Relational Selection for Collaborative Working Arrangements

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Abstract: Procurement arrangements for collaborative working arrangements (CWAs) should arguably provide suitable protocols under which different project partners can interact effectively and maintain harmonious relationships and mobilize their collective efforts towards common project objectives. Technical abilities of different project partners for carrying out the works are important. Also critical are their "soft" or "relational" qualities to work jointly and synergistically in the project team. The aims of the reported study are to examine the importance of a single set of different factors for selecting consultants, contractors, subcontractors, suppliers, and clients for CWAs; and to assess the relative importance of various factors and strategies for building CWAs. Data were collected internationally from 17 countries through a questionnaire survey and statistical analyses were conducted. Results attribute varying degrees of importance to various factors for selecting different project partners and suggest an interrelated and consolidated selection approach in general, except for "selecting" clients. The study confirms that trust and business ethics related factors and strategies are more helpful for CWAs than some others. Outcomes of this study are expected to benefit both industry practitioners and researchers, in exploring, designing, and implementing suitable CWAs and selecting appropriate project partners.

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Introduction

The success of construction projects depends on a multitude of factors. Chan et al. (2004) broadly classify those into human related factors, project related factors, project procedures, project management actions, and external environment. Ideally, an overall procurement arrangement for a specific project should be selected after careful consideration of such a diverse group of factors. Arguably, this umbrella procurement arrangement will provide a structure for how different project partners are selected and mobilized at various stages of the project, how they interact and coordinate among themselves, and how the project is executed. Given that the future is unknown because of many uncertainties and complex processes, the procurement arrangement and the related contract should be flexible enough for future adjustments, in order to effectively address any uncertainties (Rahman and Kumaraswamy 2004a). Also, any unforeseen events/risks and/or uncertainties would need to be managed using a joint risk management (JRM) strategy at the postcontract stage, with the combined efforts of all related parties, under such flexible contracts, and using the best available options at the time of their occurrences (Rahman and Kumaraswamy 2004b).

The above approach warrants that the project partners, both individually and collectively, should not only be able to successfully carry out the works (in terms of "technical" ability, such as relating to quality, time, and cost), but also be able to effectively mobilize their interacting, coordinating, and collaborating capacities (in terms of "relational" ability, such as joint decision making), to successfully deliver the project. The relationships among the project partners are therefore important. However, not every potential project partner may be equally able to mobilize such relational abilities and work under such flexible but collaborative working arrangements (CWAs). Clearly, it is critical to select the appropriate project partners, with whom the clients can build and maintain harmonious relationships, and interact and collaborate under flexible contractual arrangements in executing the project in complex and ever-changing construction scenarios, for win-win outcomes to all parties.

Traditionally oriented "legalistic and static" contracting systems and their consequent "price-only" based selection procedures seem to have failed to provide an appreciation of the above. Instead, those inhibit good ideas, limit cooperation and innovation, create pressures for local optimization, and feature inability in coordination (Matthews 2004). In addition, traditional contracting systems are inappropriate for CWAs, since those are characterized by strong confrontational interactions (Cheung et al. 2001). By contrast, relational contracting (RC) principles seem to be worthy of exploring these relational aspects, in order to provide necessary contractual flexibility, and especially for the purpose of this paper, related relational factors (or qualities) for selecting various project partners to work under such contractual flexibility. RC places much importance on the ongoing relationships among contracting parties for the success of a contract, encourages long-term provisions and mutual future planning, and introduces a degree of flexibility into the contract (Macneil 1974, 1980).

The relevant literature suggests that selecting project partners for CWAs (such as partnering and alliancing) has mainly focused

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on the potential inputs from, and interactions and collaboration with the "main" contractors. But consultants are central to most projects. Moreover, subcontractors carry out most of the actual work (Kumaraswamy and Matthews 2000). Suppliers also play important roles in project delivery. A little delay in supplying some critical materials may impact considerably on the project outcome (Rahman et al. 2003a). Furthermore, some contractors work as "main" contractors on some projects, and subcontractors or suppliers on some other projects, where their inputs may be critical to the project success. It is therefore important to also consider consultants, subcontractors, and suppliers in CWAs, in order to effectively build the overall project team.

Although considered separately, many researchers have studied different selection practices, identified common criteria for prequalification and bid evaluation, and proposed improved methodologies for selecting contractors (e.g., Hatush and Skitmore 1997; Alsugair 1999) and consultants (e.g., Avlla 1997; Cheung et al. 2002). There is a perceived shortfall on selection of subcontractors and suppliers, especially when considering them for CWAs. Moreover, other project partners hardly get any opportunities to express their preferences for potential clients. Furthermore, there is hardly any evidence of examining the importance of a single set of factors in selecting various project partners for CWAs. This is important in the sense that various project partners in CWAs need to adjust and align their own practices and objectives to match or dove-tail into the project objectives. Project partners in CWAs should possess much commonality in their abilities. Key elements of effective teamwork emphasize such commonalities, which include team identity, shared vision and team objectives, and collaboration and participation (Constructing Excellence 2004).

This paper first briefly discusses the relevant aspects of RC principles to mobilize appropriate relational qualities for major project participants for CWAs. It then examines (1) a single set of factors for selecting consultants, contractors, clients, subcontractors, and suppliers, for a coalesced team for CWAs; and also (2) a smaller set of factors for building RC based CWAs. Such a timely exercise is expected to benefit industry practitioners in designing and practicing suitable CWAs and selecting appropriate project partners and researchers in documenting the use of a single set of factors for selecting different contracting parties, providing empirical evidence, and laying the basis for further explorations.

Relevant Relational Contracting Principles

Dynamic Relationships

In contrast to the traditional "legalistic and static" contracting systems (based on classical contract law), RC (based on an emerging branch of modern contract law) provides necessary flexibility requirements of contracts and essential elements of team building. Apart from considering the events seen at the time of contract, RC dynamically takes into account the events before and after the moment of contract formation. Table 1 summarizes various characteristics of classical and modern contract law in relation to construction projects. RC recognizes that the "formation of a contract is a dynamic, evolving process" (Eisenberg 2000). RC places much importance on the ongoing relationships among the contracting parties, for the success of a contract/project. RC encourages long-term provisions and mutual future planning, and introduces a degree of flexibility into the contract, by considering a contract to be a relationship among the parties

Table 1. Characteristics of Classical and Modern Contract Law [Adapted from Eisenberg (2000)]

Classical contract law	Modern contract law
Rules were typically binary	Rules are often multifaceted
An overriding preference for objective and standardized rules	Highly flexible in adopting rules that are individualized and even subjective
Largely static	Largely dynamic
Static rules of interpretation that consider events only at the moment of contract formation	Dynamic rules of interpretation that take into account events before and after the moment of contract formation
Static legal-duty rule	Dynamic modification regime that takes into account the value of ongoing reciprocity
Static review of liquidated damages provisions	Dynamic review of liquidated damages that takes account of the actual loss
Static offer-and-acceptance rules	Dynamic rules, such as the duty to negotiate in good faith
Employs reasoning that is purported to be axiomatic and deductive	Employs reasoning that is explicitly grounded in social propositions
Only bargains are enforceable	Subjective elements play a critical role in the basic principles of contract interpretation

(Macneil 1974, 1980). RC holds that the world of contract is not a world of discrete transactions; rather it is a world of relations, an ongoing dynamic state, all segments of which—past, present, and future—are interrelated (Macneil 1974). It is not a world entirely of segmental personal engagements; rather it is one tending to engage many aspects of the total personal beings of the participants, to the process of projecting "exchange" into the future (Macneil 1980). RC lays preference of "exchange" over law because contracts are about getting things done in the real world. Moreover, not all the events can be perceived or realized and quantified at "present," and since all the information needed cannot be perceived at the time of contracting, mutual future planning is required (Macneil 1974). This leads parties to negotiation because negotiation costs are less than the higher premiums that may otherwise be incorporated in the bids of contractors, and are also less costly than terminating contracts.

Projection of Exchange

In fact, no real life human cooperation is found entirely transactional and lacking some whole personal relations, some diffuse communication, and some noneconomic personal satisfaction. Nor will contractual relations be found entirely lacking in transactional discreteness (Macneil 1974). Therefore contracts should consist of both promissory (i.e., legally binding) and nonpromissory (i.e., relational) exchange projectors. But classical contract law considers "promise" as the only exchange-projector, which is a "present communication of a commitment to engage in a reciprocal measured exchange" (Macneil 1980). But nobody can claim unlimited power to affect the future. Moreover, it clearly affects the future by limiting choices, which would otherwise be available to the promisor in the future. Furthermore, the existence of ongoing contractual relations creates expectations that future exchange will occur in certain patterns, which is partially predict-

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able, only through the dynamics of the existing relations. Such relational expectations, if firmly enough grounded in fact, assure "satisfactory" exchanges in the future without the need for present promise. Macneil (1974) argues that motivations, interdependence, and inevitable obligations arising from such relations may affect future exchange just as rigorously as any promise.

The accompaniments of both promissory and nonpromissory projectors originate from the interaction of the always-present social matrix with the nature of the promises themselves. First, "promises are inherently fragmentary" (Macneil 1980). Promises are made on the basis of partially known and partially unknown information, with predictions and the hope that everything will happen according to the prediction. Second, "promise made is never exactly the same as the promise received" (Macneil 1980). The resulting nonmutuality and differences in understanding can only be resolved by something other than the promises themselves. "This something, whatever else it may be, is a nonpromissory projection of exchange into the future" (Macneil 1980). Therefore promises are less than absolute, and nonpromissory exchange-projectors are inevitable in any economic exchange relationship. This is particularly so in construction scenarios that includes numerous complex interfaces and unpredictable events, which in turn point to the importance of maintaining relationships among the project participants. This in turn points to the importance of selecting the right partners, with whom nonpromissory exchange projectors can be exercised harmoniously.

Practice of Relational Contracting in Construction

In general, RC principles are frequently seen in the "best effort" clauses, when parties fail to devise precise performance specifications and well-defined obligations, and thus project "exchange" into the future and rely on ongoing relationships (Goetz and Scott 1981). In construction, RC principles can be recognized as underpinning various approaches, such as partnering, alliancing, joint venturing, long-term contracting, and other collaborative working arrangements and risk sharing mechanisms (Rahman and Kumaraswamy 2004a). Essentially RC seeks to emphasize points of convergence between the respective interests of contracting parties. In so doing, parties may well find that they have arrived at solutions to problems originating from a divergence of their interests. However, this requires changing traditional relationships to a shared vision and objectives (Constructing Excellence 2004) without regard to organizational boundaries (CII 1996). The attitudes of the project participants are critical. Achieving this is not easy, particularly to channel various participants from diverse "cultural" origins towards the common objectives of the project.

RC provides the means to sustain ongoing relations in long and complex contracts by adjustment processes of a more thoroughly transaction-specific, ongoing administrative kind. In fact, modern organizations display an acute awareness of the costly hazards of opportunism and of the difficulties of organizing exchange when the legal system is perceived to provide inadequate support for, and protection of, their interests (Lyons and Mehta 1997). More informal relational contractual arrangements provide a reasonably efficient solution where recurrent transactions (e.g., claims, variation orders—at a micro level) require investments of specific assets (e.g., claim experts, cost engineers) and are accompanied by a high level of uncertainty. Thus while nonlegal enforcement mechanisms clearly play a major role in relational contracts of bilateral governance, legal mechanisms also play a part in such exchange arrangements. Equally, more formal contractual (i.e., legal) arrangements are accompanied by an armory of supportive nonlegal mechanisms.

The above is seen in the present construction industry scenario, with an increasing trend towards RC approaches (such as through partnering): different project participants work as a team on the basis of a "partnering charter" that may not be legally binding, so that the parties may revert to the original contract in case of any major problem. The construction contracts are also seen to extensively use the basic principles of RC through "best effort" clauses. Nevertheless, it also points to the selection of suitable approaches in designing the overall procurement arrangement, and appropriate project partners with whom clients can successfully develop and maintain such harmonious relationships in practicing various forms of RC based CWAs for efficient project delivery.

Questionnaire Survey

A recent questionnaire survey examined the potential for actually implementing RC and JRM (joint risk management). The outcomes are based on 91 respondents: 61 from Hong Kong and 30 from 16 different countries (including 12 from Europe and 5 from USA), and comprised contractors, consultants, clients, and academics. Among 91, 73 responses were complete and 18 responses were partially complete. The average experience of the respondents was over 20 years. The survey evaluated different team-building mechanisms for CWAs, and assessed the JRM option for managing various special risks. Only the summary outcomes of the survey have been reported elsewhere (Rahman and Kumaraswamy 2004b). The detailed analyses from two questions of this survey are being reported here. They were specifically designed for evaluating the importance of (1) a single set of 22 factors for selecting consultants, contractors, clients, subcontractors, and suppliers for RC based CWAs, and (2) 25 various factors/strategies for building RC based CWAs. The former comprised a blend of nine technical factors and 13 relational factors, while the latter comprised various relational, procedural, and business ethics related factors and strategies.

The raw scores on individual factors were obtained in a range from 1 to 10 (1 being the least important or "strongly disagree" and 10 being the most important or "strongly agree"). The data were analyzed using the "statistical package for social science" (SPSS). The statistical means of the "total" sample, as well as the "Hong Kong" and "Others" (that is other countries) groups were ranked and compared (as shown in Table 2). "One-Sample t Test" was conducted at 95% confidence level in order to evaluate the importance levels of each individual factor. "Independent-Samples t test" at 95% confidence level was conducted to compare the relative importance of various factors according to "Hong Kong" and "Others" groups. Finally, "Factor Analysis" was carried out to narrow down the long list of factors into a fewer "broad factors" or "components" (as shown in Table 3). The "Principal Component" method of extraction was applied for the purpose of factor analysis, coupled with the "Varimax with Kaiser Normalization" method of rotation.

Various factors were deliberately not grouped and analyzed separately as technical and relational categories in order to have a clearer comparison of individual factors in their respective groups. In the interests of conciseness, Tables 4–7 summarize the importance of different factors, within the total sample only, for selecting contractors, subcontractors, suppliers, and clients, along

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Table 2. Comparison of Means of Factors for Selecting Consultants

Factors	Significance[a]	Total (79) Mean	Total (79) Rank	Hong Kong (53) Mean	Hong Kong (53) Rank	Others (26) Mean	Others (26) Rank	Significance[b]
Technical capabilities	0.00	9.05	1	9.13	1	8.88	2	0.47
Approach to joint problem solving	0.00	8.97	2	8.98	2	8.96	1	0.95
Approach to joint decision making	0.00	8.58	3	8.51	3	8.73	3	0.57
Timely project completion/delivery	0.00	8.51	4	8.40	5	8.73	3	0.41
Similar previous work experience	0.00	8.35	5	8.42	4	8.23	8	0.64
Creativity/innovation	0.00	8.34	6	8.36	6	8.31	7	0.90
Attitude towards teamworking	0.00	8.27	7	8.17	8	8.46	5	0.54
Quality of work/materials	0.00	8.25	8	8.30	7	8.15	10	0.76
Attitude to continuous improvement	0.00	8.06	9	8.00	10	8.19	9	0.65
Approach to negotiation	0.00	8.06	9	7.91	15	8.38	6	0.29
Willingness for mutual "learning"	0.00	8.00	11	7.92	14	8.15	10	0.59
Project management capability	0.00	7.97	12	8.02	9	7.88	13	0.74
Commitment to exceed project objectives	0.00	7.97	12	7.94	11	8.04	12	0.80
Adequate resources	0.00	7.89	14	7.94	11	7.77	14	0.75
Reputation and recognition in the industry	0.00	7.85	15	7.94	11	7.65	17	0.46
Long-term commitment	0.00	7.82	16	7.87	16	7.73	15	0.77
Attitude to work place relations	0.00	7.56	17	7.64	18	7.38	19	0.64
Attitude and performance on safety issues	0.00	7.52	18	7.72	17	7.12	20	0.25
Reputation on claims and disputes	0.00	7.44	19	7.32	19	7.69	16	0.41
Organizational culture	0.00	7.18	20	7.02	20	7.5	18	0.35
Pricing levels	0.00	6.78	21	6.79	21	6.77	21	0.97
Financial strength	0.00	5.84	22	6.02	22	5.46	22	0.32

Note: Figures in parentheses are the number of respondents in respective groups.

[a]Significance obtained from "One-Sample t Test."

[b]Significance obtained from Independent-Samples t test.

with the results of their respective factor analysis. Similarly, Table 8 summarizes the importance of different factors for building a relational contract for the total sample only, and the respective results from factor analysis.

Selecting Project Partners

Selecting Consultants

Table 2 summarizes the perceptions of the respondents on 22 factors in selecting consultants for the total sample, "Hong Kong" group, and "others" group, along with their respective ranks, significance obtained from one sample t test, and significance obtained from the independent-samples t test. "Technical capability" (a technical factor) is seen as the most important factor for selecting consultants, followed by two relational factors: approach to joint problem solving (rank 2) and approach to joint decision making (rank 3). The next two important factors are technical factors relating to time (rank 4) and work experience (rank 5). The sixth and seventh most important factors are again relational factors: creativity/innovation and attitude towards team working/teambuilding. Thus a mixture of technical and relational factors is perceived to be more important than some other factors. Interestingly, two technical factors—pricing levels and financial strength—are perceived to be the two least important factors (ranks 21 and 22). On the other hand, reputation on claims and disputes (rank 19) and organizational culture (rank 20) are seen to be the two least important relational factors. However, the scores of 20 factors are over 7.00. Moreover, the significance levels from one sample t test for all the 22 factors are less than 0.05, indicating that all of them are important for selecting consultants. The ranks of only three factors (approach to joint decision making, pricing levels, and financial strength) have the same ranks within "Hong Kong" and "others" groups. But the significance levels obtained from the independent-samples t test for all the factors are over 0.05, indicating that the respondents from both the groups significantly agree on the importance levels of various factors.

Table 3 shows the results from "factor analysis" for selecting consultants. Six "components" or "broad factors" emerged from this analysis and together they account for over 68% of the total explained variations. The percentage variations explained by the six components are over 15, 11, 11, 10, 10, and 9%, respectively. Component 1 consists of seven factors: organizational culture, attitude to work place relations, attitude towards teamworking, willingness for mutual learning, long-term commitment, attitude and performance on safety issues, and timely project completion. These are mostly related to "organizational attitude" as a whole that may be related to "business objectives" of the organization as well, which are in fact a mixture of both relational and technical factors. Component 2 comprises six factors: project management capability, similar previous work experience, attitude and performance on safety issues, attitude to continuous improvement, approach to joint decision making, and approach to negotiation. These seem to be related to regular practice and experience of an organization. Component 3 is composed of five technical factors (financial strength, adequate resources, quality, time, and technical capability) and one relational factor (attitude towards teamworking). These are mostly related to the ability of carrying out the works. Component 4 is seen to feed from four relational fac-

Table 3. Factor Analysis Outcomes of Factors for Selecting Consultants

	Components					
Factors	1	2	3	4	5	6
Organizational culture	0.81					
Attitude to work place relations	0.75					
Attitude towards teamworking	0.69		0.46			
Willingness for mutual "learning"	0.59					
Long-term commitment	0.53					
Project management capability		0.83				
Similar previous work experience		0.70				
Attitude and performance on safety issues	0.42	0.47				
Attitude to continuous improvement		0.43				
Financial strength			0.75			
Adequate resources			0.73			
Quality of work/materials			0.52			0.49
Timely project completion/delivery	0.44		0.46			
Approach to joint problem solving				0.83		
Approach to joint decision making		0.42		0.73		
Commitment to exceed project objectives				0.55	0.48	
Approach to negotiation		0.49		0.49		
Creativity/innovation					0.78	
Technical capabilities			0.41		0.75	
Reputation and recognition in the industry					0.55	0.43
Pricing levels						0.79
Reputation on claims and disputes						0.59
Eigenvalues	3.46	2.51	2.48	2.32	2.28	2.10
Percent of variance explained	15.71	11.41	11.28	10.53	10.37	9.55
Cumulative percent of variance explained	15.71	27.12	38.40	48.93	59.30	68.84

Note: Rotation converged in 12 iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.751, Bartlett's Test of Sphericity Chi 854.394, df 231, $p < 0.000$. Eigenvalues less than 1.000 and factor loadings below 0.40 have been suppressed.

tors (approach to joint problem solving, approach to joint decision making, commitment to exceed project objectives, and approach to negotiation). Component 5 consists of one technical factor (technical capability) and three relational factors. Lastly, component 6 comprises two technical and two relational factors. Thus, apart from component 4, all the other five components are composed of mixtures of technical and relational factors. In addition, different components are interrelated, and as such nine factors are seen to contribute to more than one component. For example, three factors of component 1 are seen to contribute to some other components also. The factors "attitude towards teamworking" and "timely project completion" contribute to component 3, and the factor "attitude and performance on safety issues" contributes to component 2. Similarly, the other five components are seen to feed from the factors contributing to more than one component. Such interweaving contributions of various factors to different components may indicate the need for an interrelated and consolidated approach in selecting consultants.

Selecting Contractors

For selecting contractors, "time" (a technical factor) is the most important factor. Moreover, respondents recommend only one relational factor among the seven top-ranked factors: approach to joint problem solving (rank 2). Apart from time, the other five technical factors are "quality," project management capability, adequate resources, "safety issues," and technical capabilities. Therefore the preference is clearly on technical factors. Interestingly, respondents suggested "pricing levels" to be the least important factor (rank 14) among technical factors. However, the score of even the combined least important factor is 7.83, given a maximum of 10. This reflects a general higher importance of all the factors considered for selecting contractors, and greater expectations from contractors in exercising RC approaches. The "one sample t test" also confirmed that all 22 factors are significant in selecting contractors. Despite slight differences in rankings of different factors, results from the "independent samples t test" show that respondents from "others" and "Hong Kong" have similar perceptions on the importance of various factors.

Six components emerged from the factor analysis of the responses for selecting contractors (Table 4), which explain over 70% of variances. Eleven factors are seen to contribute to more than one component. In particular, the factor of "similar previous work experience" is seen to almost equally contribute to components 2, 3, and 4. Component 2 comprises mostly the technical factors, but component 3 comprises mostly the relational factors. Components 1 and 4 are composed of a mixture of technical and relational factors, while all the factors contributing to component 5 are relational factors. On the other hand, the factor "pricing levels" alone is seen to form one component. This may indicate that while an interrelated consolidated approach is useful, "price" is always an important factor in selecting contractors.

Selecting Subcontractors

Respondents consider five technical factors relating to time, safety, quality, adequate resources, and pricing levels as the topmost important factors for selecting subcontractors (see Table 3).

Table 4. Importance and Factor Analysis Outcomes of Factors for Selecting Contractors

Factors	Mean	Rank	Components					
			1	2	3	4	5	6
Approach to joint problem solving	9.05	2	0.89					
Approach to joint decision making	8.79	7	0.81					
Project management capability	8.91	4	0.66					
Approach to negotiation	8.71	8	0.65				0.45	
Timely project completion/delivery	9.18	1	0.54			0.49		
Technical capabilities	8.61	10		0.89				
Financial strength	8.45	13		0.75				
Quality of work/materials	8.93	3		0.69		0.53		
Adequate resources	8.88	5		0.67				
Organizational culture	7.83	22			0.79			
Attitude to work place relations	8.29	16			0.67			
Attitude to continuous improvement	8.31	15			0.64	0.41		
Attitude towards teamworking	8.69	9	0.52		0.62			
Reputation and recognition in the industry	8.09	19			0.55	0.46		
Creativity/innovation	7.93	21		0.42	0.51			
Attitude and performance on safety issues	8.81	6				0.81		
Similar previous work experience	8.58	11		0.40	0.41	0.41		
Reputation on claims and disputes	8.13	18					0.70	
Willingness for mutual "learning"	8.19	17			0.40		0.61	
Commitment to exceed project objectives	8.01	20				0.40	0.52	
Long-term commitment	8.54	12	0.41				0.51	
Pricing levels	8.43	14						0.87
Eigenvalues			3.79	3.14	3.13	2.16	2.02	1.31
Percent of variance explained			17.24	14.28	14.21	9.82	9.17	5.97
Cumulative percent of variance explained			17.24	31.52	45.72	55.54	64.72	70.69

Note: Rotation converged in eight iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.794, Bartlett's Test of Sphericity Chi 996.735, df 231, $p < 0.000$. Eigenvalues less than 1.000 and factor loadings below 0.40 have been suppressed.

"Attitude to teamworking" and "approach to joint problem solving," these two relational factors, are the next two important factors (ranks 6 and 7). The least important technical factor is project management capability with rank 20 and score 7. On the other hand, the least important relational factor is creativity/innovation with score 6.92. This is also the least important factor among all 22 factors, and the only factor with a score of less than 7. This implies the importance of relational factors for selecting subcontractors, along with technical factors. Thus a mixture of both technical and soft factors is seen to be more important for selecting subcontractors than some other factors. The "one sample t test" confirms the importance of all 22 factors. However, the respondents from "Hong Kong" and "others" recommend different levels of importance on "pricing levels" and "financial strength." Respondents from "others" consider these two factors as less important (ranks 9 and 21, respectively) than those from "Hong Kong" (ranks 4 and 12, respectively).

As seen in Table 5, six components emerged from the factor analysis results for selecting subcontractors, and together they account for over 70% of the total explained variations. Except "adequate resources," the other nine factors contributing to component 1 are relational factors. Contrary to the higher importance of individual technical factors as seen above, component 1 implies that the combined effects of relational factors may be of more importance in selecting subcontractors, since it explains the highest variances among all six components. Component 2 is composed of five relational factors and two technical factors, again implying higher importance of relational factors. Component 5 is composed of three technical factors, while component 6 comprises only two relational factors relating to "reputation." Components four and five comprise mostly technical factors. Thus four out of the six components are seen to feed from a mixture of technical and relational factors. Moreover, all six components are seen as interrelated, in that they are derived from seven factors that are contributing to more than one component.

Selecting Suppliers

Table 6 shows that the factors related to quality, time, and price are the three most important factors for selecting suppliers. These are also the only three factors with scores of more than 8. The only insignificant factor is "project management capability," with a score of 4.95. All the other 18 factors have scores between 6 and 8, indicating their importance of different degrees. Thus a mixture of both technical and relational factors has been recommended with more priority on quality, time, and price. Five components emerge from factor analysis and together explain over 67% of the total variances. All the components are fed by some factors that contribute to more than one component, and as such 11 factors are seen to contribute to more than one component. They comprise both technical and relational factors, while some of the factors contribute more "heavily" than others.

Selecting Clients

If other contracting parties are given the opportunity to select potential clients as suggested by the respondents, financial strength is the most important factor that a potential client should

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Table 5. Importance and Factor Analysis Outcomes of Factors for Selecting Subcontractors

Factors	Mean	Rank	Components 1	2	3	4	5	6
Attitude to continuous improvement	7.86	11	0.74					
Attitude towards teamworking	8.35	6	0.72					
Long-term commitment	7.58	14	0.67					
Organizational culture	7.00	20	0.66	0.41				
Attitude to work place relations	8.04	10	0.64					
Approach to negotiation	8.09	9	0.59					
Reputation and recognition in the industry	7.47	18	0.54			0.46		0.48
Approach to joint problem solving	8.30	7		0.87				
Approach to joint decision making	7.55	15		0.76				
Commitment to exceed project objectives	7.64	13		0.64				
Quality of work/materials	8.78	3		0.57		0.53		
Willingness for mutual "learning"	7.36	19	0.46	0.48				
Similar previous work experience	8.12	8			0.74			
Project management capability	7.00	20			0.74			
Creativity/innovation	6.86	22	0.48		0.56			
Attitude and performance on safety issues	8.83	2				0.81		
Timely project completion/delivery	9.01	1				0.46		
Pricing levels	8.39	5					0.83	
Technical capabilities	7.83	12			0.45		0.63	
Financial strength	7.49	17		0.52			0.59	
Reputation on claims and disputes	7.51	16						0.76
Adequate resources	8.42	4	0.47					
Eigenvalues			4.25	3.58	2.25	2.13	2.03	1.37
Percent of variance explained			19.30	16.28	10.24	9.68	9.22	6.22
Cumulative percent of variance explained			19.30	35.57	45.82	55.49	64.71	70.93

Note: Rotation converged in 10 iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.836, Bartlett's Test of Sphericity Chi 975.030, df 231, $p < 0.000$. Eigenvalues less than 1.000 and factor loadings below 0.40 have been suppressed.

have (see Table 7). The next six most important factors relate to relational factors, showing a clear higher expectation from the clients. This is very important, since clients plan/design and control the project organization and contract contents, and select other project partners. They are also the biggest stakeholders of projects. Therefore clients are expected to pioneer any initiatives for CWAs. "Technical capability" is the least important factor that respondents expect from a potential client. This is also the only insignificant factor for a client. Scores of all the other 21 factors vary from 6.39 to 8.80, indicating importance of different degrees. Respondents from other countries significantly disagree with those from Hong Kong on two factors: "financial strength" and "reputation and recognition in the industry." According to them, these two factors rank 4 and 18, respectively, compared to 1 and 11 by respondents from Hong Kong. They place more importance on "negotiation," "joint decision making," and "joint problem solving."

Six components emerge from the factor analysis results and together they explained over 65% of the variations (see Table 7). Only two factors are seen to contribute to more than one component: "commitment to exceed project objectives" and "similar previous work experience." Moreover, three of the six extracted components comprise either only relational factors or technical factors. Components 1 and 3 are composed of five and three relational factors, respectively. On the other hand, component 4 is composed of three technical factors. Component 2 is composed of five technical factors (time, quality, price, safety, and similar previous work experience) and one relational factor (commitment to exceed project objectives). Although this relational factor also contributes to component 6 as well, all six factors contributing to component 2 are performance related factors in general. Component 5 consists of three relational factors and one technical factor. But none of these four factors contribute to any other components. Component 6 comprises one technical factor and two relational factors. It is therefore seen that the six extracted components have less interference among the 22 factors when compared with extracted components for selecting consultants, contractors, subcontractors, and suppliers, and a potential client may possibly be chosen in line with several "basic/broad factors" or components.

Strategies for Collaborative Working Arrangements

Table 8 summarizes the perceptions of the respondents on a set of 25 factors/strategies for building RC based CWAs, along with results of the subsequent "factor analysis." Respondents consider mutual trust as the most important factor. Open communication and understanding of each other's objectives ranked second and third, followed by equitable and clear allocation of foreseeable and quantifiable risks. The next three most important factors (fifth to seventh) are attitude of the project participants, readiness to compromise on unclear issues, and awareness of risks and rewards. Thus trust and business ethics related factors are seen to be of primary concern for building CWAs. This is followed by the trend of importance on operational factors, such as effective coordination (eighth), alignment of objectives (10th), dispute reso-

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Table 6. Importance and Factor Analysis Outcomes of Factors for Selecting Suppliers

Factors	Mean	Rank	Components 1	2	3	4	5
Technical capabilities	6.90	10	0.77				
Project management capability	4.95	22	0.75				
Approach to joint decision making	6.27	20	0.74				
Approach to joint problem solving	6.75	13	0.72	0.47			
Creativity/innovation	6.54	17	0.63				
Similar previous work experience	7.04	8	0.61		0.45		
Financial strength	6.82	11	0.52				0.42
Adequate resources	7.23	6	0.51				
Attitude to continuous improvement	7.09	7	0.50	0.47			
Willingness for mutual "learning"	6.54	17	0.43				0.43
Attitude to work place relations	6.66	15		0.88			
Attitude and performance on safety issues	6.52	19		0.76			
Organizational culture	6.00	21		0.73			
Attitude towards teamworking	6.67	14		0.72	0.41		
Reputation on claims and disputes	6.58	16	0.41	0.53			
Commitment to exceed project objectives	6.80	12	0.41	0.52	0.46		
Reputation and recognition in the industry	7.25	5			0.66	0.48	
Approach to negotiation	7.27	4		0.42	0.63		
Long-term commitment	7.03	9			0.58		0.46
Quality of work/materials	8.95	1				0.80	
Timely project completion/delivery	8.82	2				0.71	
Pricing levels	8.22	3					0.77
Eigenvalues			4.60	4.27	2.43	1.83	1.68
Percent of variance explained			20.91	19.39	11.03	8.33	7.64
Cumulative percent of variance explained			20.91	40.30	51.33	59.67	67.31

Note: Rotation converged in 12 iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.822, Bartlett's Test of Sphericity Chi 1093.184, df 231, $p < 0.000$. Eigenvalues less than 1.000 and factor loadings below 0.40 have been suppressed.

lution (12th), and performance appraisal (15th). It is also seen that developing a "partnering" culture within the organization (14th) is more important than the possibility of future work (17th), partnering workshop (19th), and partnering experience (20th). Legal implications (22nd) and cost of implementing "partnering" (23rd) have far less barriers for CWAs. In addition, "traditional owner, contractor and subcontractor hierarchy" is recommended as the least conducive for CWAs. Except for "jointly organized social/cultural activities," the one sample t test confirmed the significance of the other 24 factors/strategies for building successful CWAs. However, respondents from the "others" group significantly disagree with those from Hong Kong in terms of the importance levels on two factors: "open communication" and "traditional hierarchical relationship." They placed the highest importance on open communication with a score of 9.36, compared to the rank of 4 and a score of 8.61 by respondents from Hong Kong. In terms of a traditional hierarchical relationship, both groups ranked it as the lowest, but with scores of 4.44 by respondents from Hong Kong and 3.21 by those from other countries.

Eight components appeared from the factor analysis results and together they explained over 68% of the variations (see Table 8). Five factors are seen to contribute to more than one component: mutual trust, open communication, possibility of future works, awareness of risks and rewards, and understanding each other's objectives. Except open communication, the other four factors are seen to almost equally contribute to more than one component. However, the literature abounds in confirmations of trust being at the core of any RC based CWAs (e.g., Mohr and Spekman 1994; Bayramoglu 2001; Chan et al. 2004; Cheng and Li 2004). Effective communication has been identified as an essential part in achieving benefits from CWAs and interorganizational collaboration (Cummings 1984; Bayramoglu 2001; Chan et al. 2004). On the other hand, "possibility of future works," "awareness of risks and rewards," and "understanding each other's objectives" justify the theoretical proposition that RC based CWAs occur in "mutual reciprocity" (Macneil 1980). "Rewards," however, may vary from monetary incentives (Bayliss et al. 2004), to nonmonetary personal satisfaction (Macneil 1974). It is therefore not unlikely that these five factors contribute to more than one component.

Component 1 (business trust) is composed of six factors: "developing a partnering culture, first, within the organization," professional ethics, alignment of objectives, mutual trust, open communication, and understanding each other's objectives. These are parts of "business trust," where parties themselves govern the transactions within mutually accepted guidelines (Macaulay 1963; Deakin et al. 1997). It explains the long-term business objectives of partner organizations and depends on their flexibility in adopting suitable business strategies (Rahman et al. 2003b).

Component 2 (socialization) comprises four factors: partnering workshop, role of partnering facilitator, jointly organized social/cultural activities, and possibility of future work. These are related to "socialization"—partnering facilitator can introduce core concepts and operational arrangements of CWAs to project partners, where they can know each other and discuss and agree on different issues, and joint social/cultural activities smoothen their relationships. This may in turn increase the possibilities of work-

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Table 7. Importance and Factor Analysis Outcomes of Factors for Selecting Clients

Factors	Mean	Rank	Components 1	2	3	4	5	6
Attitude to continuous improvement	7.76	7	0.74					
Long-term commitment	8.23	5	0.73					
Willingness for mutual "learning"	7.36	12	0.70					
Creativity/innovation	6.50	20	0.66					
Reputation on claims and disputes	7.50	10	0.50					
Timely project completion/delivery	7.65	8		0.82				
Quality of work/materials	6.63	19		0.75				
Pricing levels	7.38	11		0.69				
Commitment to exceed project objectives	7.31	13		0.55				0.52
Attitude and performance on safety issues	7.51	9		0.44				
Attitude to work place relations	7.24	14			0.86			
Attitude towards teamworking	7.78	6			0.77			
Organizational culture	6.95	16			0.74			
Project management capability	6.89	17				0.82		
Technical capabilities	5.28	22				0.77		
Similar previous work experience	6.39	21		0.53		0.54		
Approach to joint problem solving	8.64	3					0.75	
Approach to joint decision making	8.51	4					0.72	
Adequate resources	6.83	18					0.60	
Approach to negotiation	8.66	2					0.51	
Financial strength	8.80	1						0.73
Reputation and recognition in the industry	7.05	15						0.56
Eigenvalues			2.98	2.94	2.58	2.17	2.12	1.58
Percent of variance explained			13.56	13.36	11.75	9.85	9.65	7.19
Cumulative percent of variance explained			13.56	26.92	38.66	48.51	58.17	65.35

Note: Rotation converged in six iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.762, Bartlett's Test of Sphericity Chi 743.171, df 231, $p < 0.000$. Eigenvalues less than 1.000 and loadings below 0.40 have been suppressed.

ing together in the future. Social or cultural functions help to develop interpersonal communication, improve trust, and maintain team spirit (Bayliss et al. 2004). These are also essential for an effective and cooperative working environment.

Component 3 (efficient coordination) is composed of five factors: frequent formal and informal meetings, effective coordination, open communication, attitude of project participants (partners), and possibility of future work. These may be termed as "efficient coordination." Coordination reflects the expectations of individual parties from others in fulfilling a set of tasks in a given scenario (Mohr and Spekman 1994). Good coordination resulting from frequent discussions, information sharing, and increased contact points among partners can address various interface problems among contracting parties, maintain project stability in an uncertain environment, and streamline project objectives with those of the contracting parties (Bayramoglu 2001; Chan et al. 2004).

Component 4 (legal and cost implications) consists of three factors: legal implications, partnering experience, and cost of implementing partnering. This component explains the concerns of participating project partners on contractual and cost issues for implementing partnering type RC approaches. However, experienced partners may not be afraid of such issues.

Component 5 (effective issue resolution mechanism) feeds on three factors: agreed process for dispute resolution, agreed mechanism for performance appraisal, and awareness of risks and rewards. It explains that project partners are ready to clarify their underlying assumptions on risks, conflicts, and performance. Diverse opinions and disagreements are discussed and settled according to an agreed mechanism and reward scheme.

Component 6 (trust based negotiation) contains four factors: mutual trust, readiness to compromise on unclear issues, compatible organizational cultures, and collective responsibility (instead of personal/individual responsibility). Trust is argued to be central to any CWA. This component explains that trusting partners with compatible organizational origins are better suited to frequent negotiations on unclear issues and more suitable for collective responsibility that is critical to CWAs.

Component 7 (client role) comprises only two factors: "traditional owner, contractor and subcontractor hierarchy," and pioneering role of the client. This component explains that clients' attitude is important in designing the framework for CWAs and mobilizing the cooperation of the contracting parties in the project team.

Component 8 (risk and reward) consists of three factors: awareness of risks and rewards, equitable and clear allocation of foreseeable and quantifiable risks, and understanding each other's objectives. This component explains that clear and equitable allocation of risks is an effective tool for CWAs, coupled with sound understanding of expectations and objectives of other contracting parties and a suitable reward plan that is ideally linked to the risks that they undertake.

Analysis of Survey Results

Based on RC principles, the survey presented in this paper evaluated a single set of factors for selecting a coalesced team for

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Table 8. Importance of Different Factors/Strategies for Building Collaborative Working Arrangements and Factor Analysis Outcomes

			Components							
Items	Mean	Rank	1	2	3	4	5	6	7	8
Developing a partnering culture, first, within the organization	7.28	14	0.74							
Professional ethics	7.79	11	0.72							
Alignment of objectives	7.83	10	0.65							
Mutual trust	9.10	1	0.56					0.50		
Partnering workshop	6.77	19		0.79						
Role of partnering facilitator	6.52	21		0.77						
Jointly organized social/cultural activities	5.17	24		0.62						
Frequent formal and informal meetings	7.55	13			0.72					
Effective coordination	7.94	8			0.71					
Open communication among the parties	8.85	2	0.41		0.61					
Attitude of the project participants	8.57	5			0.51					
Possibility of future work	6.91	17		0.42	0.48					
Legal implications	6.29	22				0.72				
Partnering experience	6.75	20				0.68				
Cost of implementing partnering	5.69	23				0.66				
Agreed process for dispute resolution	7.69	12					0.80			
Agreed mechanism for performance appraisal	7.20	15					0.74			
Awareness of risks and rewards	8.24	7					0.56			0.52
Readiness to compromise on unclear issues	8.28	6						0.80		
Compatible organizational cultures	6.94	16						0.61		
Collective responsibility, instead of personal responsibility	7.87	9						0.44		
Traditional owner, contractor, subcontractor hierarchy	4.05	25							0.85	
Pioneering role of the owner/client	6.91	17							0.59	
Equitable and clear allocation of foreseeable and quantifiable risks	8.69	4								0.76
Understanding each other's objectives	8.76	3	0.49							0.52
Eigenvalues			2.63	2.59	2.57	2.30	2.07	1.87	1.64	1.56
Percent of variations explained			10.52	10.36	10.27	9.19	8.28	7.47	6.56	6.25
Cumulative percent of variations explained			10.52	20.88	31.15	40.34	48.61	56.09	62.64	68.89

Note: Rotation converged in 18 iterations; Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.751, Bartlett's Test of Sphericity Chi 889.634, df 300, $p < 0.000$. Eigenvalues less than 1.000 and loadings below 0.40 have been suppressed.

CWAs that comprise consultant, contractor, subcontractor, supplier, and client. It also assessed different factors and strategies for building RC based CWAs. The study recognized some general trends towards an adoption of RC principles both in selecting different project partners and building CWAs in the industry. It also revealed the positive attitudes of industry participants towards such approaches. These include the following.

- All 22 factors are significant for selecting consultants. A mixture of both technical and relational factors are more important for selecting consultants than some other factors, and with less importance on price. Six interrelated components emerge from the factor analysis exercise. Five components comprise a mixture of both technical and relational factors. Only one component is seen to feed from all the relational factors, but all the components feed on factors that contribute to more than one component.
- All 22 factors are significant for selecting contractors. Respondents suggest that the contractors must have very high capabilities in all 22 factors for CWAs. Factor analysis reveals that only one factor of "price" constitutes one component, while the other five components are interrelated, in that some factors contribute to more than one component. Among these five, four components draw on both technical and relational factors, while one component draws only on relational factors.
- All 22 factors are significant for selecting subcontractors. Respondents from Hong Kong differ with those from other countries in terms of relative significance of "pricing levels" and "financial strength," but respondents as a whole prefer subcontractors to be selected for CWAs with higher abilities in technical factors and good qualities in relational factors. Six components emerge from factor analysis. Four components are fed from a mixture of both technical and relational factors, one component is fed with only technical factors, and the other one comprises only two "reputation" related relational factors. However, all six components are interrelated since they feed on factors that are contributing to more than one component.
- Except the factor of "project management capability," all the other factors are significant for selecting suppliers for CWAs. Respondents recommend a mixture of both technical and relational factors with more priority on quality, time, and price. Five components emerge from factor analysis. All the components are fed by factors that contribute to more than one component. Also, all the components comprise both technical and relational factors.
- Except for "technical capability," the other 21 factors are significant for a potential client for CWAs. Respondents ex-

Table 9. Comparison of Top Five Factors for Selecting Various Team Members

Factor ranking	Consultants	Contractors	Subcontractors	Suppliers	Clients
1	Technical capabilities	Timely project completion/delivery	Timely project completion/delivery	Quality of work/materials	Financial strength
2	Approach to joint problem solving	Approach to joint problem solving	Attitude and performance on safety issues	Timely project completion/delivery	Approach to negotiation
3	Approach to joint decision making	Quality of work/materials	Quality of work/materials	Pricing levels	Approach to joint problem solving
4	Timely project completion/delivery	Project management capability	Adequate resources	Approach to negotiation	Approach to joint decision making
5	Similar previous work experience	Adequate resources	Pricing levels	Reputation and recognition in the industry	Long-term commitment

pect a potential client to have higher relational qualities for CWAs, although they recommend financial strength as the most important factor. Respondents from other countries significantly disagree with those from Hong Kong in terms of relative importance of two factors. They seem to slightly favor relational factors over technical factors. Six components emerge from the factor analysis results, which are less interrelated and only two factors are seen to contribute to more than one component.

- With a few exceptions, all 22 factors are significant for selecting clients, consultants, contractors, subcontractors, and suppliers for CWAs, with varying degrees of importance placed on different factors, both by respondents from Hong Kong and that from other countries.
- Results from factor analysis suggest that a potential client may possibly be selected for CWAs on the basis of a few "broad factors" or components. By contrast, a consolidated approach may be more suitable for selecting consultants, contractors, subcontractors, and suppliers. It also indicates that there might be some relationships between relational and technical factors, since a mixture of both categories of factors is seen to form most of the components that emerged from the factor analysis exercise. This may be an interesting area for further exploration.
- Survey results seem to indicate that project participants should possess some common relational "qualities" to become project "partners," although these may be at different levels. Table 9 summarizes the top five factors for selecting various team members.
- "Mutual trust" is the most important factor in CWAs. On the whole, trust and business ethics related factors/strategies seem to be more helpful for CWAs, followed by operational arrangements. "Attitudes of project participants" are perceived to easily overcome any "legal implications." "Collective responsibility" is also very important, whereas "traditional contractual hierarchy" is the least beneficial factor/approach for RC based CWAs.
- "Jointly organized social/cultural activities" is the only factor/strategy that is not significant for RC based CWAs, although respondents from other countries significantly disagree with those from Hong Kong in terms of relative importance of "open communication" and "traditional hierarchical relationship."
- Results from factor analysis suggest that the 25 factors and strategies may be reduced to eight "broad factors" or components. Those are business trust, socialization, efficient coordination, legal and cost implications, effective issue resolution mechanism, trust based negotiation, client role, and risk and reward. In addition, five factors—mutual trust, open communication among the parties, possibility of future work, awareness of risks and rewards, and understanding each other″s objectives—are seen to play multiple roles in CWAs.
- With very few exceptions, statistical tests show that the respondents from 17 countries/territories and diverse contracting affiliations significantly consider the importance of various factors/strategies in the same way—both for selecting different project team partners and building CWAs. Therefore the results may be taken to be generalizable.
- The results presented in this paper may be taken to be indicative of recent developments in construction industries worldwide, including that of Hong Kong, that are in the process of being transformed towards embracing more harmonious RC based CWAs.

Conclusions

In order to interact meaningfully and cooperate consistently, teamworking in collaborative working arrangements (CWAs) needs different partners to align their diverse objectives and perceptions on some common aspects towards the project objectives. However, all the partners may not need to be at the same "level" against all the factors. This has been examined in the present paper using a single set of 22 technical and relational factors, in terms of selecting consultants, contractors, subcontractors, suppliers, and clients. Some specific patterns appeared. All the factors were found to be significant in selecting these project partners, except "project management capability" for suppliers and "technical capabilities" for clients. With a few exceptions, respondents from diverse origins considered the importance of various factors with significantly similar perceptions. Contractors are seen to need very high and all-round capabilities, and clients are expected to mobilize higher relational qualities. Only for selecting clients could all these factors be reduced to a few broader components. It seems better to select other project partners through a consolidated but interrelated approach.

The study also examined the importance of 25 different factors/strategies for building CWAs. Trust and business ethics related factors/approaches are seen to be at the core of CWAs, followed by sound operational arrangements. A traditional hierarchical contractual arrangement is seen to be the least beneficial. Factor analysis results show that different factors/strategies influ-

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encing CWAs could be grouped into eight components, where "mutual trust," "open communication," and "incentives" play multiple roles.

It is therefore expected that clients will increasingly adopt a proactive role in adopting appropriate project based CWAs and select other project partners using suitable relational factors/strategies wherever possible. This may include the clients being the first to recognize the benefits from RC based CWAs and mobilize their own relational qualities. Depending on the nature and requirements of different projects, enlightened clients may carefully craft appropriate procurement arrangements and contract conditions, injecting healthier doses of relational strategies and incentives, simultaneously striking a balance between "control" and flexibility. Selecting different project partners may include deciding on the appropriate criteria for different project partners, assigning those with proper weights, and incorporating relational elements, wherever possible. Project partners will then be able to interact meaningfully, understand each other better, and build an integrated team, e.g. to build trust, create a sense of accountability, and work jointly to deliver efficient projects. Under clients' initiatives, such project-based approaches are expected to gradually compel other project participants to "re-tune" themselves to think, behave, and work "relationally." Construction industries will then be able to perform "seamlessly" and deliver projects efficiently.

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