeling (CB-SEM) are two different forms of structural equation modeling (SEM). In comparison with CB-SEM, PLS-SEM is more suitable for this study because it has three advantages. First, PLS-SEM can be implemented with a small sample size (10 times the largest number of structural paths directed at a particular latent construct in the structural model) [81]. At least 40 samples are needed for this study, whereas CB-SEM would require more than 200 samples [82]; that is, PLS-SEM has strong analytical power when confronting a limited sample size. A total of 155 valid samples were collected in this study. In terms of samples quantity, PLS-SEM is more suitable for this study. Second, PLS-SEM is better than CB-SEM with respect to models that remain at an exploratory stage or whose theoretical basis requires further development [81]. However, few researchers have explored the mediating role of social exchange norms on megaproject governance. Hence, our structural model is not yet well established in previous research, and it is still at

an exploratory stage. Therefore, PLS-SEM is a better choice than CB-SEM for evaluating the factors in this study. Third, this study contains formative and reflective constructs. PLS-SEM allows formative and reflective constructs to exist in one research model, whereas CB-SEM exhibits much lower analytical power in regard to formative models [83]. In a reflective construct, the direction of causality is from the construct to the indicators. Changes in the construct are reflected in changes in all of its indicators. By contrast, in a formative construct, the direction of causality is from the indicators to the construct [82]. The formative construct is defined as a combination of its indicators, with each indicator reflecting an independent dimension in its own right. In this study, social exchange norms have three indicators: reciprocity, negotiation, and information sharing. These indicators are relatively independent parts of social exchange norms. An increase in the value of one indicator translates into a high score for the composite variable, regardless of the value of the other indicators. Therefore, setting social exchange norms as a formative construct is more appropriate. These reasons are important in supporting the application of PLS-SEM for further data analysis.

4.3. Measures. The process of building items for each construct began with an investigation of the theoretical and empirical literature. Wherever possible, we relied on existing measurement scales that had been validated in the literature. The questionnaire for this study was developed based on items in the previous literature on control, trust, reciprocity, negotiation, information sharing, and project success. Lissitz and Green [84] and Dawes [85] proposed that the reliability of a scale increases as the number of scale points increases. To ensure sufficient reliability of the data, a seven-point scale ranging from one (completely disagree) to seven (fully agree) was used to measure the attitudes of the respondents.

Before distributing the questionnaires, six experts with over 10 years of experience in project management were invited to modify items in the scale. An examination of the questionnaire led to further refinement, including removing four redundant items, combining three that overlapped, and rephrasing items that were deemed confusing. The items for assessing control were developed by Qian and Zhang [3]; four of these items (CO1–CO4) are used to measure the extent of control in megaprojects. The items for assessing trust were adapted from Chow et al. [86] and Pinto et al. [87]; four of these items (TR1–TR4) are used to examine the level of trust between the participants of megaprojects. Social exchange norms are set as a second-order formative construct containing three first-order reflective constructs: reciprocity, negotiation, and information sharing. Three items (RE1–RE3) were adapted from Xue et al. [12]; they are used to assess reciprocity, with an aim to test the atmosphere of friendly cooperation between megaproject organizations. Four items (NE1–NE4) were adapted from Backhaus et al. [88] to measure the extent of negotiation between megaproject organizations. Three items (IS1–IS3) for assessing information sharing were derived from Lu et al. [16]. Finally, megaproject success is measured by using items

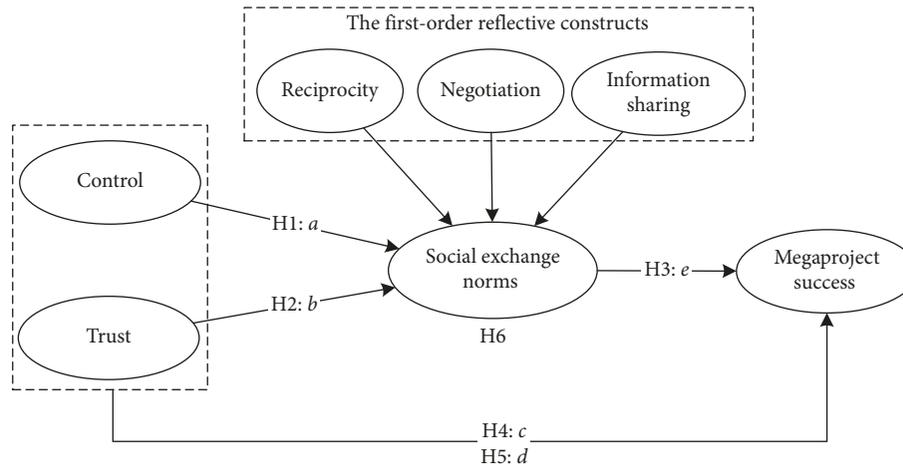


FIGURE 1: Structure model and hypotheses.

TABLE 1: Respondent classification.

	Type	Number	Percentage (%)
Experience	3–5 years	27	17.4
	6–10 years	56	36.1
	11–15 years	38	24.5
	16–20 years	22	14.2
	More than 20 years	12	7.7
Organization	Owners	68	43.9
	Construction firms	42	27.1
	Supervision firms	20	12.9
	Consulting firms	25	16.1
Region	Shandong	50	32.3
	Jiangsu	36	23.2
	Henan	23	14.8
	Hebei	19	12.2
	Zhejiang	20	12.9
	Sichuan	7	4.5

(MP1–MP5) derived from Luo et al. [89], and these items are mainly based on two aspects: project performance and stakeholder satisfaction. All items are shown in Table 2.

5. Data Analysis and Results

5.1. Measurement Model. The reliabilities of control, trust, reciprocity, negotiation, information sharing, and megaproject success were estimated based on internal consistency reliability (Cronbach's alpha) and composite reliability (CR). A Cronbach's alpha or CR value is considered adequate when it is greater than 0.7. As shown in Table 2, the results show that all Cronbach's alpha values and CR values are greater than 0.7, thereby implying a high level of internal consistency reliability and CR. Here, validity consists of convergent validity and discriminant validity. Convergent validity was assessed by the average variance extracted (AVE), and an AVE value is considered adequate when it is greater than 0.5. As shown in Table 3, the AVE values meet all requirements. According to the criterion of discriminant validity [90], the square roots of the AVE of each construct should be greater than the construct's correlation

with any other construct. As shown in Table 4, the values meet all requirements for discriminant validity, thereby confirming its existence.

5.2. Structural Model. R^2 is the coefficient of determination, and it is used to assess the central criterion of a structural model. The R^2 values of social exchange norms and megaproject success are 41.8% and 45.3%, respectively. These R^2 values demonstrate the predictive validity of the model. We execute the PLS algorithm with 300 iterations to obtain the path coefficients and perform bootstrapping analysis with 5,000 subsamples to test the significance of the path coefficients. As shown in Figure 2, control has no significant effect on social exchange norms ($a=0.103$, $p>0.05$), but has a significant effect on megaproject success ($c=0.289$, $p<0.01$). Thus, H1 is not supported, and H3 is supported. Trust has significant effects on social exchange norms ($b=0.376$, $p<0.001$) and megaproject success ($d=0.365$, $p<0.001$). Therefore, H2 and H4 are supported. Social exchange norms have a significant effect on megaproject performance ($e=0.302$, $p<0.01$). Therefore, H5 is

TABLE 2: Measures of constructs.

Constructs	Items
Control	CO1: We specify the performance standards in a contract, which is seen as the basis for monitoring
	CO2: We specify the deadlines, which are seen as a basis for controlling
	CO3: We strictly control and monitor the accomplishment of the targets
	CO4: We check all material brands and quality delivered to the site in person
Trust	TR1: We believe the other party can keep their word throughout the life of the project
	TR2: We feel confident that the other parties have high levels of integrity and honest
	TR3: We trust that the project participants are able to fulfill contractual agreements
	TR4: We are certain that the other parties have the ability to perform their tasks
Reciprocity	RE1: The leader of our partner will do me a favor if I did one for him/her before
	RE2: I will do the leader of our partner a favor if he/she did one for me before
	RE3: We are equitable in treating those partners dealing with
Negotiation	NE1: We actively listened to everyone's ideas before making a decision
	NE2: We insisted that both sides give in a little
	NE3: We avoided differences of opinion as much as possible
	NE4: We fought for a good outcome for ourselves
Information sharing	IS1: Exchange of information among the parties takes place frequently
	IS2: We keep each other informed about events or changes that may affect the other parties
	IS3: The parties established a good contact with each other, avoiding the possible misunderstandings
Megaproject success	MS1: This project was completed within the budget
	MS2: This project was completed on schedule
	MS3: The construction and deliverables quality are in accordance with the standard
	MS4: The project results, or deliverables, are in line with participants' satisfaction
	MS5: The project results, or deliverables, are in line with users' satisfaction

supported. The path coefficients of reciprocity, negotiation, and information sharing are 0.473, 0.355, and 0.392, respectively. Therefore, reciprocity, negotiation, and information sharing are considered appropriate constructs of social exchange norms. Regarding megaproject success, we observed that the path coefficients of control and trust are different. We conduct a path comparison to test the significance of the different effects between the two paths ($c < d$, $T = 6.31$, $p < 0.001$) by using the t -test approach proposed by Cohen et al. [91]. The results indicate that trust has a stronger impact on megaproject success in comparison with control.

TABLE 3: Measurement reliability and convergent validity assessment.

Constructs	Cronbach's alpha	CR	AVE
Control	0.83	0.91	0.67
Trust	0.89	0.88	0.73
Reciprocity	0.83	0.91	0.72
Negotiation	0.75	0.85	0.83
Information sharing	0.79	0.92	0.65
Megaproject success	0.88	0.91	0.77

TABLE 4: Correlations of the constructs and the values of discriminant validity.

Constructs	1	2	3	4	5	6
(1) Control	0.819					
(2) Trust	0.371	0.854				
(3) Reciprocity	0.124	0.542	0.848			
(4) Negotiation	0.256	0.565	0.513	0.911		
(5) Information sharing	0.334	0.511	0.624	0.521	0.806	
(6) Megaproject success	0.478	0.412	0.562	0.539	0.517	0.877

We then study the indirect effects of control and trust on megaproject success through social exchange norms, that is, the mediating role of social exchange norms. In this study, bootstrapping is used to estimate the indirect effects. A total of 5,000 subsamples at the 0.95 significance level are calculated. The bias-corrected confidence intervals of control and trust range from -0.002 to 0.146 and from 0.003 to 0.174 , respectively. The bias-corrected confidence interval of control includes zero. Thus, social exchange norms have no mediating effect between control and megaproject success. The bias-corrected confidence interval of trust does not include zero. This result indicates that the mediating role of social exchange norms between trust and megaproject success is significant. Thus, H6 is partially supported.

6. Discussion

6.1. The Effects of Control and Trust. The results show that in megaprojects, control has no significant impact on social exchange norms. By contrast, trust can effectively promote the application and development of social exchange norms. The reasons for this result are multifaceted. Due to the high complexity of megaprojects, implementing sound control governance and creating an enormous amount of space for opportunism are difficult, which is not conducive to the operation of social exchange norms. A trust-based governance mechanism can effectively promote the quality of interpersonal relationships and interorganizational relationships and help build common goals and enhance cooperation among participants [92]. Regarding the effects of control and trust on three first-order constructs of social exchange norms, control measures, such as the embodiment of contractual governance and its operation based on command and supervision, cannot reflect human-based management. Thus, the quality of reciprocity, negotiation,

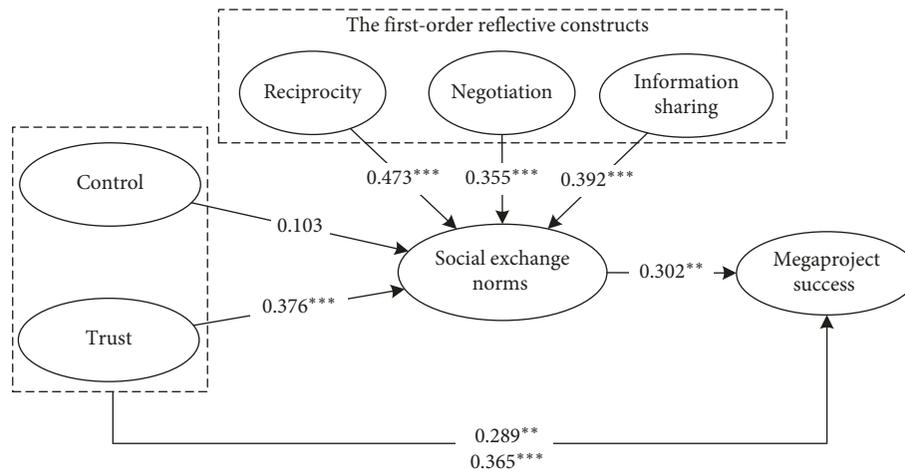


FIGURE 2: Results of structural equation modeling. Note. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

and information sharing cannot be effectively promoted based on good interpersonal relationships. This view was also shared by Long and Sitkin [7]. Trust has been widely regarded as a prerequisite for reciprocity and information sharing, and it can effectively promote the quality of negotiations. Control is based on a formal contract and lacks flexibility in reciprocity. Therefore, in some cases, controls may crowd out reciprocity [93]. By contrast, trust is usually accompanied by social history, and it guarantees reciprocity. Social history can enhance the relationship between trust and reciprocity [94]. Negotiation requires more trust than control. In addition, negotiations with space for compromise and mutual trust games can lead to high levels of cooperation [95]. However, control may easily lead to distrust and feelings of authoritarianism for the parties, thereby making their interests insecure. Symmetry and transparency are important principles of information exchange. Clearly, control cannot force people to share information transparently and symmetrically. In comparison, a partnership with a good foundation of trust can effectively promote the quality of information exchange.

The results of this study also show that control and trust have a significant positive impact on megaproject success. Control provides an institutional framework for megaproject success, which stipulates the responsibilities and the action scope of the parties. As a lubricant for the cooperation among multiple participants, trust plays a powerful role in improving megaproject implementation efficiency and promoting megaproject success [12]. We also find that the effect of trust on megaproject success is stronger than that of control in megaproject governance because of the high complexity of stakeholders in megaprojects. Although control can organize all participants in an orderly manner, it provides only a basic implementation rule and framework. Trust is the key factor driving the rule and framework [28]. It can increase the enthusiasm of participants and inhibit opportunistic behavior, thereby laying the foundation for megaproject success. These findings may help us understand that in megaprojects, trust is more powerful than controls in promoting the development of social exchange norms and

achieving megaproject success. Project managers should not only focus on the development of contract-based controls but also on the effectiveness of trust-based social exchange norms between parties of the megaproject.

6.2. Mediating Role of Social Exchange Norms. In this study, the effect of social exchange norms on megaproject success is significant. However, the mediating effects of social exchange norms are different between control and trust. Social exchange norms have a mediating effect on the relationship between trust and megaproject success but not on the link between control and megaproject success. This result illustrates that the influence of control on megaproject success cannot be improved by affecting social exchange norms. One reason is that reciprocity, negotiation, and information sharing are mostly based on informal relationships, whereas controls are practices of formal rules. However, trust was proven to be effective in positively impacting megaproject success through social exchange norms. According to the factor loadings of reciprocity, negotiation, and information sharing, reciprocity has the strongest explanatory power for social exchange norms because it is considered an important prerequisite of cooperation and understanding. Moreover, it can promote trust and megaproject success effectively. Information sharing and negotiation ranked second and third. We understand that, in megaproject governance, trust has a positive effect on information sharing and negotiation. In addition, their mediating effects on the relationship between trust and megaproject success are second only to reciprocity. This conclusion provides decision-making directions for project managers in their practical work, thereby helping them utilize trust accurately to influence different aspects of social exchange norms. As one of the few studies applying the social exchange theory literature to the context of control and trust governance in megaprojects, the current work initially empirically confirms the mediating role of social exchange norms in the relationships between control or trust and megaproject success. The findings of this study lead to a deeper understanding of megaproject parties' inherent

willingness to strengthen collaboration by borrowing social exchange norms. All parties aim to create long-term cooperation and maintain a good reputation and credibility to achieve megaproject success and obtain long-term cooperation opportunities in the future.

6.3. Managerial Implications. Although the results of this study are based mainly on questionnaire data from China, the conclusions have equal value for project governance in other countries. The reform and development of China's construction industry have been learning from the experiences of developed Western countries. However, many similarities have been observed in their construction management systems. The participants in megaprojects in China come from different countries and regions worldwide. Many megaprojects are designed by famous designers from the United States or Europe. Most consultants are from Hong Kong or the United Kingdom, and some contractors are from Japan. Therefore, the sample reflects the advantages, concerns, and opinions from an extensive experiential knowledge base, which accelerates the generalization and globalization of many common construction industry issues, problems, and solutions [96]. The research methodology of this study can provide a basis for similar research and can be used to solve other problems in project governance, where particular differences may be perceived, e.g., in terms of the relations between control and social exchange norms, possibly due to other concerns and priorities. In summary, the research methodology and research contents of this paper can attract global interest in the field of project governance in terms of the impact of the social exchange theory on the governance mechanisms of control and trust to promote project decision-making in a rational and efficient manner.

7. Conclusions

We established a novel research framework of control-trust governance in megaprojects based on the social exchange theory. In this study, we find that control and trust can influence megaproject success positively. However, the indirect effect of control on megaproject success through social exchange norms is insignificant. Thus, the mediating role of social exchange norms exists only between trust and megaproject success. Control is still indispensable although trust is more effective than control. The relationship between control and trust can be described as "macro-micro complementarity." Control provides a formal framework for all parties from a macro level, whereas trust maintains a friendly social relationship from the micro level. The findings of this research provide insights into the relationships between control, trust, social exchange norms, and megaproject success. They also enhance the ability of megaproject managers to resolve conflicts via control-trust governance.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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