Contractor as Trust Initiator in Construction Partnering—Prisoner's Dilemma Perspective

Peter S. P. Wong[1]; Sai On Cheung[2]; and Peter K. M. Ho[3]

Abstract: Partnering has been advocated for use in construction as a project-delivery approach to curb dispute and enable a cooperative contracting environment. Successful construction partnering is perceived to derive benefits to both developers and contractors. In view of significant implications to successful project delivery, there has been a surge of research and studies on construction partnering. These studies typically focus on the partnering process as well as the identification of critical success factors. Among the various success factors that underpin partnering success, establishing trust among partners is considered the most important. Moreover, skeptics have been swift to point out that establishing trust in construction is daunting. A better understanding of the role of trust and its manifestation in partnering efforts is therefore of both academic and practical value. In this study, motivating trust in construction partnering is described within the classic framework of "the prisoner's dilemma," which suggests the trust cycle can be kick-started if construction partners put cooperation before competition and self-interest. This paper reports a study that is designed to suggest a suitable candidate for the trust initiator. As such, the critical trust factors for two groups of construction partners in Hong Kong—developers/consultants and contractors—are first identified. It is found that "performance" and "permeability" of partners are the two most critical trust factors. "Performance" describes the partner's competence and problem-solving ability as perceived by their counterpart. "Permeability" reflects the partner's openness in sharing information. The result of a multiple-regression analysis further suggests that the contractor is in a position to initiate trust through competent performance and maintaining effective communication with the client. In this manner, the trust cycle can expand with reciprocal trustworthiness from the client.

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Introduction

Despite defying universal definitions and appearing in different forms and levels, construction partnering is generally agreed upon as a commitment of the contracting organizations to collaborate and achieve the communal business objectives (Bresnen and Marshall 2000a,b). The construction industry has placed strong faith in partnering to achieve cost effectiveness, work efficiency, opportunities for innovations, equitable risk allocation, and less confrontation (CII 1989; Black et al. 1999; CIRC 2001; Bayliss 2002). However, successful partnering does not come naturally. Studies on construction partnering suggest that developing trust relations, equity of benefits sharing, effective communication, and a competent management team are critical success factors (Harback et al. 1994; CIIA 1996; Larson and Drexler 1997; Black et al. 2000; McGeorge and Palmer 2000; Ng et al. 2002). Among these, it has further been found that developing trust among partners is the most important (Larson and Drexler 1997).

Construction partnering is regarded as a high-risk/high-gain approach (McGeorge and Palmer 2000). Although many successful cases have been reported (So 2000; Howlett 2002), some failure cases have also been encountered (Bresnen and Marshall 2000a,b). Several studies have shown that the industry's practice to select contractors by competitive bidding is the major cause of the project failure (Larson and Drexler 1997; Bresnen and Marshall 2000a,b). In a similar context, the lowest-bid-wins approach has also been identified as an initiation of a mistrust cycle (Kadefors 2004). Supported by several case studies, it was found that a bid-price-driven environment encouraged suspicious and mistrustful attitudes that might eventually lead to project failure (Kadefors 2004). This not merely augments the positive correlation between trust and partnering success, but also highlights the difficulty in establishing trust among partners when they are operating under a bid-price-driven environment.

In this connection, the suggestion to incorporate performance as a criterion for contractor selection has also been raised (Holt et al. 1993; Egan 1998). Notwithstanding, clients play the decisive role on this initiative, as they may find maintaining the lowest-bid-wins approach in contractor selection more commodious. Moreover, it is suggested that by including nonprice factors in the award equation, a more trusting environment can be effected, in particular at the early stage of the project. Nonetheless, trust

[1]Member, Construction Dispute Resolution Research Unit, Dept. of Building and Construction, City Univ. of Hong Kong, 83 Tat Chee Ave., Kowloon Tong, Hong Kong.

[2]Director, Construction Dispute Resolution Research Unit, Dept. of Building and Construction, City Univ. of Hong Kong, 83 Tat Chee Ave., Kowloon Tong, Hong Kong.

[3]Director, Davis Langdon & Seah (Hong Kong) Ltd., 2101 Leighton Centre, 77 Leighton Road, Causeway Bay, Hong Kong.

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Table 1. Fourteen Trust Attributes for Construction Partnering

Trust Attribute	Description	Reference
Competent	Project team members will trust each other if both of their "behaviors" and "outcomes" are competent. The outcomes are the physical representations of the promises and actions.	William et al. 2002
Problem solving	Construction personnel saw problem solving as an important element in building trust, especially if it is solved at an early stage. If the parties deal with problems with forbearance instead of blaming each other, trust will be built.	US & CCI 2002
Communication	Open and frequent communication and maintaining open-door policies with each other results from a willingness of the partners to create transparency in the relationship.	Sarker et al. 1998
Openness	Failure of integrity involves lying: cheating or hiding facts will tarnish trust. Honest and truthful communication among contracting parties will positively affect the trust level among contracting parties.	Rosenfield et al. 1991
Alignment	Benefits received should be fair and match with the input efforts, otherwise mistrust will result. If efforts and rewards are not aligned, mistrust will result.	Wood and McDemott 1999
Information flow	Effective and sufficient information flow would reduce risk and uncertainty of the work. Project participants who provide complete, unbiased, and accurate information to each other would help to increase their mutual trust.	US & CCI 2002
Unity	Trust can be built by understanding and appreciating a partner's requirements and difficulties, and looking to meet a partner's expectation.	US & CCI 2002
Respect	The success of construction projects hinges on the mutual interdependence of all parties. A lack of appreciation of this interdependency would hamper the development of trust within the project management system. A respect on the mutually dependent project management system is a source of trust.	Gill and Bulter 1996
Compatibility	Compatibility is the inherent congruence that exists among partners in terms of their normative, cultural, procedural, and technological orientations. Project team members will trust each other when they share these similar orientations.	Sarker et al. 1998
Long-term relations	A long-term relationship implies continuous interaction sand successful collaboration among partners. This will lead to trust.	Morgan and Hunt 1994
Financial	The financial status of the company affects the decision to trust. Contractors who have a healthy financial status are trustworthy in the views of the clients, as their risks to make profits by finding loopholes in contract or applying unreasonable claims are lowered.	US & CCI 2002
Adopt ADR	The implementation of ADR techniques before litigation as stated in the contract would also gain trust from other parties. These contracting parties will feel that their partners are willing to seek a win/win resolution sincerely without destroying the cooperation harmony.	Cheung 1999
Reputation	The company reputation affects the decision to trust. The establishment of reputation takes time and resources; companies with better reputations are more trustworthy as they do not want to lose their valuable asset.	Gambetta 1998
Satisfactory terms	Equitable agreements or contract terms can help the contracting parties to establish trust and sustain cooperation since their perceived benefits are secured.	Bonet et al. 1994

building is complex, dynamic, and affected by interactions among partners along the project (Hawke 1994; Kadefors 2004). As such, it is of significant importance in examining how trust can be fostered during the project duration.

Trust in Construction Partnering

Trust is regarded not only as the glue that holds partners together, but also the lubricant that aids project completion (Nicholas 1993; Whitney 1996; Wong et al. 2000). Project trust level is dynamic and is either growing or diminishing. The happenings on a project would reinforce or reduce the trust among the people involved (Hawke 1994). Perception of trust results from positive feedback toward prediction and expectation of future events. Its generation is associated with the honoring of promises by the other party (Rotter 1967).

In fact, the concepts of trust are expanded in a variety of contexts (Ford 2001). For example, Rosenfeld (1991) suggested that the changing project structure and conditions, project complexity, and the period of collaboration cause trust relations in the construction industry to differ from other settings. Thus, trust in construction partnering should be considered according to its own characteristics.

In this connection, what are the factors that have an effect on trust of construction partners? Typical frames of reference to determine the trustworthiness of contractors from the perspective of developers include the achievement of project targets and problem-solving speed. Likewise, the promptness to honor payment certificates and the employer's attitude toward claim negotiations are often used by a contractor to gauge the trustworthiness of that employer (McGeorge and Palmer 2000). Upon review of literature as presented in Table 1, following are fourteen trust attributes that would affect the trust level of construction partners are identified:

- Competence of work (competent);
- Problem-solving ability (problem solving);
- Frequency and effectiveness of communication (communication);
- Openness and integrity of communication (openness);
- Alignment of effort and rewards (alignment);
- Effective and sufficient information flow (information flow);
- Sense of unity (unity);
- Respect and appreciation of the system (respect);

		Partner B	
		Honor	Exploit
Partner A	Trust	r, r	$-c_a$, r+p
	Mistrust	0, $-c_b$	0, 0

Fig. 1. Theoretical model of developing trust in construction partnering (adapted from James 2002)

- Compatibility (compatibility);
- Long-term relationships (long-term relations);
- Financial stability (financial);
- Adoption of ADR techniques (adopt ADR);
- Reputation (reputation); and
- Satisfaction of contract terms and agreement (satisfactory terms).

Table 1 provides brief descriptions and the references for these trust attributes.

Trust Driver: Prisoners' Dilemma Perspective

Skeptics about the use of partnering in construction often raise the question, "Are cooperative moves possible in a conflict-ridden environment like that of construction?" Given that, who is willing to instigate the first cooperative move? The question can be framed as the prisoner's dilemma (PD) game suggested by Rapoport and Chammah (1965), Deutsch (1960), La Porta et al. (1997), and James (2002). They described PD as a two-party nonconstant-sum game in which both parties prefer some outcomes to the other. Moreover, the outcomes depend on the reaction of the other party. In the context of construction partnering, the moves of partners can either be competitive or cooperative. Competitive moves are those that focus on a partner's own interest. This generally would invoke retaliation and/or defensive responses. Cooperative moves are those that put the interest of both partners first. Cooperative moves are characterized by reciprocal moves. This means if a partner is behaving cooperatively, he is expecting a cooperative response from his counterpart. This expectancy is built on trust.

Unfortunately, the desire of a partner to select a cooperative move is usually low (James 2002). As illustrated in Fig. 1, Partner A may either trust or mistrust Partner B, who in turn can either honor or exploit the trust. When both partners cooperate with mutual trust and honor, they both can benefit. If Partner A provides a cooperative move but Partner B exploits it (trust, exploit), then Partner A loses their cost invested in trust (i.e., $-c_a$). On the other hand, Partner B receives a reward of $(r+p)$, where p represents a premium that he earned from not putting effort on honoring trust expected by Partner A. If Partner A mistrusts and Partner B honors it, then Partner B incurs a cost of $-c_b$. If both parties select competitive moves (mistrust, exploit), their investment costs in trust are both 0. It can be seen from Fig. 1 that if Partner B is to maximize his rewards, he will exploit the trusting behavior of Partner A. Hence, the incentive for Partner A to trust Partner B is low if he anticipates that Partner B adopts a dominant strategy to exploit trust. In this context, the famous Nash equilibrium of mistrust/exploitation will result (James 2002). This scenario is commonly perceived in construction where no one is considered to be trustworthy. This framework thus helps to explain why trust is so difficult to build in construction projects (Hawke 1994).

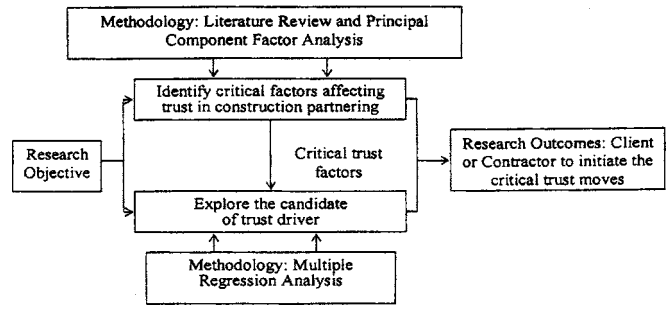

Fig. 2. Research framework of the research process

With trust being the most critical success factor for partnering (CII 1989; Black et al. 1999; CIRC 2001; Bayliss 2002), it is not difficult to understand why, despite the potential benefits that can be derived, partnering fails to deliver if partners have little confidence in initiating trust in one another. In this connection, James (2002) advocates that creating appropriate incentives for cooperative interaction could alter the orientation of partners from mistrust to trust. He suggests four ways to create trust incentives, including writing an explicit contract, relying on reward and punishment, repeating the interaction, and emphasizing the honesty among parties. Although these are good strategies, the next question becomes: "Who best to be the first trust mover?" (i.e., the partner to kick-start the trust cycle). In addition, Kenneth and Martin (2001) suggest that if the first mover chooses to trust, a prospective cooperation cycle begins and thus facilitates the partnering success. Their point of view was also echoed by Gill and Bulter (1996) who found that the trust cycle begins when one of the partners genuinely trusts the other. In sum, the prisoners' dilemma framework illustrates that trust is built on reciprocal trust moves. However, the construction industry is dominated by mistrust orientations. To overcome this inertia, the trust driver needs first to be identified.

The Study

This study seeks to enhance the understanding on construction partnering by first identifying the critical factors that affect trust. With this result, the partner as the trust driver, client, or contractor in construction partnering is explored.

To ensure the relevance of the responses, questionnaires were directed to respondents that have experience in managing partnering projects. The names and the postal addresses of the respondents were researched from the Web pages of the local professional institutes and the Hong Kong Builder Directory. In order to safeguard the reliability of the received responses, respondents were requested to declare their experience in partnering projects in Part 1 of the questionnaire. If the respondents replied that they have not taken part in the partnering projects, their returned questionnaires were not used. Therefore, the reliability of the survey results was ensured. The sample of the research framework and the sample of the questionnaire for the study are presented in Figs. 2 and 3.

To accomplish these research objectives, a questionnaire was designed for data collection. The first question in Part 2 of the questionnaire was designed for measuring the trust level of partners. The remaining questions were used to solicit the respondents' assessment on the degree of importance of the fourteen

PART 1 - Personal Information

Please or circle the appropriate choice for each question

Q1.1	Do you have experience to take part in partnering project(s)?			a)	Yes
				b)	No
Q1.2	Your role in this partnering project	a)	Developer	b)	Contractor
		c)	Consultant		
Q1.3	Working experience	a)	< 5 years	b)	5-10 years
		c)	11-15 years	d)	16-20 years
		e)	>20 years		

PART 2(a) The measurement of trust level

		Very low ← → Very high						
Q2.1	The trust level on my partner	1	2	3	4	5	6	7

PART 2(b) The trust factors in partnering projects

According to the answers you provided in Part 2(a), please circle the no. that best reflects the degree of importance of the following 14 attributes in developing trust

		Very low ← → Very high						
Q3.1	The competence of work of my partner	1	2	3	4	5	6	7
Q3.2	Problem solving ability of my partner	1	2	3	4	5	6	7
Q3.3	The frequency and the effectiveness of communication of my partner	1	2	3	4	5	6	7
Q3.4	The openness and integrity of communication of my partners	1	2	3	4	5	6	7
Q3.5	Alignment of effort and rewards among partners	1	2	3	4	5	6	7
Q3.6	Effective and sufficient information sharing with my partner.	1	2	3	4	5	6	7
Q3.7	The sense of unity of my partner	1	2	3	4	5	6	7
Q3.8	Partner's respect, believe and rely on the project management system	1	2	3	4	5	6	7
Q3.9	The compatibility of my partner	1	2	3	4	5	6	7
Q3.10	A long-term relationships with my partner	1	2	3	4	5	6	7
Q3.11	The financial stability of my partner	1	2	3	4	5	6	7
Q3.12	Adoption of ADR techniques by my partner	1	2	3	4	5	6	7
Q3.13	The reputation of my partner	1	2	3	4	5	6	7
Q3.14	My partner's satisfaction on the contract terms and agreement	1	2	3	4	5	6	7

Fig. 3. Sample of the Questionnaire

attributes, listed in Table 1, that are associated with developing trust. A seven-point Likert scale was used for this purpose.

Identifying Critical Factors That Affect Trust

Table 1 outlines the fourteen trust attributes as suggested from the literature. However, these are discussed in different contexts. To put these in perspective, the statistical technique of principal component factor analysis (PCFA) was applied in this study. The PCFA is an attempt to make the notion of trust in construction partnering more precise and amenable for analytical grip. This is possible because PCFA can condense a large set of trust attributes down to a smaller and more manageable number of factors (Hair et al. 1998). Besides, the factors identified generally could better represent the underlying construct in a concise and interpretable form (Basilevsky 1984; Dulaimi et al. 2002). As such, a PCFA was conducted to identify the critical factors of both the developers/consultants group and the contractors group.

Determining the Trust Driver

A multiple regression analysis was used in this research to explore which partner would best be the trust driver. Multiple regression analysis is typically used to find the best prediction of a dependent variable (trust level) from several independent variables (trust factors) by an equation. The general equation of multiple regression (Norušis 1999; Coakes and Steed 1999) is shown as follows

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 \ldots + b_nX_n + \varepsilon \qquad (1)$$

where Y=dependent variable; $X_1, X_2 \ldots X_n$=independent variables; $a, b_1, b_2 \ldots b_n$=unknown constant; and ε=random error for any given set of values for $X_1, X_2 \ldots X_n$

There are three major regression models: standard or simultaneous regression, hierarchical regression, and stepwise regression model. This research study adopted standard regression, as this method includes all predictors' contributions to explain the dependent variables (Norušis 1999; Coakes and Steed 1999). The R-square value in the regression analysis represents the power of the independent variables to explain the dependent variable. The value can vary from 0 to 1. If the value is 1.0, it is indicated that all the change in the dependent variable would be due to the changes of the independent variables and suggests a close relationship between the dependent and the independent variables (Hair et al. 1998). This relationship can be used to suggest a candidate for trust driver. If the relationship is high, this can be interpreted that the trusting moves of the partner have a significant correlation with the trust level of the partner as perceived by the responding group, who will be more inclined to provide reciprocal trusting moves. On the other hand, if the correlation is not that significant, this would suggest that the trusting moves of the partner are not that effective in deriving trust from his counterpart. As such, his suitability to assume the role of trust driver is less apparent.

Response Rate

A total of 120 questionnaires were sent to private- and public-sector developers, consultant firms, and contractor firms. There were 65 replies received, representing a 54.2% response rate. Fourteen replies were found not useful because either the respondent had indicated little experience in partnering or the responses provided were incomplete. As a result, the net response rate was 42.5%. The detailed response rates are reported in Table 2.

Both the return rate and the sample size were considered reasonably good compared with similar studies conducted in the United States (Sarker et al. 1998) and Hong Kong (Cheng and Li 2001). In terms of respondents' roles in the partnering projects, 23 out of 51 respondents (i.e., 45%) were from a developer's or consultant's firm. Twenty-eight respondents (55%) were from

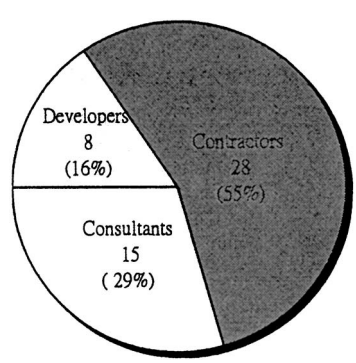

Fig. 4. Respondents' profile: Role in partnering projects

Table 2. Questionnaries Sent and Received

	Developers	Consultants	Contractors	Total
Questionnaires sent	43	44	44	120
Questionnaires received	15	17	33	65
Percentage received (%)	34.9	51.5	75.0	54.2

contractors as shown in Fig. 4. Among the valid responses as shown in Fig. 5, 62% of the respondents have over 10 years of working experience. It is anticipated that the results are reliable and reflective to the current industry's opinion in Hong Kong.

Discussion

Critical Trust Factors

To condense the 14 trust attributes into a smaller and more manageable set of factors that could sufficiently represent the underlying structures of these attributes, PCFAs were carried out (Hair et al. 1998). The findings follow.

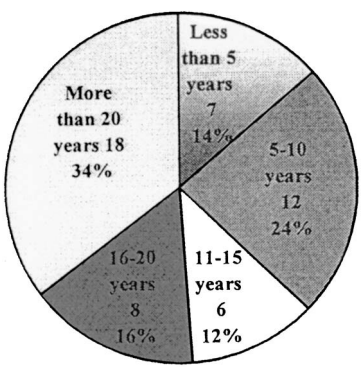

Fig. 5. Respondents' profile: Working experience

Developers/Consultants Group

For the developers/consultants group, the sample data is adequate for data analysis as the Kaiser–Meyer–Olkin measure of sampling adequacy is higher than the threshold of 0.500 (Sharma 1996; Cheung 1999) and the Bartlett test statistic is also highly significant ($p<0.0000$) (Hair et al. 1998) as reported in Table 3. To achieve a simpler and pragmatically more meaningful factor solution, VARIMAX rotation was performed (Sharma 1996; Hair et al. 1998).

Following the Eigenvalue greater-than-one rule (Sharma 1996), a four-factor solution is suggested (Table 3).

Six trust attributes, including problem solving, competent, unity, communication, and respect, were extracted as significant for Factor 1. These explain 28.96% of the variance, suggesting developers/consultants consider the contractor's problem-solving ability, working competence, sense of unity, communication frequencies, and respect of the partnering system in positioning their trust attitudes. As such, Factor 1 is described as "performance." The Crobach's alpha value of Factor 1 is 0.927 and is regarded as "good" in the reliability testing (Hair et al. 1998).

The attributes openness, alignment, financial stability, adopt ADR, and information flow loaded highly in Factor 2. In fact, the level of openness, the effectiveness of information flow, and their willingness to adopt ADR for dispute settlement are related to the contractor's intention to disclose information. In addition, the confidence on the financial stability and promise keeping for fair rewards will be gained when the transparency of partners are adequate. Thus, Factor 2 can be interpreted as "permeability." This factor explained 27.57% of the variance after VARIMAX rotation. The Crobach's alpha value of this factor is 0.887, also suggesting "good" reliability (Hair et al. 1998).

Factor 3 consists of the trust attributes satisfactory terms and reputation. These trust attributes are aligned with the systems installed for the project. Thus Factor 3 can be interpreted as system-based trust, a term used by Lumann (1988) and Blomqvist (1997) to describe trust that is based on legal terms or bureaucratic sanc-

Table 3. Factor Analysis and Total Variance Explained: Trust (Developers/Consultants Group)

	Factors			
Trust Attributes	Factor 1 Performance	Factor 2 Permeability	Factor 3 System-based trust	Factor 4 Relational bonding
Problem solving	**0.910**	0.235	3.328×10^{-2}	-9.564×10^{-2}
Competent	**0.861**	1.552×10^{-3}	0.359	0.145
Unity	**0.845**	0.399	0.235	-1.971×10^{-2}
Communication	**0.697**	0.462	-9.766×10^{-2}	0.173
Respect	**0.662**	0.556	−0.200	-3.597×10^{-2}
Openness	0.153	**0.922**	0.183	−0.141
Alignment	0.305	**0.722**	0.326	−0.230
Financial stability	0.629	**0.694**	-1.405×10^{-4}	4.099×10^{-2}
Adopt ADR	0.339	**0.687**	7.567×10^{-2}	0.263
Information flow	0.243	**0.670**	0.194	0.397
Satisfactory terms	8.409×10^{-3}	7.385×10^{-2}	**0.898**	−0.177
Reputation	0.398	0.447	**0.639**	3.275×10^{-2}
Long-term relations	8.359×10^{-3}	0.195	-2.262×10^{-2}	**0.902**
Compatibility	2.346×10^{-2}	−0.324	−0.447	**0.723**
% Variance	28.963	27.569	13.083	12.397
Eigenvalue	4.055	3.860	1.832	1.733
Internal consistency reliability (Cronbach alpha)	0.926	0.887	0.669	0.657

Note: Kaiser–Meyer–Olkin measure of sampling adequacy=0.700; Bartlett test of sphericity=approx. chi square−224.985; Df−91; and sig=−0.000.

Table 4. Factor Analysis and Total Variance Explained: Trust (Contractors Group)

	Factors			
	Factor 1	Factor 2	Factor 3	Factor 4
Trust Attributes	Performance and permeability	System-based trust	Relational bonding	Financial stability
Unity	**0.895**	9.513×10^{-2}	0.129	1.416×10^{-3}
Problem solving	**0.876**	−0.125	5.344×10^{-2}	−0.133
Competent	**0.802**	2.850×10^{-2}	−0.126	0.276
Openness	**0.726**	0.404	0.194	0.118
Alignment	**0.721**	0.306	−0.195	0.423
Information flow	**0.674**	0.511	-3.574×10^{-2}	−0.174
Respect	**0.454**	0.348	−0.428	0.377
Satisfactory terms	5.406×10^{-2}	**0.784**	0.296	0.330
Reputation	1.684×10^{-2}	**0.704**	-7.678×10^{-3}	-3.040×10^{-2}
Adopt ADR	0.557	**0.698**	−0.111	9.620×10^{-2}
Compatibility	0.206	-4.014×10^{-2}	**0.849**	0.121
Long-term relations	0.111	8.249×10^{-2}	**0.780**	0.372
Communication	0.251	−0.132	**−0.682**	0.209
Financial stability	2.830×10^{-2}	7.660×10^{-2}	-3.433×10^{-2}	**0.932**
% Variance	31.076	16.379	15.652	11.744
Eigenvalue	4.351	2.293	2.191	1.644
Internal consistency reliability (Cronbach alpha)	0.893	0.694	0.748	

Note: Kaiser–Meyer–Olkin measure of sampling adequacy=0.677; Bartlett test of sphericity=approx. chi square−225.847; Df−91: Sig=−0.000.

tions rather than in people or organizations. Factor 3 explained 13.08% of the variance. The data reliability is sufficient since the Crobach's alpha value is 0.668 (Hair et al. 1998).

Long-term relations and compatibility are the trust attributes extracted for Factor 4. These trust attributes are concerned with the relational connections between the developers and the contractors. Factor 4 can be interpreted as the relational bonding among partners. Factor 4 explained 12.40% of the variance. The data reliability is sufficient with a Crobach's alpha value of 0.657 (Hair et al. 1998).

Contractors Group

For the contractors group, the Kaiser–Meyer–Olkin measure of sampling adequacy is 0.677 and is higher than the threshold of 0.500 (Sharma 1996; Cheung 1999). The Bartlett test statistic is 225.847 with a high significance level ($p<0.0000$) (Hair et al. 1998) as shown in Table 4. Hence, the sample data is adequate for factor analysis. VARIMAX rotation was again performed to enhance the factor interpretations (Sharma 1996; Hair et al. 1998).

Similar to the results of the developers/consultants group, a four-factor solution was suggested. However, compositions of the factors are different from that of the developers/consultants group.

Seven trust attributes, including unity, problem solving, competent, openness, alignment, information flow, and respect, can be interpreted broadly as the performance and permeability of developers/consultants were extracted for the first factor. Thus, Factor 1 is described as "performance and permeability." Factor 1 explained 31.08% of the variance after VARIMAX rotation. The Crobach's alpha value of this factor is 0.893 representing good reliability (Hair et al. 1998).

Satisfactory terms, reputation, and adopt ADR are trust attributes extracted for Factor 2. As explained in the results from the developers/consultants group, these trust attributes represent the system-based trust of partners (Lumann 1988; Blomqvist 1997). Factor 2 explained 16.38% of variance after VARIMAX rotation. The Cronbach alpha of this factor is 0.817 and therefore indicates "good" reliability (Hair et al. 1998).

Factor 3 consists of three trust attributes: compatibility, long-term relations, and communication. Indeed, maintaining the long-term relations and the compatibility of partners should be facilitated by frequent and effective communication. Thus, the three extracted trust attributes represent the relational bonding of partners. Factor 3 explained 15.65% of the variance. The Cronbach alpha of this factor is 0.647, representing "sufficient" data reliability.

Factor 4 explained 11.74% of variance. There is only one trust attribute (financial stability).

Trust Driver: Client or Contractor

Having identified the trust factors, the next step is to investigate which partner is more appropriate to act as the trust initiator. For this purpose, the impact of the trust factors on trust level was instrumental. As discussed, comparing the R-square values of the multiple regression equations of partners assisted in suggesting the trust driver in construction partnering. In this part of the study, trust factor scores of the extracted factors in the PCFA were set as the independent variables, while the partner's trust level was set as a dependent variable in the multiple regression analyses. The trust factor score is an average score of its respective attributes computed by the SPSS. Take as an example Factor 1 of the developers/consultants group—the scores of the five trust attributes (problem solving, competent, unity, communication, and respect) were averaged as follows

$$F_1(\text{developers/consultants}) = (4.3913 + 4.4348 + 4.3913 + 4.5652 + 4.3043) = 4.4174$$

Table 5. Multiple Regression Model (Partner's Trust Level versus Extracted Trust Factor): Developers/Consultants Group

Independent variables (trust factors)	Unstandardized coefficients B	Standard error	Standardized coefficients β	t-value	Sig.	R^2
Constant	4.524	0.075		60.208	0.000	0.930
Performance	0.975	0.077	0.835	12.659	0.000	
Permeability	0.542	0.077	0.464	7.038	0.000	
System-based trust	0.130	0.077	0.111	1.685	0.111	
Relational bonding	-8.203×10^{-2}	0.077	−0.070	−1.065	0.303	

Note: dependent variable=trust level of contractor.

Developers/Consultants Group

The statistical results of the multiple regression analysis of the developers/consultants group are shown in Table 5. According to the results, the R-square value is 0.930, meaning that the multiple regression equation can explain 93% of the total variance. This indicates strongly the effectiveness of the developer's/consultant's trust factors to motivate their trust level (Hair et al. 1998). The standardized regression coefficient (beta value) of performance (Factor 1) is 0.835; permeability (Factor 2) is 0.464; system-based trust (Factor 3) is 0.111; and relational bonding (Factor 4) is −0.070. The standardized regression coefficient (beta value) denotes the estimated change in independent variable (the trust factor) for a unit change in the dependent variable (trust level). From the results, it is observed that performance (Factor 1) and permeability (Factor 2) have a higher beta value with the significance level at $p\leqslant0.001$. Thus, when the contractor is demonstrating trust by performing competently and maintaining an open and effective communication system, the corresponding increase in trust on them by the clients/consultant is apparent.

Contractors Group

The statistical results of the contractors group as shown in Table 6.

The R-square value is 0.482, meaning that the multiple regression equation can explain 48.2% of the total variance. Compared with the results in the developers/consultants group, the effectiveness of client/consultants trusting moves in fostering trust in them by the contractors is much lower. The standardized regression coefficient (beta value) of performance and permeability (Factor 1) is 0.587; system-based trust (Factor 2) is 0.101; relational bonding (Factor 3) is −0.177; and financial Stability (Factor 4) is 0.310. As indicated, only performance and permeability (Factor 1) is effective to motivate contractor's trust level at a significant level of $p\leqslant0.001$.

As discussed, the significant predictive power of trust factors on trust score as indicated in Table 5 suggests the relative effectiveness of the contractor to act as trust driver in construction partnering.

Key Observations and Concluding Remarks

This study is built on the belief that trust is the fundamental success factor for construction partnering. The objectives of this study include the identification of critical trust factors so as to provide foci for management actions. By comparing the standardized regression coefficients (beta values) of the regression equations, the critical trust factors for both groups are basically the same: performance and permeability. Hence, to cultivate trust among the contracting partners, the critical factors are to perform competently and communicate openly and effectively. Performance is evaluated by the problem-solving ability and competence of work. Permeability is often assessed by the effectiveness and efficiency of the communication between the construction partners. The importance of performance is self-explanatory, as clinical performance underpins project success. Without competent performance, trust can never be established. Communication is essential to resolve differences efficiently and expeditiously. In fact, an effective communication system can prevent problems from becoming disputes.

The prisoner's dilemma framework explains that a trust cycle needs to be kick-started by a trust driver, a situation conceived by many as impossible in the construction industry. With the trust factors being extracted from a PCFA, the second objective of the study is to consider a candidate for the trust driver. The technique of multiple regressions is employed with trust factors as independent variables and trust level as the dependent variable. This was applied to the two groups of data: developers/consultants and contractors. The R-square value in the regression equation represents the power of the independent variables to explain the dependent variable. The value can vary from 0 to 1. If the value is 1.0, it indicates that change in the dependent variable would be due to the changes of the independent variables and suggests a close relationship between the dependent and the independent variables (Hair et al. 1998).

It is found that trusting moves on the behalf of contractors have a significant correlation with the trust level of them as per-

Table 6. Multiple Regression Model (Partner's Trust Level versus Extracted Trust Factor): Contractors Group

Independent variables (trust factors)	Unstandardized coefficients B	Standard error	Standardized coefficients β	t-value	Sig.	R^2
Constant	5.500	0.142		38.780	0.000	0.482
Performance and permeability	0.565	0.144	0.587	3.911	0.001	
System-based trust	9.725×10^{-2}	0.144	0.101	0.673	0.507	
Relational bonding	−0.170	0.144	−0.177	−1.117	0.251	
Financial Stability	0.298	0.144	0.310	2.062	0.051	

Note: dependent variable=trust level of developers/consultants.

ceived by the client/consultant. This suggests that if trusting moves are initiated by a contractor, there is a good chance that reciprocal trusting moves from the client will be returned. In this respect, a trust cycle can be spun off. The relative lower predictive power of clients'/consultants' trusting moves toward trust in them (by the contractor) suggests that contractors are more cautious toward trusting moves from the client. In these perspectives, the findings suggests that in construction partnering, if the contractors perform and maintain an effective communication system, trust from the client/consultant side can be expected. With this, a trust cycle is established and can be built upon with reciprocal trusting moves from the client/consultants. As such, the contractor is a suitable candidate as the trust driver in a partnering endeavor.

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