sustainability

MDPI

Article

The Cooperation Establishment Mechanism of EPC Project Consortium in Context of China: Form the Perspective of Trust

Weiping Jiang * and Shanqing Tang

School of Civil and Transportation Engineering, Shenzhen University, Shenzhen 518060, China
* Correspondence: swingopen@szu.edu.cn

Abstract: The purpose of this paper is to explore the establishment mechanism of an EPC consortium from the perspective of trust. Questionnaire surveys were undertaken to collect data from the experienced project managers of a design company group and a construction contractor group. Structural equation modeling was used to test the hypotheses in this research. The results reveal that reputation and communication are important factors in the generation of trust (including calculative trust and relational trust) from the design company perspective. Meanwhile, reputation, reciprocity and communication are important factors for the generation of trust from the construction company perspective. Both calculative trust and relational trust are positive factors that affect the intent of both the design company and the construction contractor to cooperate. This research has innovatively added to and contributed to the existing knowledge of EPC consortium establishment mechanisms.

Keywords: engineering; procurement and construction; project consortium; trust; intention to cooperate

Citation: Jiang, W.; Tang, S. The Cooperation Establishment Mechanism of EPC Project Consortium in Context of China: Form the Perspective of Trust. *Sustainability* **2023**, *15*, 1266. https://doi.org/10.3390/su15021266

Academic Editors: Chunlu Liu and Janez Kušar

Received: 28 November 2022
Accepted: 23 December 2022
Published: 9 January 2023

1. Introduction

The construction industry is moving towards becoming highly integrated, modernizing through a professional division of labor [1]. This modern integration is different from the original forms of integration. For example, in the past, the contractor did both design and construction work. Modern integration is a re-integration, based on the professional division of labor. Under this background, the engineering, procurement and construction (EPC) mode is greatly advocated and promoted, both at home and abroad [2]. In 2019, the Ministry of Housing and Urban-Rural Development of China issued "Measures for the administration of general contracting of housing construction and municipal infrastructure projects" [3]. This new policy pushed the EPC mode into a new historical development stage in China.

An EPC project is a complex process involving a set of products (materials, equipment), services, and construction tasks. Each element is specifically designed to complete a particular output for a customer within a certain period of time: a building, a power plant, a turnkey factory, or something similar [4]. The EPC mode has been increasingly adopted in projects, because of its high efficiency in terms of simultaneously integrating diverse design, procurement, and construction processes. However, only a limited number of companies are competent enough to fulfill the relevant EPC tasks by relying only on their own capacities [5]. In addition, a great number of EPC contractors—called consortiums—are being set up by design companies and construction companies. For example, in 2020, 69% of EPC project contractors involved in Shenzhen government investment projects were in consortiums [6]. A consortium generally has two forms: being led by design companies or being led by construction contractors.

In studies of EPC consortiums, much of the existing research focuses on the distribution of benefits [7], risks [8], performance evaluation [9], and risk management [10]. However, to date, very little research has examined how to establish a consortium relationship. In addition, the difference between the establishment of an EPC consortium led by a

design company, as opposed to one led by a construction contractor, is also a research area blind spot. Trust is indispensable for the establishment of a cooperative relationship in a consortium. There are two research questions needed to be resolved. The first question is that, how can trust be established in the process of setting up a consortium constituted by a design company and construction contractor. The second question is what impact will that trust have on the intent to establish consortium cooperation. The purpose of this study is to resolve the above research questions.

2. Literature Review

2.1. EPC in China

2.1.1. EPC Development History in China

Policies and laws have played a very important role in guiding the development of EPC projects in China. The following subsection describes the development history of EPC projects in China, mainly from the perspective of relevant policies and laws.

- Introduction period (1984–2001)

In 1984, the State Council of China promulgated the "Interim Provisions on Several Issues Concerning the Reform of the Construction Industry and Major Construction Management System". This policy referred to the EPC mode for the first time, opening the way for EPC practice in China [11]. In 1987, the National Development and Reform Commission issued a document requiring the promotion of Lubuge project management experience. This signaled the beginning of learning the classic case of the EPC mode [12]. In 1997, the Construction Law of China clearly stipulated that the implementation of EPC was being advocated, thus strengthening the promotion of the EPC mode [13].

- Pilot promotion period (2002–2008)

In 2003, the Ministry of Construction of China promulgated its opinions on cultivating and developing EPC and project management enterprises. The ministry clearly stipulated that general contracting includes both EPC and DB (design and build) [14]. In 2007, the Ministry of Construction issued "The measures for general contracting of railway construction projects". The aim of this policy was to popularize the general contracting mode in railway construction [15]. The EPC mode has been extended from the initial petroleum and chemical field to now encompassing highway, railway, water conservancy, electric power and other fields.

- Adjustment period (2009–2013)

Affected by the financial storm triggered in part by the 2008 global economic crisis in 2008, China's construction industry continued to be depressed for several years. During this period, the heat behind the EPC trend decreased greatly. However, the model text of EPC contracts for construction projects (for trial implementation) and the standard EPC bidding documents had been successively issued. These contracts and documents determine the preliminary specifications for EPC contract and bidding behavior in China [16].

- Acceleration period (2014–present)

Since 2014, accelerating general contracting (as represented by EPC) has become a top priority in the reform of China's construction industry. In 2016, the Ministry of Housing and Construction issued several opinions that further promote the development of EPC. The ministry stressed that general contracting should be actively adopted in projects in which the government has invested. Also, those involved in the construction of prefabricated buildings, and project owners should be encouraged to give priority to the EPC mode of construction [17]. In 2017, the State Council issued its opinions on promoting the healthy development of the construction industry, and proposed accelerating the implementation of the general contracting of projects [18]. The general contracting management specification for construction projects was officially implemented in 2018. In 2020, the general contracting management measures for housing construction and municipal infrastructure projects were

formally implemented. The EPC mode is developing rapidly due to the government's encouraging policies [19].

2.1.2. EPC Application

- Overall Performance

The use of the EPC method is accelerating but has not yet been fully rolled out. According to public data from the Ministry of Construction, EPC projects in China's construction industry show a trend of rapid increase in business volume and continuous expansion of project scale. In 2018, the output value of the construction industry was 27 trillion RMB, and the general contracting income was about 2.7 trillion RMB, accounting for only 10% of the total [12]. As can be seen, therefore, the promotion of the EPC mode in China is effective, but its use still faces significant challenges.

At present, two directions, namely design-led and construction-led have been formed in terms of EPC practice. Taking design as the leading direction clearly puts forward that EPC practice takes the designer as the leader, thereby giving full play to the leading role of design. Conversely, taking construction as the leading direction is the choice of most construction enterprises. In practice, there are currently more EPC projects led by construction enterprises than by design companies [20,21].

- EPC application scope

The "General Contracting Management Measures for Housing Construction and Municipal Infrastructure Projects" policy stipulates that projects in which the government has invested and projects controlled or dominated by state-owned funds must give priority to EPC. Projects using BIM technology must actively adopt EPC, and prefabricated building manufacturers shall adopt EPC in principle [22].

The time points of EPC contractors' involvement in the project vary in different parts of China. Generally, however, the owner can only contract the EPC project after the project scope, construction scale, construction standards, functional requirements, investment quota, project quality and progress requirements are determined [12,23]. As shown in Figure 1 below, the owners generally complete the project proposal and feasibility study before contracting out the work.

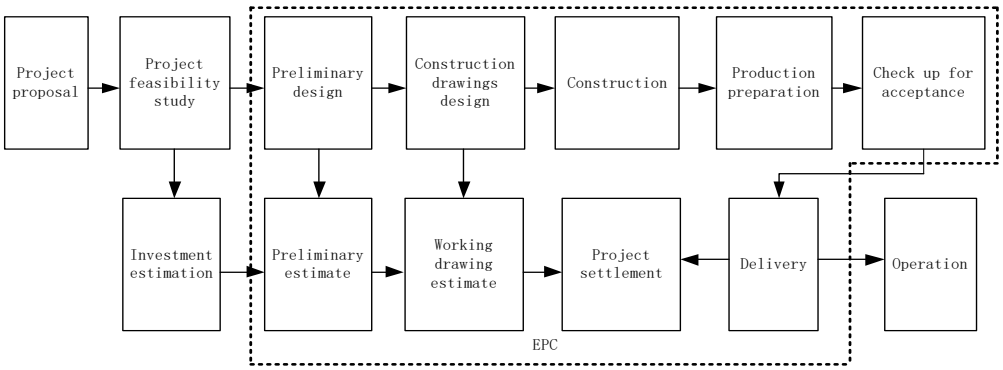

Figure 1. Project phases relevant to EPC.

Policies and laws have played a very important role in guiding the development of EPC projects in China. The following subsection describes the development history of EPC projects in China, mainly from the perspective of relevant policies and laws.

2.1.3. Consortium Application

Few enterprises in the market can have adequate design and construction capabilities at the same time. Therefore, the consortium mode accounts for a high proportion of EPC projects [24]. At the national level, taking design as the leader and implementing the architect responsibility system has been advocated. However, in reality, not many

projects are actually being led by design; such projects that are led by design are mainly concentrated in petrochemical projects. In housing and municipal projects, the EPC projects led by the construction companies are in the majority.

In addition, as a consortium is a temporary and one-time organization, which is not conducive to the accumulation of project experience, and because there are inevitably disputes over risk sharing and profit distribution, some local governments do not advocate the consortium mode [12,25].

2.2. Trust Theory

Trust research is approaching maturity, as shown in Figure 2 below, which itself is the basic framework of trust theory.

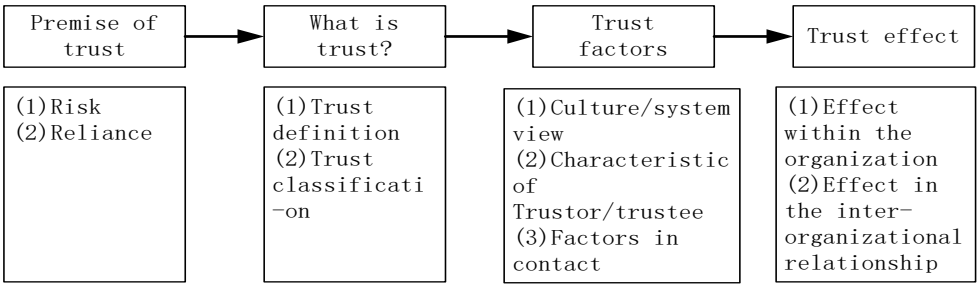

Figure 2. Framework of trust theory.

2.2.1. Premise of Trust

Risk and dependence are generally recognized as the premise of trust [26]. Where there is no risk, there is likewise no need to trust others. When the result of something is certain, there is no need to generate trust. In many definitions, trust is regarded as a psychological state under risk conditions [26,27]. Some studies even regard trust as a behavioral risk-taking act [28,29]. In short, risk is one of the preconditions of trust.

In addition, one must rely on others to have the need for trust. If something is risky, but you can deal with it yourself and you don't need to rely on others, there's also no need to trust others. When there is nothing you can do to deal with things, you must trust others. It is reasonable to believe that the higher the degree of dependence is, the higher will be the degree of trust. Indeed, some studies have measured trust through dependence [30].

Trust only exists when risk and dependence both exist at the same time. However, it must be noted that dependence means letting go. That is, as the turstor, has no competence or opportunity to exert control on the trustee. However, in reality, trust and control often coexist, but to different degrees [31].

2.2.2. Connotation of Trust

After clarifying the premise of trust, the connotation of trust actually becomes clear. There are many definitions of trust, involving many different fields, such as economics and management; the definitions are quite similar. Rousseau et al. [26] put forward an authoritative definition. That study maintained that trust is a psychological state comprised of the intention of one person to accept vulnerability based upon positive expectations of the intentions or behavior of another. However, the composition of trust (i.e. the fundamental elements of trust's definition) are comparable across research and theory. Definitions of trust focus on parties both inside and outside firms, and studies have investigated trust relations from different disciplinary advantage points. As Table 1 shows, there are different types of trust.

Table 1. Types of trust (adapted form [32]).

Scholars	Type of Trust
Rousseau et al. [26]	Calculative; relational; institutional
Williamson [33]	Calculative; personal; institutional
Shapiro et al. [34]	Knowledge-based; identification-based; deterrence-based
Lewis and Weigert [35]	Cognition-based; affect-based
Lewicki and Bunker [36]	Economy-based; knowledge-based; identification-based
Sako [37]	Competence-based; goodwill-based; contractually-based
Hartman [38]	Competence based; integrity-based; intuitive-based
Cheung et al. [39]	Cognition-based; affect-based; system-based

In fact, all these types of trust are universally aligned with the classification developed by Rousseau et al. [26]. That study classified trust into calculative, relational, and institutional trust, forming the basis of subsequent research.

Calculative trust is based on rational calculations and is derived from credible information or competence obtained through certification or reputation [32]. Calculative trust is fragile, as it is limited to discrete exchanges reinforced by the existence of deterrents [26]. In construction projects, contractors are generally trusted because of their certifications, which indicate the contractors' competency. Relational trust is emotional and based on information acquired through long-term and frequent communication. The essence of relational trust is a kind of relational exchange; that is, the two sides have relationships with each other [40], such as feelings and family affection. Relational trust is different from calculative trust. Relational trust is both long-term and sustainable. Calculative trust will terminate once the interests of either party are damaged. Institutional trust is the trust of the two parties involved in the social system, law, or the culture of one of the parties that governs behavior and actions. Institutional trust can help to facilitate either calculative or relational trust [26]. There is no doubt that institutional trust can be used as the basic trust of any given society, which in turn is conducive to the establishment of both calculative and relational trust. However, in Chinese society and culture, the awareness of the system is weak, and the system is often unstable, frequently changing with people and things change [41]. Trust is more so built on relation sanctions [42]. Consequently, institutional trust is not concerned and discussed in this paper. Rather, the role of calculative trust and relational trust will be discussed in further detail.

2.2.3. The Antecedent of Trust

There are many factors required to generate trust. From a systematic point of view, there are mainly three aspects, namely (1) the characteristics of the trustee and trustor, (2) bilateral relationships, and (3) environmental factors. In many studies, both the characteristics of the trustor and environmental factors (such as the degree of social legalization and social moral level) are regarded as the control variables [43]. In this study, the researcher also agrees with this approach and will no longer consider the characteristics of the trustor and environmental factors; the antecedents of trust in construction inter-organizations are shown in Table 2.

Table 2. The antecedents of trust in construction inter-organizations (adapted from [43]).

Types	Antecedents of Trust	Reference
The characteristic of trustees	Commitment, risk-taking, knowledge, honesty and benevolence	Cheung et al. [44]
	Results, integrity and concern	Wong and Skitmore [45]
	Reliable behavior, communication skills, sincerity, showing commitment, benevolence and competence, showing and acting with integrity, working toward reaching project milestones	Karlsen [46]
	Accomplished results, integrity between words and behavior, and the showing of care	Shaw [47]; Wong and Skitmore [45]
	Goodwill, commitment, and "sacrificing behavior"	Wood and McDermott [48]
	Sacrificing behavior, problem solving, and reputation	Wood and McDermott [48]
	Reputation, competency, and integrity	Jiang et al. [43]
The characteristic of the relationship between trustors and trustees	Communication	Karlsen [46]; Wood et al. [49]
	Communication and long-term relationship	Wood and McDermott [48]
	Establishing common goals	Karlsen [46]
	Past experience, problem resolving, shared goals, and reciprocity	Khalfan et al. [50]; Wood and McDermott [48]
	The contract	Jannadia et al. [51]; Thompson and Anderson [52]
	Contract, communication, and reciprocity	Jiang et al. [43]

In terms of trustees' characteristics, many factors may induce people to trust the trustors, including commitment, risk-taking, knowledge, honesty, benevolence, integrity, concern, reputation, competency and so on [44–47,49]. Reputation always be seen as the reflection of past performance and historical records [48], and is cumulative. Similarly, competency is also cumulative, and the the competency of one party may not be largely improved at one time [43,46]. Integrity reflects the behavioral characteristics of the trading party [46]. While a deceptive party's words and deeds can pretended to be temporary, they always show the true face in when key interest arise. Therefore, the characteristics of the trustee basically represent the static factors, with no significant changes during the whole project life cycle [32].

The relationship between the two parties is dynamic, whereby the process and results of communication are constantly changing [46,49]. Reciprocity is also dynamic. Perhaps, at a given time, one party's sacrifice for the other party is returned in a timely manner with gratitude and the reciprocity is strong [48]. The same is true for contracts, people like contracts with clear terms. However, contracts that have been signed can be changed with project progress [43,51]. Therefore, the characteristics of the relationship between the two parties represent dynamic factors, which are constantly changing throughout the whole project life [32].

This paper studies trust building between design companies and contractors in constituting consortiums in EPC projects. The factors of competency and contract are not selected in this study as the factors that affect the cooperation between the two sides. This is because the contract has not been signed, and the design company and the contractor have not worked together in the past. Moreover, as the embodiment of past performance, reputation has already reflected the ability of the companies. Generally speaking, those with strong ability will have a good reputation [52]. In addition, the communication that occurs before determining the cooperative relationship between the two sides also plays a very important role in the establishment of trust. Only after sufficient communication and understanding can trust be generated [53]. Finally, reciprocity is also an important factor in the building of trust between EPC consortium members. In addition, communication, mutual assistance and mutual benefit are undoubtedly conducive to the establishment of trust. Therefore, this paper selects reputation, communication and reciprocity as the antecedents of trust.

2.2.4. Effects of Trust

Although different disciplines have different perspectives with regard to the role of trust, the positive role of trust is universally recognized. Sociologists understand trust to be a simplified social mechanism [54,55]. Economists believe that trust can reduce costs and opportunistic behavior [33]. Management experts believe that trust can reduce organizational conflict and improve team and organizational performance [28,40].

Previous research on the role of trust in construction projects is mostly empirically-based. Jiang et al. [43] demonstrated the role of trust in project success in China. Pinto et al. [56] demonstrated the role of trust in large-scale construction projects in Canada. The results show that trust has different meanings for the owner and the contractor. For the owner, trust based on integrity and trust based on ability are both important factors for establishing a healthy relationship between both parties. However, only trust based on integrity is believed to have an important and direct impact on project success. For the contractor, trust based on integrity is the only important determinant of the relationship between the two parties. Lau and Rowlinson [57] believed that trust can reduce claims, save time and cost, and improve project quality. The role of trust in existing research is mostly concerned with the cooperative relations that have been established. How trust can help the establishment of cooperative relationships is still under discussion, and there is a lack of empirical research related to this question.

2.3. Cooperation Theory

This is an era in which competition and cooperation coexist. It is not easy to reach a state of cooperation. Conditions of cooperation include: (1) one party relies on the other [58]. In this regard, trust and cooperation are similar. (2) The interests of each party will not be harmed by the other [59]. Transaction cost theory, game theory and strategic alliance theory can all explain the existence of cooperation.

From the perspective of transaction cost theory, when the outsourcing cost is higher than a party's own production cost, internal vertical production is adopted. If the production cost is higher than the market price, the cooperation method is adopted [33]. From the perspective of game theory, in a temporary cooperation, opportunistic behavior opportunities may appear. However, multiple cooperation or even long-term cooperation is in place, an equilibrium solution will exist, and mutual cooperation will benefit both parties [60]. The strategic alliance theory is actually an extension of game theory. That is, many companies establish long-term cooperative relationships to protect the interests of all parties. In the construction field, due to the one-time nature of construction projects and the diversity of project characteristics, there are few long-term cooperative relationships. Rather, most of the relationships are one-time in nature.

The development history of EPC in China is not long. At present, very few enterprises can independently undertake EPC projects [61]. It is common to undertake EPC projects in the form of a consortium [7]. How to establish a consortium between design and construction units is a research gap worthy of discussion and a problem that has not yet been solved. This paper will discuss the generation of trust in the process of consortium establishment, as well as the impact of trust on the cooperation intention from the perspectives of design companies and construction contractors. The research results will be beneficial to the smooth building of EPC consortiums and the rapid promotion of EPC projects in China's construction industry. In addition, this study will theoretically enrich the existing research on trust in the construction industry and help to understand the differences between trust mechanisms in different cooperative relationships (such as owners and contractors, and design companies and construction contractors).

3. Research Hypotheses

3.1. Antecedents of Trust and the Creation of Trust

3.1.1. Reputation and Trust

Reputation is defined as the impression a person makes on others because of his or her characteristics and trade behavior [43]. Reputation is also closely related to time and is an intangible asset formed over the long-term accumulation of experiences [62]. In the field of economics, those with good reputations can make credit loans. In inter-organizational cooperation, there is reason to believe that reputation plays a positive role in trust. Many studies have confirmed the positive correlation between reputation and trust [63,64]. For a trustor, the reputation of the trustee is seen as reliability, and there will be a reliable guarantee of the trustor's cooperation [65]. The trustee is also willing to communicate with the trustor and maintain a long-term cooperative relationship [66]. In view of the above discussion, we assume the following:

H1a. *The better the reputation a trustee has, the more calculative trust the trustee will receive from a trustor.*

H1b. *The better the reputation a trustee has, the more relational trust the trustee will receive from a trustor.*

3.1.2. Communication and Trust

Communication is another important factor in building trust [43]. Karlsen [46] stated that project communication skills play an important role in developing stakeholders' trust. Good communication can promote both parties' full understanding. High-quality communication can also easily enhance understanding and feelings, which are conducive to increasing calculative trust and relational trust, respectively. In addition, good communication delivers accurate and timely information, allowing the two parties to understand each other's requirements. Simply put, good communication promotes the building of trust [43]. Poor communication not only leads to information blockage and untimely information transmission, but to suspicion between both parties. As such, poor communication has a bad impact on trust. As an extreme example, trust quickly disappears and cannot be recovered when one party lies. However, research has found that poor communication can lead to the breakdown of all four major trust issues: circumstances beyond control, understanding that mistakes can happen, fair representation, and fixing problems [50]. Therefore, it is reasonable to put forward the hypotheses concerning the relationship between communication and trust as follows:

H1c. *The better the communication is, the more calculative trust a trustee will receive from a trustor.*

H1d. *The better the communication is, the more relational trust a trustee will receive from a trustor.*

3.1.3. Reciprocity and Trust

Reciprocity means that, when one party makes contributions to the other party, the other party should return the gesture. That is, the recipient of the initial contribution should also take an action that is beneficial to the other party [67]. Reciprocity has been widely studied in game theory. The basic view of game theory is that, when one party makes a contribution to another party, the second party will not necessarily make a corresponding contribution. Rather, that second party will weigh its own interests. Only when an action is beneficial to itself will the second party make the response expected by the first party [68]. However, if one party cannot get the corresponding expected response, the cooperative relationship may not last for long. Other studies have shown that people do tend to take responsive actions, even if those actions are contrary to their own interests [69,70]. Therefore, when deciding whether to trust the other party, one party must consider the reciprocity between the two parties; that is, whether the other party is willing to return contributory gestures. Research has shown that organizations (or individuals) tend to trust organizations (or individuals) who respect and return trust [71–73].

In the EPC consortium covered in this study, it is obvious that the two parties use each other's advantages equally, in order to satisfy their own interests [9]. The design company and the construction contractor jointly signed a contract with the owner as a whole. The two sides already have a closer relationship than the traditional project management mode [24]. In this relationship, both parties will need to face various uncertainties related to the project. When unforeseen circumstances arise, reciprocity must play a role in resolving problems. For example, when an unforeseen problem occurs, that problem needs to be solved through consultation between the design company and the construction contractor. The design scheme may need to be changed, or, conversely, the construction scheme may need to be changed. Therefore, the hypotheses are put forward as follows:

H1e. *The more reciprocity there is, the more calculative trust a trustee will receive from a trustor.*

H1f. *The more reciprocity there is, the more relational trust a trustee will receive from a trustor.*

3.2. Trust and Cooperation Intention

Many studies have explored the relationship between trust and cooperation. The main point of these studies is that trust is conducive to promoting cooperation [9,31,43,74]. As mentioned earlier, trust and cooperation have a common premise; that is, one party needs to rely on others to accomplish what they want to do. Trust is actually the result of a series of screenings. It has been said that, when a person is trusted, it means that person is reliable and capable. Therefore, one can cooperate with this person. Mashima [74] found that trust plays a signaling role in promoting mutual cooperation, even in relationships with unfixed or temporary partners.

In the studied EPC consortium, the design company and construction contractor are generally familiar with each other from prior contacts [9]. The design company contacts the contractor, or the construction contractor contacts the design company; this is a kind of trust behavior. Of course, the design company or construction contractor may also contact several other units at the same time, for investigation purposes [10]. The decision to choose which unit to cooperate with is made after comprehensive consideration of various factors. However, one thing that is certain is that only when one party has enough trust will that party finally decide to cooperate with the other unit. Therefore, the hypotheses are as put forward as follows:

H2a. *The more calculative trust there is, the more cooperation intention a trustee will receive from a trustor.*

H2b. *The more relational trust there is, the more cooperation intention a trustee will receive from a trustor.*

4. Research Methodology

The survey method was adopted to test the hypotheses proposed in this research. The survey method generally contains three stages, namely questionnaire design, sampling, data collection and model validation [43].

4.1. Questionnaire Design

The measures used in this study were first obtained from a literature review. The measures were modified after the project review. As a considerable part of the original questionnaire was written in English, we translated the questionnaire into Chinese and then translated Chinese back to English for comparison purposes, in order to ensure the accuracy of the translation. In addition, project management experts were hired to propose modifications to the Chinese version of the questionnaire and to better adapt to the Chinese situation.

A pilot test was conducted to validate the measures [75]. A total of 115 questionnaires were sent to the project managers of design companies and construction companies, all of whom were representatives in the setting up of EPC consortiums. A total of 66 completed

questionnaires were returned, and the author conducted a preliminary data analysis to determine the reliability. We then modified the questionnaire to improve the reliability. Eventually, a questionnaire that could be used for sampling was created, as shown in Table 3. The questionnaire used a 5-point Likert scale, ranging from "1" for "strongly disagree" to "5" for "strongly agree. The responses therefore indicated the extent of the agreement of the respondents.

Table 3. Questionnaire: Construct, description and references(Adapted from [39]).

Construct	Description	Reference
Reputation	The other party has a reputation for being honest (REP1). The other party is known to care about others' interests (REP2). The other party is considered in the industry to be fair (REP3).	Jiang et al. [43]
Communication	Two parties communicate with high frequency and good effect (COM1). Two parties efficiently and adequately share information (COM2). Two parties communicate in a timely manner (COM3). The information exchanged in communication is accurate (COM4). Conflicts can be resolved through communication (COM5).	Jiang et al. [43]; Wood et al. [49]; Wong and Chen [76]
Reciprocity	When dealing with uncertainty, the other party will consider our interests (REC1). The other party would provide help when we face problems (REC2). The other party would return the favor to us when we provide the help (REC3). When we make sacrifices for the project, the other party will also make similar sacrifices (REC4).	Jiang et al. [43]
Calculative trust	We are sure that the party has the ability to effectively perform the work (CAL1).	Jiang and Lu [31]; Lui and Ngo [77]
	We believe that project staff members of the party are competent (CAL2).	
	Given the previous track record of the other party, we see no reason to doubt the competency and preparation for this project (CAL3).	
Relational trust	We believe that the other party will make good on their promises during the project's execution (REL1).	Jiang and Lu [31]; McAllister [40]; Lui and Ngo [77]
	We believe that the other party will follow moral standards during the project's execution (REL2).	
	We believe that the other party can be trusted (REL3).	
	We believe that the other party is fair (REL4).	
	We believe that the other party will take us into consideration during the project's execution (REL5).	
	We believe that the other party will not exploit us to maximize profits (REL6).	
	We believe that the other party is professional and dedicated to the project (REL7).	
Intention to cooperate	In order to establish a cooperative relationship, we are willing to give some preferential terms (INT1).	Jiang and Zhao [32]
	We are willing to invest resources in this cooperation (INT2).	
	We hope to maintain long-term cooperation with the other partner (INT3).	

4.2. Sampling and Data Collection

The research survey was carried out in 2020, in Shenzhen and Guangzhou. These are highly-developed cities with relatively more EPC projects than other cities. Questionnaires were sent to the design institute and the construction contractor, respectively. Since a consortium is generally established by the project manager of the lead unit before project bidding, the questionnaire was sent to the project manager of both the design unit and the contractor. Questionnaires were sent to the design companies and the construction contractors, respectively. Of the 320 questionnaires mailed out to the design companies, 221 usable questionnaires were received back. That total represented a 69.06 percent response rate, which is a little lower than that of the construction contractors group. The response rates of Shenzhen and Guangzhou were both more than 40 percent of the completed questionnaires. See Table 4 for details of the response rate.

Table 4. Questionnaire response rate.

Group	City	Number of Questionnaires Received	Response: Total Questionnaires Sent (%)	Response: Total Questionnaires Received (%)
Design companies group	Shengzhen	112	35.00	50.68
	Guangzhou	109	34.06	49.32
	Total	221	69.06	100.00
Construction contractors group	Shengzhen	123	38.44	52.12
	Guangzhou	113	35.31	47.88
	Total	236	73.75	100.00

4.3. Model Validation

For model validation, a series of analyses were used to test the reliability and validity of the constructs. By following the research of Jiang and Lu [31], an exploratory factor analysis (EFA) was utilized to test the unidimensionality of the constructs; Cronbach's α was employed to assess the reliability [78].

The EFA was used with a principal component analysis to analyze the data; SPSS 26 was also used. Moreover, varimax rotation with Kaiser normalization was used for each factor [79]. Cronbach's α was then used to test the internal consistency of the constructs. All of the measurements had strong loadings on the constructs. All of the Cronbach's α values were above the threshold value (0.7) suggested by Sharma [80], as shown in Table 5. Therefore, the constructs' unidimensionality and reliability were confirmed.

Table 5. Measurement validity assessment.

Construct	Cronbach's α (Design Companies/Construction Contractors)	CR (Design Companies/Construction Contractors)	AVE (Design Companies/Construction Contractors)
Reputation	0.85/0.84	0.85/0.84	0.65/0.59
Communication	0.82/0.80	0.82/0.80	0.55/056
Reciprocity	0.83/0.84	0.83/0.84	0.58/0.55
Calculative trust	0.82/0.80	0.82/0.80	0.71/0.69
Relational trust	0.81/0.82	0.81/0.82	0.52/0.51
Intention to cooperate	0.85/0.86	0.85/0.86	0.69/0.64

Then, AMOS software was used for the confirmatory factor analysis, in order to test the model. For the design companies group, model fit indices were derived from $\chi^2/df = 1.87$, root mean square error of approximation (RMSEA) = 0.05, incremental fit index (IFI) = 0.970, comparative fix index (CFI) = 0.970, and goodness of fit index (GFI) = 0.905, indicating an adequate fit of the model to the data [81]. The result for the construction contractors also demonstrated the good fit of the model.

The average variance exacted (AVE) was calculated for each construct to assess convergent validity; construct reliability (CR) was calculated to assess discriminant validity [82]. If the CR value is above 0.6, and AVE > 0.5, then the AVE and CR values of the constructs are all above the thresholds. The result is shown in Table 5.

Structural equation modeling (SEM) was used to assess the causal relationships among the constructs. The model fit indices are shown in Table 6. For the design company group, although the model fitting index is good, the path coefficients from reciprocity to calculative trust and relational trust are not significant. After the paths were deleted by modifying the model, the fitting index of the model improved. Therefore, we have reason to believe that the revised model is accurate. For the construction contractors group, the model fitting index is good, and the path coefficients are significant. The final SEM models for the design company and construction contractor are shown in Figures 3 and 4, respectively.

Table 6. Results of the original model and the revised model.

Relationship among Variables	Hypothesis	Original Model		Revised Model
		Design Company's Response	Contractor's Response	Design Company's Response
Independent variables' impact on intermediate variables	H1a	0.301 *	0.255 *	0.302 *
	H1b	0.211 *	0.200 *	0.210 *
	H1c	0.148 *	0.188 *	0.150 *
	H1d	0.150 *	0.148 *	0.165 *
	H1e	0.007	0.112 *	N/A
	H1f	0.007	0.108 *	N/A
Impact of intermediate variables on dependent variables	H2a	0.304 *	0.311 *	0.310 *
	H2b	0.406 *	0.389 *	0.411 *
Goodness of fit indexes	Chi-square	1.870	1.901	1.852
	RMSEA	0.050	0.052	0.049
	IFI	0.970	0.955	0.975
	CFI	0.970	0.955	0.975
	GFI	0.905	0.900	0.911

* Significance level is less than 0.05.

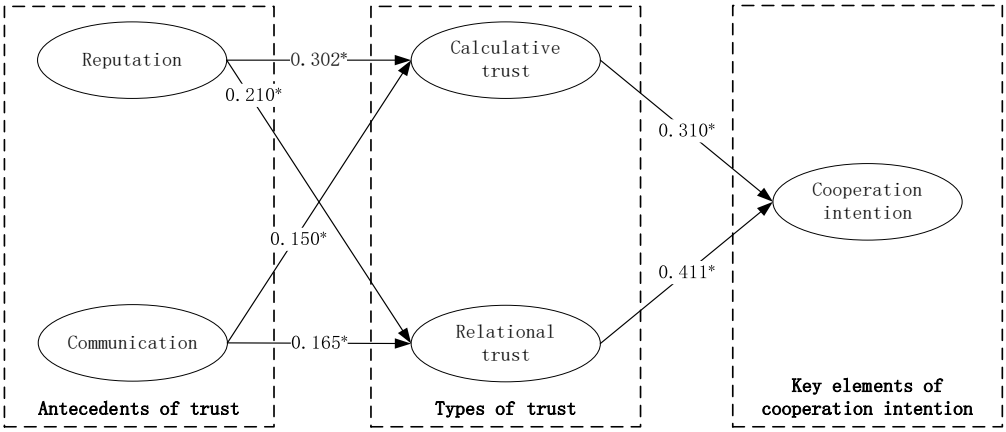

Figure 3. Final SEM model for design company's perception of the trust relationship. * Significance level is less than 0.05.

Figures 3 and 4 show that reputation has a positive impact on both calculative trust and relational trust. One can infer from this finding that, for both design companies and construction contractors, when one party has a good reputation, the other party will generate high calculative trust and relational trust. Thus, H1a and H1b are supported. The path coefficients of Figures 3 and 4 also reveal that communication has a positive impact on both calculative trust and relational trust, thus supporting H1c and H1d. This further indicates that, when communication is abundant and effective, calculative trust and relational trust

will be either generated or increased. However, for the design company group, Figure 3 reveals that there are no significant coefficients for the paths from reciprocity to calculative trust and relational trust. Therefore, for the design companies group, H1e and H1f are not supported. For the construction contractor group, Figure 4 shows that reciprocity has a positive impact on both calculative trust and relational trust, thus supporting H1e and H1f. Moreover, Figures 3 and 4 show that both calculative trust and relational trust have a positive impact on cooperation intention, thus supporting H2a and H2b.

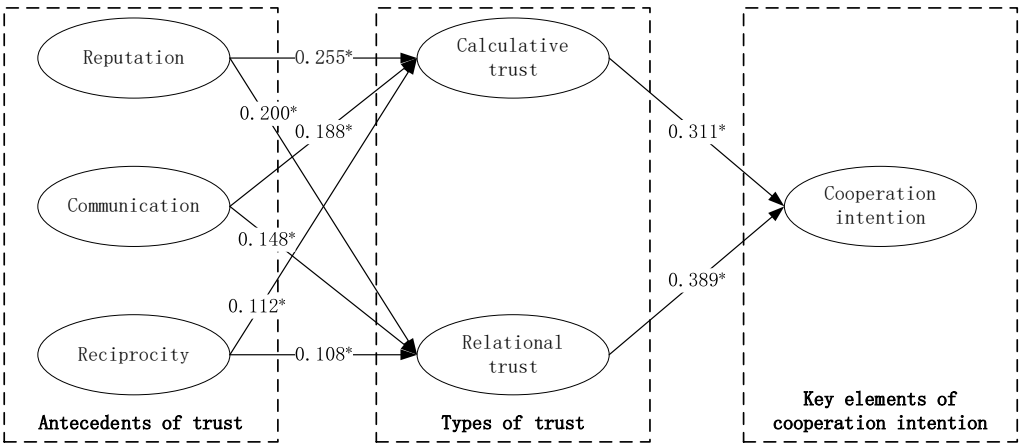

Figure 4. Final SEM model for construction contractor's perception of the trust relationship. * Significance level is less than 0.05.

5. Discussion

5.1. Reputation and Trust

The positive effect of reputation on trust is proved in this study. However, for the design companies and the construction contractors, differences in trust exist. Design companies seem to prefer to use the reputation mechanism to choose cooperation partners, because for the design companies, reputation has a greater influence coefficient on calculative trust and relational trust. This finding is basically consistent with the conclusions of existing research on EPC consortiums. In the studied EPC consortium, the design company and the construction contractor are considered to have information asymmetry [83]. Specifically, the design company may not know much about construction procedures and construction technology. In contrast, the construction contractor knows relatively much more about the construction process [84]. Therefore, the design company relies more on the reputation mechanism to select the construction contractor as a partner.

In addition, reputation has different effects on calculative trust and relational trust. Reputation, as is well understood, has a greater impact on calculative trust. When cooperating with reputable companies, our rights and interests are highly protected. Reputation is an asset that is accumulated over the long-term [31]. A reputable company rarely takes opportunistic actions that may destroy its reputation [85]. The design companies and construction contractors interviewed for this study said that, in the construction field, reputation is very important for attracting business. Design companies must provide high-quality designs to maintain their reputations, while the construction contractor must ensure the construction quality, resources, and progress of the project to maintain its reputation.

5.2. Communication and Trust

The positive effect of communication on trust is confirmed in this study. The empirical results of this study clearly show that communication is one of the most important means to generate trust, both for the design company and the construction contractor. In the course of communications, one party will come to understand more about the other partner, generating an "echo in the hearts" of the partners. Eventually, trust between the two partners will be generated through clear and effective communication [43,86].

In project reviews, project managers from the design companies and construction contractors both recognize the important role of communication in trust. The project manager of one design company admitted that, "when we build a consortium with the construction contractor, we mainly know each other and our internal members through meetings, emails and private conversations". Whether or not communication is sufficient is one of the important bases upon which cooperative decisions can be made. The project manager of a construction contractor said that an EPC project requires both parties of the consortium to give full play to their strengths and advantages. Each hopes to understand the other in the communication process, and each must put forward his own views and requirements. Communication is conducive to promoting mutual understanding, enhancing feelings and quickly reaching a cooperation scheme, all of which is conducive to the generation of trust.

5.3. Reciprocity and Trust

The positive relationship between reciprocity and trust is testified to in the construction contractor group, but not in the design company group. Why reciprocity does not play an important role in trust generation for the design company is a question that deserves to be explored. After several project reviews, the main reason was found. The design comes first, and the construction follows behind. The design company does not have the benefit of relying on the work already performed by the construction contractor. However, for the construction contractor, in the project cooperation, a large number of design changes must be completed by the design company, in some cases even before the construction work has commenced. Therefore, the construction contractor pays more attention to the reciprocity of the design company. Just as one design manager said, "We mainly complete the design, (but) we have not so much to cooperate with the contractor on in the project construction phase".

However, the construction contractor group is completely different from the design company group. The positive relationship of reciprocity and trust is confirmed in the contractor group. Jiang et al. [43] also confirmed that, in the relationship between the owner and the contractor, reciprocity will be conducive to the establishment of their mutual trust relationship. Moreover, by carefully analyzing the effect of reciprocity on trust, one can find that good interaction between the two partners will accelerate the development of trust, as shown in Figure 5 below. After Unit 1 makes a sacrifice, Unit 2 has a corresponding response. If Unit 1 accepts that response, the trust in Unit 2 will increase. After being trusted, Unit 2 will be more willing to make sacrifices. After an effective response, if Unit 1's work is recognized by Unit 2 and trust is obtained from Unit 2, then Unit 1 will continue to make sacrifices, thereby forming a virtuous circle. One contractor's project manager said that, "We attach great importance to the interaction between the design unit and us. A benign cooperative relationship will help us promote the progress of the project. During the design change phase of the project, we very much hope that the design unit will cooperate to provide design changes in time and provide effective guidance for construction".

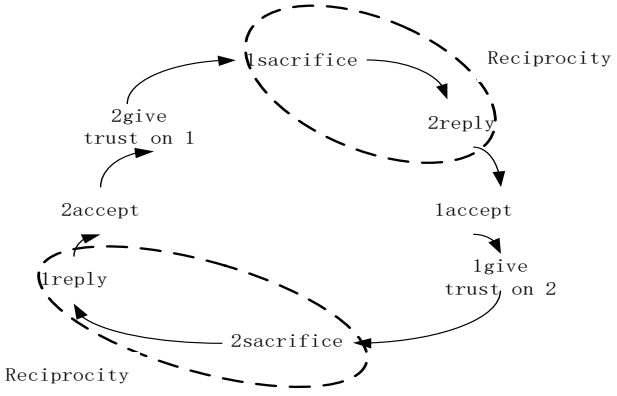

Figure 5. The relationship between reciprocity and trust.

5.4. Trust and the Intention to Cooperate

Although many factors affect the intention to cooperate, trust plays a vital role in cooperation. The positive effects of calculative trust and relational trust on the intention to cooperate have been confirmed in both design companies and construction contractors. Calculative trust is the result of calculation, which is based on future economic considerations and risk estimates [32]. In a sense, the higher the level of calculative trust is, the better the benefits of future cooperation will be. Therefore, calculative trust has a significant positive effect on the willingness to set up a consortium. As a project manager of a design company said, "When the contractor is competent and provides assurance against risks, we can dispel our worries about the future and tend to cooperate with the contractor." A project manager of a construction contractor said that, "As long as the future expectations of cooperation are positive and profitable, we are willing to cooperate with the design company to jointly complete the project."

Relational trust is the result of identification and affection [67]. When one internalizes the other's attitude (especially values), cooperation will be greatly facilitated [32]. China is a relational society, a feature which is particularly prominent in project cooperation [87]. Under certain circumstances, it is the relationship and not ability that determines whether a cooperative relationship can be established. Therefore, relational trust is more important under specific circumstances. During an interview, one design manager said that, when setting up an EPC consortium, he will consider whether the contractor can correspond with the design company. If the contractor can, this will significantly improve the efficiency of cooperation and improve both parties' ability to jointly deal with problems in the future. A project manager of the construction contractor said that they pay special attention to the relationship with the design company. The integration of design and construction requires good communication and a cooperation relationship with the design company.

6. Conclusions

Based on China's national conditions, this research explores the cooperation formation mechanism of EPC consortiums in the construction industry from the perspective of trust. Reputation and communication are found to be important factors in the generation of trust (including calculative trust and relational trust) from the design company perspective. Meanwhile, reputation, reciprocity and communication are important factors for the generation of trust from the construction company perspective. In addition, both calculative trust and relational trust are positive factors that affect the intention to cooperate for both the design company and the construction contractor.

This research has innovatively added to and contributed to the existing knowledge of EPC consortium establishment mechanisms, to a certain extent. Existing EPC consortium research focuses on benefit distribution, the integration of design and construction, cooperation risk, etc. However, no formal or systematic attention has been paid to how EPC consortium cooperation relationships can be established. This study establishes a theoretical model of the influencing factors of trust, as well as the effect of trust on the intention to cooperate in an EPC consortium. The results show that the establishment of an EPC consortium relationship is affected by the level of trust. In EPC theoretical research, adequate attention should be paid to trust; attention should also be paid to the theoretical research on trust cultivation. In particular, the difference in trust between the design company and the construction contractor provides a reference and inspiration for future research.

Moreover, this research also supplies guidance for design companies and construction contractors seeking to set up EPC consortiums. In China, a large number of projects are already using the EPC consortium mode. A practical problem is how to improve the quality of cooperation selection and how to establish a high-level benign relationship. This research can provide guidance to design companies and construction contractors on how to establish a good cooperative relationship. For the design company, when deciding whether to trust the construction contractor, the reputation of the contractor and the communication

state will be the main considerations. For the construction contractor, the consideration of relevant information before cooperation commences is not only for the direct purpose of establishing cooperative relations, but also for the smooth sailing of good cooperation ventures in the future.

This research has several limitations that need to be addressed in future research. First of all, owing to the limitations of investigation conditions, the design company and the construction contractor cannot conduct a paired comparative analysis; neither can they get targeted and valuable suggestions on the relationship between the two sides. Secondly, the relevant conclusions come from the situation of China's construction industry, so these conclusions may only be applied to situations in China. Few enterprises in China have independent design, construction and management capacity and capability. Foreign countries, especially developed western countries, with their mature construction markets and large comprehensive groups, may not be suitable for the applications recommended in this study. Finally, the impact of trust in the cooperation selection stage on the success of the cooperation still needs relevant empirical research, in order to establish the connection between the two stages.

Author Contributions: Conceptualization, W.J.; methodology, W.J.; software, S.T.; validation, S.T.; formal analysis, S.T.; investigation, W.J.; resources, W.J.; data curation, W.J.; writing—original draft preparation, W.J.; writing—review and editing, W.J.; visualization, W.J.; supervision, W.J.; project administration, W.J.; funding acquisition, W.J. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the Natural Science Foundation of Guangdong Province, China (Grant No. 2017A030310355).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Kent, D.C.; Becerik-Gerber, B. Understanding construction industry experience and attitudes toward integrated project delivery. *J. Construct. Engin. Manag.* **2010**, *8*, 815–825. [CrossRef]
2. Nikjow, M.A.; Liang, L.; Qi, X.; Sepasgozar, S. Engineering procurement construction in the context of belt and road infrastructure projects in west Asia: A swot analysis. *J. Risk. Financ. Manag.* **2021**, *14*, 92. [CrossRef]
3. Ministry of Housing and Urban-Rural Development of China. *Measures for the Administration of General Contracting of Housing Construction and Municipal Infrastructure Projects*; Ministry of Housing and Urban-Rural Development of China: Beijing, China, 2019.
4. Almaian, R.Y.; Needy, L.S.; Walsh, K.D.; Alves, T.C.L. A qualitative data analysis for supplier quality-management practices for engineer-procure-construct projects. *J. Constr. Eng. M.* **2016**, *142*, 04015061.
5. Tang, W.; Zhang, Q.; Yilei, H.; Yang, L. Study on international hydropower engineering-procurement-construction contractor-designer alliance. *J. Tongji Univ. Nat. Sci.* **2019**, *47*, 444–450.
6. Shenzhen Housing and Construction Bureau. *Shenzhen Construction Industry Development Report*; Shenzhen Housing and Construction Bureau: Shenzhen, China, 2020.
7. Lv, J.; Liu, W.; Zou, Q.; Gan, L. Distribution of Cooperation Benefits in EPC Projects Considering Fairness Concerns. *Syst. Eng.* **2014**, *32*, 62–66.
8. Wang, Z.Q.; Qiu, Q.Q.; Si, M.M. Analysis of optimal ratio of risk sharing of EPC project consortium under partnership. *Inz. Ekon.* **2019**, *2*, 72–75.
9. Zhao, T.; Liu, S.; Shi, F. Study on achievements evaluation based on organization structure of EPC project consortium. *J. Harbin Univ. Com. (Nat. Sci. Ed.)* **2006**, *22*, 144–146.
10. Li, X.; Xin, H. Discussion on risk management of EPC project under the contractual consortium model. *Cons. Econ.* **2015**, *36*, 37–40.
11. State Council of China. *The Interim Provisions on Several Issues concerning the Reform of the Construction Industry and Major Construction Management System*; State Council of China: Beijing, China, 1984.
12. Chen, X.; Zhang, Z. Difficulties and countermeasures of implementing EPC mode in China. China. *Expl. Des.* **2020**, *11*, 71–77.
13. State Council of China. *The Construction Law of China*; State Council of China: Beijing, China, 1997.

14. Ministry of Construction of China. *The Opinions on Cultivating and Developing EPC and Project Management Enterprises*; Ministry of Construction of China: Beijing, China, 2003.
15. Ministry of Construction of China. *The Measures for General Contracting of Railway Construction Projects*; Ministry of Construction of China: Beijing, China, 2007.
16. Chen, Z. Thoughts on EPC's developing with high quality. *China Expl. Des.* **2019**, *12*, 95–97.
17. Ministry of Housing and Urban-Rural Development of China. *Several Opinions on Further Promoting the Development of EPC*; Ministry of Housing and Urban-Rural Development of China: Beijing, China, 2016.
18. State Council of China. *The Opinions on Promoting the Healthy Development of the Construction Industry*; State Council of China: Beijing, China, 2017.
19. Quan, H.; Liu, H. Evolutionary game study on risk governance behavior between owner and general contractor of railway engineering EPC general contract project. *Henan Sci.* **2022**, *6*, 938–947.
20. Mo, Z. Management strategy of EPC project general contracting mode with the construction unit as the main body. *Bldg. Tech. Dev.* **2020**, *47*, 85–86.
21. Mao, Y.; Zhou, H. Research on the implementation obstacles of EPC general contracting model based on grounded theory. *J. Engi. Manag.* **2021**, *5*, 42–47.
22. Ministry of Housing and Construction of China. *General Contracting Management Measures for Housing Construction and Municipal Infrastructure Projects*; Ministry of Housing and Construction of China: Beijing, China, 2019.
23. Ma, L.; Zheng, Y.; Fang, J. Research on cost optimization under EPC project. *Proj. Manag. Technol.* **2020**, *6*, 92–96.
24. Wang, D.D.; Fu, H.W. Evolutionary game analysis of cooperation relationship of EPC consortium. *J. Eng. Manag.* **2019**, *33*, 81–89.
25. Shi, D. Research on risk evaluation of EPC model led by design institute based on entropy weight-FAHP. *Construct. Ecno.* **2021**, *1*, 132–135.
26. Rousseau, D.M.; Sitkin, S.B.; Burt, R.S.; Camerer, C. Not so different after all: A cross-discipline view of trust. *Acad. Manag. Rev.* **1998**, *23*, 393–404. [CrossRef]
27. Judge, T. Measuring trust between organizational boundary role persons. *Organ. Behav. Hum. Dec.* **1995**, *64*, 151–170.
28. Mayer, R.C.; Davis, J.H.; Schoorman, F.D. An integrative model of organizational trust. *Acad. Manag. Rev.* **1995**, *20*, 709–734. [CrossRef]
29. Mcknight, D.H.; Cummings, L.L.; Chervany, N.L. Initial trust formation in new organizational relationships. *Acad. Manag. Rev.* **1998**, *23*, 473–490. [CrossRef]
30. Shazi, R.; Gillespie, N.; Steen, J. Trust as a predictor of innovation network ties in project teams. *Int. J. Proj. Manag.* **2015**, *33*, 81–91. [CrossRef]
31. Jiang, W.; Lu, Y. Influence of initial trust on control from client perspective: Construction industry in China. *Eng. Constr. Archit. Ma.* **2017**, *24*, 326–345. [CrossRef]
32. Jiang, W.; Zhao, X. Trust and the intent to cooperate in energy performance contracting for public buildings in China. *Eng. Constr. Archit. Ma.* **2021**, *28*, 372–396. [CrossRef]
33. Williamson, M. Invaders, weeds and the risk from genetically modified organisms. *Experientia* **1993**, *49*, 219–224. [CrossRef]
34. Shapiro, D.L.; Sheppard, B.H.; Cheraskin, L. Business on a handshake. *Negotiation J.* **1992**, *8*, 365–377. [CrossRef]
35. Lewis, J.D.; Weigert, A. Trust as a social reality. *Soc. Forces* **1985**, *63*, 967–985. [CrossRef]
36. Lewicki, R.J.; Bunker, B.B. *Trust in Relationships: A Model of Trust Development and Decline*; Max, M., Ed.; Fisher College of Business, Ohio State University: Columbus, OH, USA, 1994.
37. Sako, M. *Price, Quality and Trust: Inter-Firm Relations in Britain and Japan*; Cambridge University Press: Cambridge, UK, 1992.
38. Hartman, F. The role of trust in project management. In Proceedings of the PMI Research Conference 2000: PM Research at the Turn of the Millennium, Paris, France, 21–24 June 2000; pp. 23–28.
39. Cheung, S.O.; Wei, K.W.; Yiu, T.W.; Pang, H.Y. Developing a trust inventory for construction contracting. *Int. J. Proj. Manag.* **2011**, *29*, 184–196.
40. McAllister, D.J. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Acad. Manag. J.* **1995**, *38*, 24–59. [CrossRef]
41. Xu, G.; Dellaportas, S. Challenges to Professional Independence in a Relational Society: Accountants in China. *J. Bus. Ethics* **2021**, *168*, 415–429. [CrossRef]
42. Peng, S. Guanxi in trust: An indigenous study of Chinese interpersonal trust. *Vet. Med. Small Anim. Clin.* **1998**, *72*, 479.
43. Jiang, W.; Lu, Y.; Le, Y. Trust and project success: A twofold perspective between owners and contractors. *J. Manag. Eng.* **2016**, *32*, 04016022.
44. Cheung, S.O.; Wong, W.K.; Yiu, T.W.; Pang, H.Y. *Developing a Trust Inventory for Construction Contracting*; Construction Dispute Research; Springer International Publishing: Berlin/Heidelberg, Germany, 2014; pp. 147–168.
45. Wong, E.S.; Then, D.; Skitmore, M. Antecedents of trust in intra-organizational relationships within three Singapore public sector construction project management agencies. *Constr. Manag. Econ.* **2000**, *18*, 797–806. [CrossRef]
46. Karlsen, J.T. Forming relationships with stakeholders in engineering projects. *Eur. J. Ind. Eng.* **2008**, *2*, 35–49. [CrossRef]
47. Shaw, R.B. *Trust in the Balance: Building Successful Organizations on Results, Integrity, and Concern*; Jossey-Bass: San Francisco, CA, USA, 1997.

48. Wood, G.; McDermott, P. Searching for trust in the UK construction industry: An interim view. In *Profitable Partnering in Construction Procurement*; Ogunlana, S., Ed.; Routledge: London, UK, 1999; pp. 107–116.
49. Wood, G.; McDermott, P.; Swan, W. The ethical benefits of trust-based partnering: The example of the construction industry. *Bus. Ethics* **2002**, *11*, 4–13. [CrossRef]
50. Khalfan, M.M.A.; Mcdermott, P.; Swan, W. Building trust in construction projects. *Supply Chain. Manag.* **2007**, *12*, 385–391.
51. Jannadia, M.O.; Assaf, S.; Bubshait, A.A.; Naji, A. Contractual methods for dispute avoidance and resolution (DAR). *Int. J. Proj. Manag.* **2000**, *18*, 41–49. [CrossRef]
52. Thompson, I.; Cox, A.; Anderson, L. Contracting strategies for the project environment. *Eur. J. Purch. Supply Manag.* **1998**, *4*, 31–41. [CrossRef]
53. Butler, J.K.; Cantrell, R.S. Communication factors and trust: An exploration study. *Psychol. Rep.* **1994**, *74*, 33–34. [CrossRef]
54. Luhmann, N. *Trust and Power*; Wiley: New York, NY, USA, 1979.
55. Chen, S.J.; Ma, J.H. Cooperative Motivation and Trust: Research Based on Uncertainty Simplification Mechanism. *Chin. J. Appli. Psycho.* **2010**, 208–214.
56. Pinto, J.K.; Slevin, D.P.; English, B. Trust in projects: An empirical assessment of owner/contractor relationships. *Int. J. Proj. Manag.* **2009**, *27*, 638–648. [CrossRef]
57. Lau, E.; Rowlinson, S. Trust relations in the construction industry. *Int. J. Manag. Proj. Bus.* **2010**, *3*, 693–704. [CrossRef]
58. Dang, X.H.; Li, L.; Zhang, W. Research on the influence of enterprise dependent and cooperation motivation to cooperation behavior in technological innovation network. *Manag. World.* **2010**, *29*, 37–41.
59. Tavoni, A. Game theory: Building up cooperation. *Nat. Clim. Chang.* **2013**, *3*, 782–783. [CrossRef]
60. Wu, H.; Yang, M.Y.; Chen, L.Q. An analyzes on complexity and evolutionary stability in co-petition games. *Syst. Eng. Theory Practi.* **2004**, *24*, 90–94.
61. Wang, T.F.; Tang, W.Z.; Qi, D.S.; Shen, W.X.; Huang, M. Enhancing design management by partnering in delivery of international EPC projects: Evidence from Chinese construction companies. *J. Constr. Eng. M.* **2016**, *142*, 4015099. [CrossRef]
62. Mahon, J.F. Corporate reputation research agenda using strategy and stakeholder literature. *Bus. Soc.* **2013**, *41*, 415–445. [CrossRef]
63. King-Casas, B.; Tomlin, D.; Anen, C.; Camerer, C.F.; Quartz, S.R.; Montague, P.R. Getting to know you: Reputation and trust in a two-person economic exchange. *Science* **2005**, *308*, 78–83. [CrossRef] [PubMed]
64. Keh, H.T.; Yi, X. Corporate reputation and customer behavioral intentions: The roles of trust, identification and commitment. *Ind. Market. Manag.* **2009**, *38*, 732–742. [CrossRef]
65. Crescenzi, M.; Kathman, J.D.; Kleinberg, K.B.; Wood, R.M. Reliability, reputation, and alliance formation. *Int. Stud. Quart.* **2012**, *56*, 259–274. [CrossRef]
66. Wu, J.; Balliet, D.; Lange, P.V. Gossip versus punishment: The efficiency of reputation to promote and maintain cooperation. *Sci. Rep* **2016**, *6*, 1–8. [CrossRef] [PubMed]
67. Mansson, D.H. Trust as a mediator between affection and relational maintenance in the grandparent-grandchild relationship. *South. Commun. J.* **2014**, *79*, 180–200. [CrossRef]
68. Malhotra, D. Trust and reciprocity decisions: The differing perspectives of trustors and trusted parties. *Organ. Behav. Hum. Dec.* **2004**, *94*, 61–73. [CrossRef]
69. Berg, J.; Dickhaut, J.; McCabe, K. Trust, reciprocity, and social history. *Game Econ. Behav.* **1995**, *10*, 122–142. [CrossRef]
70. Ortmann, A.; Fitzgerald, J.; Boeing, C. Trust, reciprocity, and social history: A re-examination. *Exp. Econ.* **2000**, *3*, 81–100. [CrossRef]
71. Andreoni, J. *Trust, Reciprocity, and Contract Enforcement: Experiments on Satisfaction Guaranteed*; Working Paper; University of Wisconsin: Madison, WI, USA, 1995.
72. Dufwenberg, M.; Gneezy, U. *Efficiency, Reciprocity, and Expectations in an Experimental Game*; Working Paper; Tilburg University: Tilburg, The Netherlands, 1996.
73. Snijders, C.; Keren, G. Determinants of trust. *Games Hum. Behav. Essays Honor. Amnon Rapoport* **1999**, *40*, 375.
74. Mashima, R.; Yamagishi, T.; Macy, M. Trust and cooperation: A comparison of in-group preference and trust behavior between American and Japanese students. *Jpn. J. Psychol.* **2004**, *75*, 308–315. [CrossRef]
75. Lu, S.; Hong, Y. A model for evaluating the applicability of partnering in construction. *Int. J. Proj. Manag.* **2007**, *25*, 164–170. [CrossRef]
76. Wong, P.; Cheung, S. Structural equation model on trust and partnering success. *J. Manag. Eng.* **2005**, *21*, 70–80. [CrossRef]
77. Lui, S.S.; Ngo, H.Y. The role of trust and contractual safeguards on cooperation in non-equity alliances. *J. Manag.* **2004**, *30*, 471–485. [CrossRef]
78. Falkenstrom, F.; Hatcher, R.L.; Holmqvist, R. Confirmatory factor analysis of the patient version of the working alliance inventory-short form revised. *Assessment* **2015**, *22*, 581–593. [CrossRef] [PubMed]
79. Dolgova, V.I.; Rokitskaya, Y.A. Factor structure of coping behavior of curious elderly people. *Adv. Gerontol.* **2020**, *33*, 172–178.
80. Sharma, S.C. *Applied Multivariate Techniques*; John Wiley and Sons: Hoboken, NJ, USA, 1996.
81. Clara, I.P.; Cox, B.J.; Enns, M.W.; Murray, L.T.; Torgrudc, L.J. Confirmatory factor analysis of the multidimensional scale of perceived social support in clinically distressed and student samples. *J. Pers. Assess.* **2003**, *81*, 265–270. [CrossRef] [PubMed]
82. Podsakoff, P.M. Self-reports in organizational research: Problems and prospects. *J. Manag.* **2016**, *12*, 531–544. [CrossRef]
83. Zhang, Q.Z.; Tang, W.Z.; Zhang, X.T.; Shen, W.X.; Lei, Z.; Huang, Y.L. Design management of international EPC projects based on contractor-designer alliance. *J. Hydropower* **2019**, *38*, 32–40.

84. She, J.J.; Zhou, H.H.; Pei, L.J. Member selection and combination optimization of dynamic alliance for EPC construction industrialization project. *Proj. Manag. Tech.* **2019**, *17*, 7–13.
85. Wang, X.Y.; Wang, C.Y.; Mu, J. Governance of Sellers Speculation Behavior in Platform Economy from the Perspective of Platform Active Governance. *J. Bus. Econ. Manag.* **2020**, *10*, 17–28.
86. Kathleen, L.V.; Joseph, M.; Max, H.B. A matter of trust: Effects of communication on the efficiency and distribution of outcomes. *J. Econ. Behav. Organ.* **1998**, *34*, 211–238.
87. Le, Y.; Wei, J.F.; Wang, S.H. Empirical research on the impact of Guanxi on contractor's performance and project performance. *J. Eng. Manag.* **2015**, *29*, 1–5.