

Potential for Implementing Relational Contracting and Joint Risk Management

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Abstract: This paper focuses on the outcomes of the second survey in a broad Hong Kong-based study on joint risk management (JRM) through relational contracting (RC). The questionnaire survey itself focused on issues relating to the formation of a coalesced team for JRM at the postcontract stage, comprising owners, consultants, contractors, subcontractors, and suppliers. Results indicate the greater importance of more relational, trust, and joint responsibility-related factors in general, both for selecting different parties and for building a successful relational contract. While some differences in group perceptions emerge, respondents recommend mobilizing project participants at earlier stages of projects, that is, mostly before the contract award, and they strongly support the JRM option for managing various unforeseen risks. Respondents also suggest adjustment/extension of contract provisions for managing unforeseen events, indicating emerging preferences for flexibility in contracts. All these are indicative of a perceived trend toward more RC, teamworking, and collaborative working environments.

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Introduction

Literature Review

Risks can be transferred, shared, accepted, managed, or minimized but cannot be ignored (Latham 1994). Construction risks are often project specific and are allocated to different parties through contract conditions. But not all the risks are foreseeable at the outset, and therefore a completely definitive and exhaustive allocation of risks cannot be achieved. Moreover, quantification of foreseeable risks may be neither always possible nor correct. As a project progresses, the nature and extent of foreseeable risks may change, new risks may emerge, and existing risks may change in importance or be reallocated and may influence other risks. Furthermore, some of the risks may require the combined efforts of all contracting parties for their effective management. Such uncertainties and unforeseen risks would need to be managed using a joint risk management (JRM) strategy at the postcontract stage. This implies a need for some flexible contract conditions that can enable a selection of the best available options at the time of their occurrence and with the joint efforts of all contracting parties (Rahman and Kumaraswamy 2002). This means contracting parties should (1) proactively and jointly address known risks and methods of mitigation, and (2) work together at mitigating risks that have not been identified, planned

for, and allocated (Hartman et al. 1997). The goal of optimal risk management should be to (1) minimize the total cost of risks to a project, not necessarily the costs to each party separately (CII 1993), and (2) minimize risk-whosever risk it may be (ASCE 1979).

In addition to the above, contract language alone is insufficient to clearly specify risk apportionment between contracting parties. Different groups of contracting parties, as well as different members of individual groups, interpret contract clauses differently (Hartman et al. 1997; Rahman and Kumaraswamy 2002). A clear meeting of minds of the different parties appears necessary. Given the nature of the present construction industry as a very complex, high-risk, multiparty business, conflicts between the diverse participants need to be minimized through better relationships and cooperative teamwork and under flexible contract conditions (Dissanayaka and Kumaraswamy 1999). Relational contracting (RC) principles may be mobilized to provide (and justify) such contractual flexibility, improve relationships, and build teamworking (Macneil 1974, 1980), which will in turn smooth JRM.

RC principles underpin various approaches, such as partnering, alliancing, joint venturing, long-term contracting, and other collaborative working arrangements and better risk-sharing mechanisms (Alsagoff and McDermott 1994; Jones 2000). RC allows mutual future planning and considers contracts to be relationships among the parties in the process of projecting exchange into the future. This requires transforming traditional relationships toward a shared culture that transcends organizational boundaries (CII 1996). However, the nature and extent of flexibility that may be incorporated in the standard contract conditions must be carefully controlled in order not to invite abuse, misinterpretations, and other problems that may, for example, lead to claims, disputes, and disruptions of relationships.

To the best of the writers' knowledge, no study of joint management of risks at the postcontract stage has been conducted previously. Moreover, worldwide concerns, as reflected in recent construction industry reports in many countries, and the emergence of various innovative project delivery methods, together

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with the apparent success of relationship-based contracting (e.g., in partnering), encouraged the researchers to undertake the present study into the potential for JRM at the postcontract stage.

Scope, Objectives, and Research Methods of Overall Study

The scope of the overall study includes (1) an evaluation of perceptions on present and preferred risk allocations, including attitudes of project participants toward JRM through flexible contract conditions, and the potential for implementing JRM; and (2) subsequent formulation and validation of a JRM model. While this Hong Kong-based study focuses on local construction projects, the observations are very relevant, if not directly applicable, to other countries as well, since the basic problem of risk management is generic.

The objectives of the overall study are to formulate strategies for (1) achieving the right balance of risks among contracting parties, and (2) managing construction project risks effectively and efficiently. In order to cover such a wide scope of works in an acceptable manner and meet the objectives, the overall study uses a series of research methods aimed at achieving comprehensive coverage. These methods include a literature review, questionnaire surveys, case studies, and interviews with local industry experts.

Background Study

The first of the three planned surveys elicited current perceptions of (1) present risk allocation between contractors and owners, and (2) preferred allocation to contractors and owners, with a provision for JRM at the postcontract stage (Rahman and Kumaraswamy 2002). With a few exceptions, the Hong Kong-based survey results indicated that different project participant groups (owners, contractors, and consultants) had inherently different perceptions of both present and preferred allocation of risks, both between and within the groups. This was consistent with previous findings in Canada (Hartman et al. 1997). Despite such specific divergences, it was clear that the respondents as a whole recommended JRM (1) of varying degrees for almost all of the 41 risk items used in the survey, and (2) with considerable percentages for most of the risk items. It was also clear that the respondents generally preferred to reduce the risk liabilities (as compared to present allocations) of either one or both of the contracting parties (i.e., contractors and owners) and allocate these reduced risk components for JRM instead of transferring them to the other party. These preferences were interpreted as indicative of an industry shift toward teamworking-based collaborative working arrangements. JRM at the postcontract stage calls for nonadversarial teamwork where better relations, mutual understanding, and strong cooperation among the contracting parties are preconditions. These needs also align well with RC principles, hence providing the basis for this second survey on implementing RC and JRM.

Scope and Objectives of This Paper

The present paper reports the results of the second survey in the context of the above overall study and examines the way forward for forming a coalesced team comprising various project partners (owners, consultants, contractors, subcontractors, and suppliers) for the active joint management of unforeseen risks (JRM) at the postcontract stage. This outcome is built up from the information

presented on the basic theoretical concepts and relevant results of the first survey, as mentioned above. However, the present paper constitutes a stand-alone documentation of the outcomes of the second survey, which clearly point to suitable strategies for team-building in the construction projects.

Methodology

The Questionnaire and Its Distribution

The carefully designed questionnaire for the survey reported in this paper (i.e., the second survey in this structured study) was (1) based on a literature review and preliminary information obtained from a pilot study (by interviewing some industry experts from both public and private sectors) in order to address the relevant concerns and status of the industry; (2) pilot tested by five experts (two academics and one each from owner, consultant, and contractor); and (3) improved based on the opinions obtained from these experts. Among the seven independent questions in the questionnaire, the first three were related to RC and focused on (1) evaluation of different selection criteria for selecting various project partners (consultant, contractor, owner, subcontractor, and supplier); (2) identification of suitable stages for bringing the various project partners into the project team to facilitate JRM; and (3) evaluation of the relative importance of different factors for developing a successful relational contract. The next three questions were related to JRM and attempted to measure different risk management options relating to risks that (1) are not foreseeable and quantifiable at the planning stage, (2) are clearly seen and quantifiable but need joint efforts, and (3) change in nature with project progress. Respondents were requested to add and evaluate additional factors/stages/options to these six questions. Question 7 was open ended, seeking suggestions and recommended strategies for implementing JRM. Responses to this last question are not specifically discussed here due to space restrictions.

The improved questionnaire was distributed (1) internationally through the Internet to different interest group networks, construction lists, and organizations, such as the Cooperative Network for Building Researchers (CNBR), the Association of Researchers in Construction Management (ARCOM), the International Council for Research and Innovation in Building and Construction (CIB), and the Project Management Institute (PMI); and (2) locally to a cross-section of selected owners, contractors, consultants, academics, and construction experts by e-mail, ordinary mail, fax, or in person. The local target group included (1) all of the over 200 members of the Association for Project Management, Hong Kong (APMHK), (2) over 300 selected owners, contractors, consultants, and academics, and (3) 22 top construction and consulting executives and top-level client representatives who were approached during another (parallel) interview-based study, with a request to distribute the questionnaire within their organizations and to any others whom they thought appropriate.

Responses and Data Analysis

A total of 92 responses from 17 countries were received (62 from Hong Kong and 30 from other countries, including 12 from Europe and 5 from the United States), which provided a desirable cross section of present industry perceptions. The responses from Hong Kong and other countries, as presented and discussed in the

Table 1. Perceptions of Importance of Different Factors for Selecting Consultants for Relational Contracting

Factors	ALL (79)	R (all)	SD (all)	AC (12)	R (ac)	CS (12)	R (cs)	CT (40)	R (ct)	OW (15)	R (ow)	OC (26)	R (oc)	HK (53)	R (HK)
Hard/technical															
Technical capabilities	9.05	1	1.43	8.50	4/e	9.33	1	9.10	1	9.13	1	8.88	2	9.13	1
Timely project completion/delivery	8.51	4	1.69	8.50	4/e	9.17	3/e	8.13	6	8.87	3/e	8.73	3/e	8.40	5
Similar previous work experience	8.35	5	1.61	8.00	12	8.33	16	8.25	5	8.93	2	8.23	8	8.42	4
Quality of work/materials	8.25	8	1.98	7.67	15/e	9.08	6/e	8.05	7	8.60	6	8.15	10/e	8.30	7
Project management capability	7.97	12/e	1.69	8.08	9/e	9.00	8	7.45	16	8.47	7/e	7.88	13	8.02	9
Adequate resources	7.89	14	2.22	8.33	8	8.92	9/e	7.43	17	7.93	11/e	7.77	14	7.94	11/e
Performance on safety issues	7.52	18	2.17	7.58	17	8.75	11	7.30	18	7.07	20	7.11	20	7.72	17
Pricing levels	6.78	21	2.29	7.33	19	6.92	20/e	6.40	21	7.27	17/e	6.77	21	6.79	21
Financial strength	5.84	22	2.31	6.25	22	6.67	22	5.55	22	5.60	22	5.46	22	6.02	22
Soft/relational															
Approach to joint problem solving	8.97	2	1.19	8.83	1	9.25	2	9.00	2	8.80	5	8.96	1	8.98	2
Approach to joint decision making	8.58	3	1.63	8.50	4/e	9.17	3/e	8.53	3	8.33	9/e	8.73	3/e	8.51	3
Creativity/innovation	8.34	6	1.59	7.67	15/e	8.58	14	8.28	4	8.87	3/e	8.31	7	8.36	6
Attitude toward team working	8.25	7	1.99	8.42	7	9.17	3/e	7.88	11	8.47	7/e	8.46	5	8.17	8
Attitude to continuous improvement	8.06	9/e	1.76	7.25	20	8.67	12/e	8.03	8/e	8.33	9/e	8.19	9	8.00	10
Approach to negotiation	8.06	9/e	1.86	8.75	2	8.42	15	7.83	12	7.87	14/e	8.38	6	7.91	15
Willingness for mutual learning	8.00	11	1.75	8.67	3	8.67	12/e	7.63	14	7.93	11/e	8.15	10/e	7.92	14
Commitment to exceed project objectives	7.97	12/e	1.55	7.92	13	9.08	6/e	7.98	10	7.13	19	8.04	12	7.94	11/e
Reputation/recognition in industry	7.85	15	1.63	7.17	21	7.83	18/e	8.03	8/e	7.93	11/e	7.65	17	7.94	11/e
Long-term commitment	7.82	16	1.96	8.08	9/e	8.92	9/e	7.53	15	7.53	16	7.73	15	7.87	16
Attitude to workplace relations	7.56	17	2.28	7.75	14	8.25	17	7.18	19	7.87	14/e	7.38	19	7.64	18
Reputation on claims and disputes	7.44	19	1.87	7.42	18	6.62	20/e	7.68	13	7.27	17/e	7.69	16	7.32	19
Organizational culture	7.18	20	2.15	8.08	9/e	7.83	18/e	6.90	20	6.67	21	7.50	18	7.02	20
Percentage agreement ^a	—	100	—	—	61	—	70	—	83	—	78	—	88	9.90	89
Average experience at present organization	10.00	—	—	7.60	—	10.30	—	11.60	—	7.50	—	10.30	—	20.90	—
Average total experience	21.10	—	—	20.10	—	20.30	—	20.80	—	23.30	—	21.60	—	—	—

Note: (1) Figures in parentheses in title row represent number of respondents; (2) compared in terms of average scores on a scale of 1 to 10, 1 being least important and 10 being most important; (3) ALL=whole sample, AC=academia, CS=consultants, CT=contractors, OW=owners, OC=other countries, HK=Hong Kong, SD=standard deviation, and R=relative ranks of factors/items within different groups, as mentioned; and (4) e signifies equal rank, whereas next rank(s) is/are omitted.

^aCompared with the "ALL" sample, that is, 100%.

next section, were found to be consistent, as indicated later in this paper. Therefore, the findings may be considered generalizable, although one response among the 92 was fundamentally incomplete and could not be used in the analysis. In terms of Questions 1 to 6, 73 responses were complete and 18 were partially complete (had not responded to all 6 of the basic questions). In addition to the 73 complete responses, any available full responses to a particular question from the partially complete 18 responses were also used in the analysis. Almost all of the respondents were holding at least a middle-level managerial position during the survey, and at least 65% had working experience in organizations of more than one contracting party (contractor, consultant, owner, academia). The exact number of responses in each group (owners, contractors), their average experience at their present organization, and average total experience are also provided in respective tables and discussed in later sections.

Data obtained from responses to Question 2 have been analyzed by counting the number of respondents who opted for each of the different stages (of team player entries into the projects) and by comparing different groups of respondents (e.g., total sample, Hong Kong sample, academics, consultants, contractors, owners). Data obtained from other questions were analyzed by arithmetically averaging the raw scores of each factor, which was considered the best available method for obtaining a single value. The raw scores were obtained in a range from 1 to 10, 1 being least important or strongly disagree, and 10 being most important or strongly agree. The average scores were ranked and compared among different respondent groups. Factors with the same score were given the same ranks, whereas the next rank(s) is/are omitted. The consistency of responses for a particular factor was assessed in terms of standard deviation (SD), whereas the degree of agreement in rankings between different groups of respondents was compared by percentage agreement (PA), calculated as described in the appendix. The lower the SD, the higher the consistency of responses for a particular factor. In the context of this study, responses to a factor have been considered consistent if the related SD is less than 2. On the other hand, a higher value of PA suggests a higher agreement in rankings among the groups. For the purposes of this study, the degree of agreement was termed highly consistent if PA=90–100, consistent if PA=80–89, satisfactorily consistent if PA=70–79, less consistent if PA=60–69, barely consistent if PA=50–59, and inconsistent if PA is less than 50.

Results and Discussions

Implementing Relational Contracting: Selecting Partners

Tables 1 and 2 summarize the perceptions of the respondents (as elicited by Question 1) on the importance of 22 different factors in selecting various potential project partners for RC. For the purpose of this survey, 9 factors were considered hard/technical, the other 13 factors being soft/relational (as shown in the tables). Table 1 gives the detailed comparison of perceptions of different respondent groups for selecting consultants on these 22 factors. In the interests of conciseness, Table 2 summarizes the comparison of the whole sample with respondents from Hong Kong and other countries only for selecting other team members: contractors, subcontractors, suppliers, and owners. The tables are arranged in de-

scending order of combined ranks (of both hard and soft factors) of the total sample for selecting consultants and contractors, respectively.

As shown in Table 1, technical capability (a hard/technical factor) is seen to be the most important factor (with a score of 9.05) for selecting consultants, followed by two soft/relational factors: approach to joint problem solving (Rank 2), and approach to joint decision making (Rank 3). The two next important factors are hard/technical factors concerning time (Rank 4) and similar work experience (Rank 5). The 6th and 7th most important factors are again soft/relational factors: creativity/innovation and attitude toward teamworking/teambuilding. Thus a mixture of hard and soft factors is perceived to be more important than some other factors for selecting consultants. Interestingly, pricing levels and financial strength (both hard factors) are perceived to be the two least important factors (Ranks 21 and 22). Among the soft/relational factors, reputation on claims and disputes (Rank 19) and organizational culture (Rank 20) are seen to be the two least important factors. Responses to different factors may be considered consistent since the SDs of 16 factors (out of 22) are less than 2.00. Rankings of the groups of contractors, other countries, and Hong Kong are consistent with that of the whole sample in that their PAs are between 80 and 89. However, ranking within the group of academics is less consistent (PA=61), and those of the consultants and owners are satisfactorily consistent (PAs =70–79). Nevertheless, scores of different factors are high enough (scores of 20 factors are over 7), although there are small differences in individual ranks.

Within the academic group, three soft/relational factors are perceived to be the three topmost important factors: approach to joint problem solving (Rank 1), approach to negotiation (Rank 2), and willingness for mutual learning (Rank 3). Three factors have the equal rank of 4, of which two are technical/hard factors: technical capabilities and timely project completion, and one is a soft/relational factor: approach to joint decision making. The 7th most important factor, again a relational factor, is attitude toward teamworking/teambuilding. Thus the emphasis is on soft/relational factors. For selecting themselves, consultants prefer a mixture of hard and soft factors. However, they consider various factors to be of differing importance, compared to the whole sample. Similar to academics, consultants ascribe less importance to their previous experience (Rank 16, compared to Rank 5 in the whole sample) and creativity (Rank 14, compared to Rank 6 in the whole sample). They ascribe more importance to a commitment to exceed project objectives (Rank 6, compared to Rank 12 in whole sample) and to safety issues (Rank 11, compared to Rank 18 in whole sample) instead.

On the other hand, owners lay stress on project management capability (Rank 7, compared to Rank 12 in the whole sample), previous experience (Rank 2, compared to Rank 5 in the whole sample), and creativity (Rank 3, compared to Rank 6 in the whole sample). In addition, they consider approach to joint decision making (Rank 9, compared to Rank 3 in the whole sample), approach to negotiation (Rank 14, compared to Rank 9 in whole sample), and commitment to exceed project objectives (Rank 19, compared to Rank 12 in the whole sample) less important than some other factors for selecting consultants. Nevertheless, the generally high scores of almost all the factors in the whole sample and in all individual groups of respondents convey industry concerns that the consultants should have good capabilities relating to all the factors.

For selecting contractors and within the whole sample (Table 2), respondents recommend only one soft/relational factor among

Table 2. Perceptions of Importance of Different Factors for Selecting Various Team members for Relational Contracting

Factors	Contractor						Subcontractor						Supplier						Owner					
	ALL (80)	R (all)	OC (27)	R (oc)	HK (53)	R (HK)	ALL (77)	R (all)	OC (25)	R (oc)	HK (52)	R (HK)	ALL (79)	R (all)	OC (27)	R (oc)	HK (52)	R (HK)	ALL (80)	R (all)	OC (25)	R (oc)	HK (55)	R (HK)
Hard/technical																								
Timely project completion/delivery	9.18	1	8.15	17	8.38	15	9.01	1	8.76	1	9.13	1	8.82	2	9.07	1	8.69	2	7.65	8	7.04	12	7.93	7
Quality of work/materials	8.93	3	8.26	15	8.70	12	8.78	3	8.56	2	8.88	3	8.95	1	8.67	2	9.10	1	6.63	19	6.00	20	6.91	18
Project management capability	8.91	4	8.81	6/e	9.02	3/e	7.00	20/e	6.60	22	7.19	19	4.95	22	4.52	22	5.17	22	6.89	17	6.36	17	7.13	16
Adequate resources	8.88	5	8.85	5	9.38	1	8.42	4	8.44	4	8.40	5/e	7.23	6	7.52	5	7.08	5	6.83	18	7.32	8	6.60	21
Performance on safety issues	8.81	6	7.70	22	8.28	17	8.83	2	8.52	3	8.98	2	6.52	19	6.33	20	6.62	14/e	7.51	9	6.96	13/e	7.76	9
Technical capabilities	8.79	7	9.00	1	9.09	2	7.83	12	7.76	12	7.87	11	6.90	10	7.15	9	6.77	12	5.28	22	4.92	22	5.44	22
Similar previous work experience	8.58	11	8.41	11/e	8.32	16	8.12	8	7.84	9/e	8.25	8	7.04	8	7.37	7	6.87	9	6.39	21	5.56	21	6.76	19
Financial strength	8.45	13	8.89	3/e	9.00	5	7.49	17	6.88	21	7.79	12	6.82	11	6.81	15	6.83	10	8.80	1	8.16	4	9.09	1
Pricing levels	8.43	14	8.33	13/e	8.75	8/e	8.39	5	7.84	9/e	8.65	4	8.22	3	7.89	3	8.38	3	7.38	11	6.84	15	7.62	10
Soft/relational																								
Approach to joint problem solving	9.05	2	8.89	3/e	8.66	13	8.30	7	8.36	5	8.27	7	6.75	13	7.00	12	6.62	14/e	8.64	3	8.48	3	8.71	2
Approach to negotiation	8.71	8	8.07	18	8.72	11	8.09	9	8.04	7/e	8.12	10	7.27	4	7.67	4	7.06	6	8.66	2	8.76	1	8.62	3
Attitude toward teamworking	8.69	9	8.04	19	8.00	21	8.35	6	8.24	6	8.40	5/e	6.67	14	6.85	13/e	6.58	16	7.78	6	7.76	5	7.78	8
Approach to joint decision making	8.61	10	8.81	6/e	8.83	7	7.55	15	7.72	13	7.46	18	6.27	20	6.59	18	6.10	20	8.51	4	8.68	2	8.44	5
Long-term commitment	8.54	12	8.69	8	8.74	10	7.58	14	7.44	16/e	7.65	15	7.03	9	7.07	10/e	7.00	7	8.23	5	7.64	7	8.49	4
Attitude to continuous improvement	8.31	15	8.96	2	8.87	6	7.86	11	8.04	7/e	7.77	13	7.09	7	7.41	6	6.92	8	7.76	7	7.24	10	8.00	6
Attitude to workplace relations	8.29	16	7.78	20	8.04	20	8.04	10	7.68	14	8.21	9	6.66	15	6.41	19	6.79	11	7.24	14	6.76	16	7.45	11/e
Willingness for mutual learning	8.19	17	8.44	10	8.75	8/e	7.36	19	7.80	11	7.15	20	6.54	17/e	6.74	16	6.44	18/e	7.36	12	7.28	9	7.40	15
Reputation on claims and disputes	8.13	18	8.19	16	8.57	14	7.51	16	7.44	16/e	7.54	17	6.58	16	6.85	13/e	6.44	18/e	7.50	10	7.68	6	7.42	13/e
Reputation and recognition in industry	8.09	19	8.33	13/e	8.06	19	7.47	18	7.04	19	7.67	14	7.25	5	7.26	8	7.25	4	7.05	15	6.16	18	7.45	11/e
Commitment to exceed project objectives	8.01	20	8.41	11/e	8.13	18	7.64	13	7.64	15	7.63	16	6.80	12	7.07	10/e	6.65	13	7.31	13	7.08	11	7.42	13/e
Creativity/innovation	7.93	21	8.48	9	9.02	3/e	6.86	22	6.92	20	6.83	22	6.54	17/e	6.67	17	6.48	17	6.50	20	6.04	19	6.71	20
Organizational culture	7.83	22	7.74	21	7.83	22	7.00	20/e	7.12	18	6.94	21	6.00	21	5.93	21	6.04	21	6.95	16	6.96	13/e	6.95	17
Percentage agreement ^a	—	100	—	40	—	42	—	100	—	81	—	88	—	100	—	88	—	89	—	100	—	78	—	88
Average experience at present organization	9.80	—	9.90	—	9.90	—	10.10	—	10.60	—	9.90	—	9.90	—	10.00	—	9.90	—	10.10	—	10.60	—	9.90	—
Average total experience	20.70	—	21.00	—	20.50	—	21.10	—	20.00	—	20.60	—	21.00	—	21.90	—	20.60	—	20.50	—	22.00	—	19.80	—

Note: (1) Figures in parentheses in title row represent number of respondents; (2) compared in terms of average scores on a scale of 1 to 10, 1 being least important and 10 being most important; (3) ALL=whole sample, OC=other countries, HK=Hong Kong, SD=standard deviation and R=relative ranks of factors/items within different groups, as mentioned; and (4) e signifies equal rank, whereas next rank(s) is/are omitted.

^aCompared with the corresponding "ALL" sample, that is, 100%.

the seven top-ranked factors: approach to joint problem solving (Rank 2). The other six factors are hard/technical factors: time (Rank 1, with a score of 9.18), quality (Rank 3), project management capability (Rank 4), adequate resources (5), safety issues (Rank 6), and technical capabilities (Rank 7). Therefore the preference is clearly for hard/technical factors. Interestingly, respondents chose pricing levels as the least important factor (Rank 14) among hard/technical factors. However, the rankings within all the groups of respondents differ considerably. For example, the ranks of time within groups of Hong Kong and other countries are 17 and 15, respectively (compared to Rank 1 in the whole sample); and that for creativity/innovation are 9 and 3, respectively (compared to Rank 21 in the whole sample). This is also reflected in the PAs, the highest being 52 (within the group of contractors, but not shown here), all others being <50 , indicating inconsistency between the rankings. However, SDs of all 22 factors are less than 2, showing consistency of the responses for each factor. Moreover, the score of the least important factor is 7.83 (out of 10), reflecting the higher importance of all the factors and thus indicating a correspondingly lower importance of PAs of the rankings themselves. Interestingly, the contractors' group assigned higher scores to different factors for selecting themselves than any other groups of respondents, the highest and lowest scores being 9.32 and 7.85, respectively.

Table 2 also shows that respondents in the whole sample seek out comparatively hard/technical factors in selecting subcontractors, with time, safety issues, quality, resources, and price being ranked from 1 through 5, respectively. The least important hard/technical factor is project management capability, with Rank 20 and score 7.00. On the other hand, the most important soft/relational factor is teamworking, with Rank 6 (and score 8.35), followed by joint problem solving. The least important soft/relational factor is creativity/innovation, with score 6.92, which is also the least important factor among all 22 factors used in the survey, and also the only factor with a score of less than 7.00, implying the importance of soft/relational factors for selecting subcontractors along with hard/technical factors. Among different groups of respondents, the academic group is barely consistent with the ranking of the whole sample for their preference of soft/relational factors over hard/technical qualities. For example, the rank of mutual learning is 3 compared to Rank 19 in the whole sample, and the rank of negotiation is 1 compared to Rank 9 in the whole sample. The ranking of the contractors' group is highly consistent, while those for consultants and owners are satisfactorily consistent, and for Hong Kong and other countries are consistent. Despite such differences in rankings between different groups, responses to different factors within the whole sample may be considered consistent since SDs of 18 factors (among 22) are less than 2.

As perceived by the respondents, the top three important factors for selecting suppliers are quality, time, and price, with ranks from 1 through 3, respectively, which are hard/technical factors and the only three factors with scores of more than 8.00. The responses to these three factors are also among the only 5 consistent factors (whose SDs are less than 2). This may imply that less consideration is usually given to any other factors except the above three, and therefore the respondents are not sure how important the other factors are. However, the next two important factors are soft/relational factors: negotiation, with Rank 4, and recognition, with Rank 5, followed by a hard/technical factor (adequate resources, with Rank 6) and then a soft/relational factor (continuous improvement, with Rank 7). Moreover, the ranks of 9 of the 13 soft/relational factors are over 10, and scores of only 9

factors (among the 22) are over 7.00, with the lowest score being 4.95 (near to the mean of the measuring scale). This may be interpreted to imply that the major thrust for selecting suppliers is on hard/technical factors, and in particular on quality, time, and price, with comparatively less importance given to most of the soft/relational factors. However, inconsistencies in responses for these latter factors imply differing perceptions of the respondents. Nevertheless, the ranking of the academic group is barely consistent (PA=55), that of consultants is less consistent (PA=64), and those of contractors, owners, Hong Kong, and other countries are consistent (PAs=81–89).

Respondents consider financial strength (a hard/technical factor) the most important factor that owners should possess, followed by 6 soft/relational factors: negotiation, joint problem solving, joint decision making, long-term commitment, teamworking, and continuous improvement, ranking from 2 through 7. This may mean that apart from financial strength, the industry has a high expectation from the owners about the soft/relational factors. This is important in that owners are the biggest stakeholders of any project and effectively control the project organization, contract content, and selection of different other project team members, and therefore, any initiative from them is expected to influence the others. However, owners themselves, though they consider financial strength their most important factor, also think (unlike others) that they should have good project management capability (Rank 3, compared to Rank 17 in the whole sample). Among others, they also consider mutual learning (Rank 19, compared to Rank 12 in the whole sample), safety issues (Rank 18, compared to Rank 9 in the whole sample), and teamworking (Rank 12, compared to Rank 6 in the whole sample) less important than some other factors.

On the other hand, academics think that financial strength is comparatively less important for owners (Rank 10, compared to Rank 1 in the whole sample), instead putting more emphasis on owners having adequate resources (Rank 3, compared to Rank 18 in the whole sample). These divergences resulted in rankings of the owners and academics groups being less consistent (PAs are 60 to 69), while those for consultants and other countries being satisfactorily consistent (PAs are 70 to 79), and contractors and Hong Kong groups are consistent (PAs are 80 to 89). Responses for different factors in the whole sample may be considered inconsistent, as SDs of only 5 factors are less than 2. This may mean not only that different contracting parties have diverse expectancies from owners, but also that some parties do not seriously consider the caliber and capacities of owners when seeking a contract, which might encourage owners toward more dominant behavior, apparently reinforcing their perceived rights to control other parties (as project initiators and funders). Moreover, such mind sets and behavior may suppress potential innovations and lower overall productivity. It is therefore important that owners learn more about the process in general and appreciate the benefits of RC in particular. Preferences for the more relational factors by other parties convey (1) their readiness to accept and practice RC approaches in a more collaborative and teamworking environment, and (2) their expectations that owners should treat them as members of a common team instead of merely controlling them and enforcing contractual obligations.

Implementing Relational Contracting: Mobilizing Partners

Table 3 summarizes the perceptions of when different project partners (consultants, contractors, subcontractors, and suppliers)

Table 3. Perceptions of When Various Team members Should Be Brought into Project

Stages/options	Consultant			Contractor			Subcontractor			Supplier		
	ALL (88)	OC (27)	HK (61)	ALL (87)	OC (27)	HK (60)	ALL (79)	OC (25)	HK (54)	ALL (81)	OC (26)	HK (55)
Inception of project	73	24	49	21	9	12	4	3	1	4	3	1
During preliminary/early stage of design	13	3	10	38	11	27	17	5	12	14	4	10
Toward end of design	1	—	1	14	5	9	20	8	12	24	8	16
After design but before tendering	1	—	1	11	2	9	11	4	7	10	3	7
During tendering but before submission of bid	—	—	—	2	—	2	15	3	12	14	6	8
After awarding contract	—	—	—	1	—	1	10	2	8	8	2	6
No need to consider	—	—	—	—	—	—	2	—	2	7	—	7
Average experience at present organization (years)	9.9	9.9	9.8	9.7	9.9	9.6	9.8	10.1	9.7	9.2	9.8	9.0
Average total experience (years)	20.5	21.0	20.3	20.5	21.0	20.3	20.9	21.6	20.6	20.8	22.0	20.2

Note: (1) Figures in parentheses in title row represent number of respondents in corresponding groups; (2) compared in terms of number of respondents; and (3) ALL=whole sample, OC=other countries, and HK=Hong Kong.

should be brought in at what stage of an RC approach in order to facilitate JRM, as asked in Question 2 of the survey questionnaire. As seen in industry practice, all the respondents prefer to bring in consultants before the contract award. In particular, 73 (83.0%) and 13 (14.8%) respondents, among a total of 88, recommend bringing in consultants at the inception and preliminary design stages, respectively. This may reinforce the existing notion that consultants are an indispensable party to any contract and that they need to participate from an early stage of an RC-based approach. Moreover, despite small differences between respondents from Hong Kong and other countries about the stage of mobilization, only one respondent from Hong Kong (who is an owner) does not consider bringing in contractors before the contract award. Furthermore, most of the respondents (21+38=59 out of 87=67.8%) in the whole sample recommend bringing in contractors either at inception or at the early design stage.

However, respondents from other countries seem more enthusiastic on this matter than Hong Kong respondents, as 74.1% (9+11=20 out of 27) of them consider bringing in contractors at the early two stages of the project, in comparison to 65% (12+27=39 out of 60) of Hong Kong respondents. Optimistic responses from different groups of respondents may reflect their appreciation of inputs from contractors to enhance project delivery. For example, early inputs from the practical experiences of contractors may improve the design considerably in terms of constructibility and construction methods and assist in economies, faster completion, and consistent quality. Owners, however, seem less enlightened than others. This may be due to their (1) concerns that contractors may then have too big a share in the project, (2) reliance on tried and tested ways, (3) lack of sufficient knowledge and beliefs about such approaches, and (4) perception that not every project is suitable for bringing in contractors at very early stages. These in turn reemphasize the needs for educating owners on such relational approaches, particularly for their project-specific uses, for example, in the form of alliancing, guaranteed maximum price, or postcontract partnering.

Table 3 also shows that only 12 (10+2) or 15.2% of 79 respondents do not recommend bringing in subcontractors before the contract award. This may be considered indicative of a para-

digm shift of the industry worldwide toward extending RC-oriented approaches down the supply chain, which can in turn facilitate JRM. Further analysis shows that only 1 (out of 13) academic respondents, 1 (out of 11) consultant respondents, 7 (out of 38) contractor respondents, and 3 (out of 17) owner respondents do not consider it useful to mobilize subcontractors before the contract award. However, 10 (18.5% in the Hong Kong group) among these 12 respondents are from Hong Kong, which may indicate that local respondents are comparatively less receptive toward such approaches than those in other countries. This may also reflect the fact that related calls (e.g., for greater integration) from a national construction industry report were more recent in Hong Kong than in some other countries. This may also suggest the need for a stronger change initiative and a more proactive and pioneering role of the owners so that they may motivate their slower project partners toward RC-based approaches in order not to lose the momentum of a newly emerging industry's enthusiasm. The government seems in a better position to lead such initiatives, not only as the policy maker but also as the single largest construction owner, and also because of its effective control over the entire public sector decision-making machinery.

In the case of the suppliers, only (8+7=) 15 respondents (18.5% of 81) do not prefer bringing them into the project team before the contract award. Further analysis shows that 29 out of 38 (76.3%) of contractor respondents (having direct contractual relations) consider bringing the suppliers into the project team before the contract award. In addition, 17 among 20 (85%) owner respondents consider bringing the suppliers into the project team before the contract award! This may be considered highly relevant and important in the sense that suppliers are frequently seen to be overlooked in teambuilding exercises; although owners do not have direct contractual relations with suppliers, they do effectively control the project organization. However, as is the case with subcontractors, Hong Kong respondents seem less welcoming in this respect than those from other countries, since 13 of the 15 respondents who do not recommend bringing the suppliers into the project team before the contract award. This may reflect the

greater care taken by the local industry in mobilizing suppliers from an international construction industry (Marriott 2000) of diversified cultural origins.

Implementing Relational Contracting: Formulating the Strategy

Table 4 compares perceptions of the importance of 25 different factors among different groups of respondents for building a successful relational contract. The table shows that trust and business ethics-related factors are perceived to be more important than some other factors for building a relational contract, with mutual trust topping the list. Open communication and understanding each other's objectives are the second and third most important factors, followed by equitable and clear allocation of foreseeable and quantifiable risks (Rank 4). The attitude of the project participants (Rank 5), readiness to compromise on unclear issues (Rank 6), and awareness of risks and rewards (Rank 7) are the next three most important factors. The table also shows that developing a partnering culture within the organization (Rank 14) is more important than the possibility of future work (Rank 17), partnering workshop (Rank 19), and partnering experience (Rank 20). Legal implications (Rank 22) and cost of implementing partnering (Rank 23) are not considered any major barrier to building a relational contract. In addition, the traditional hierarchical relation between owner, contractor, and subcontractor (Rank 25) is seen as the least conducive factor for such approaches.

Responses on the various factors may be considered consistent as SDs of 18 factors (out of 25) are less than 2. This consistency of average results from respondents originating from different countries and diverse contracting parties indicates the globally perceived need for RC approaches. Although the rankings of various individual factors within respondent groups differ slightly, rankings of academics', consultants', and owners' groups are consistent (PAs=80 to 89), and those for contractors, Hong Kong, and other countries are highly consistent (PAs=90 to 100). All these pointers hopefully may indicate that the construction industries, including that of Hong Kong, have now entered the first phase of the long-awaited paradigmatic cultural shift, which can eventually culminate in the effective joint management of unforeseen risks (JRM) during project execution. Efforts of all related parties may then be mobilized more efficiently under flexible contract conditions, as and when unforeseen events unfold. It is therefore envisaged that appropriate change initiative(s) will soon be designed to translate this apparent industry enthusiasm and emergent motivation toward a more cooperative and productive industry.

Implementing Joint Risk Management

Table 5 presents the perceptions of different groups of respondents on various options for managing different unforeseen risks, as elicited by Questions 4, 5, and 6 of the survey questionnaire, respectively. The table shows that the respondents consider JRM the best solution for managing all categories of unforeseen risks, and with a higher consistency of responses, as SDs for JRM options are the lowest and below 2.00. In particular, the score for JRM is 8.43 for managing risks that are not foreseeable and quantifiable at the planning stage. The least recommended option, with a score of 5.71, is to blindly allocate those risks to contractors upon their occurrence. This score, being closer to (although higher than) the average of the measuring scale (5.50), may mean that respondents do not consider blindly allocating risks a good

solution, but might foresee situations where parties need to use this strategy. The second best option (with a score of 7.79) is to provide for contingencies in the contract and allocate unforeseeable and unquantifiable risks to the party best able to handle them when such risks occur. This sequence of recommendation is seen in all the groups of respondents except the consultants, who slightly prefer allocating such risks to the party best able to handle them to the JRM option.

For the management of foreseeable and quantifiable risks that need joint effort, respondents from the whole sample, as well as other groups, seem almost to reject the option of assigning such risks to other parties contractually. The highest score for this option is 3.89 (as derived from owners and other countries), and the responses are not consistent ($SD > 2.00$). The score for opportunism (assuming the risks for more profit and at the expense of other parties) is less than the average (of the measuring scale), implying that respondents do not consider this a healthy option. However, the higher SD ($=2.25$) of the whole sample suggests inconsistency of responses; that is to say, some of the respondents favor opportunism more than some other respondents. The recommendation for JRM is seen to be consistent and a far better option than other choices. For managing risks that unforeseeably change in nature during project execution, the JRM is seen as the only consistent option, and the best choice as well. The scores of the other two options in the whole sample and all other groups (except owners) are near the average of the measuring scale (5.5). This may mean that respondents do not recommend these options strongly, but they are also useful, depending on the situation. However, owners seem to favor the contractual adjustment mechanism for managing those risks over reallocation at their occurrence.

The higher scores for JRM in managing all three categories of unforeseen risks used in the survey indicate a strong support for it, implying JRM to be a better way of managing unforeseen risks. This may arise from a realization that no party can really make extra profits (in the long term) by shifting risks or costs to another party, and that such shifting is not a healthy practice for the industry. This is also very important since JRM at the postcontract stage needs nonadversarial relations and collaborative working arrangements among the contracting parties where all parties should do what they are supposed to do and should get/pay what they are supposed to get/pay in order to deliver a quality product on time and within the budget appropriations and to improve overall productivity levels and build a healthier construction industry that can sustain and improve such productivity levels and overall performance.

Analysis of Results

The survey presented in this paper investigated the best ways of forming a coalesced team (comprising consultant, contractor, subcontractor, supplier, and owner) for JRM, that is, dynamic management of risks at the postcontract stage based on RC principles. These approaches include (1) evaluating the importance of different criteria for selecting different parties, (2) selecting appropriate stages of projects for mobilizing different parties, (3) measuring the importance of different factors for building a successful relational contract, and (4) assessing different risk management options for managing various unforeseen risks. The study allowed some general trends toward adoption of RC principles in the industry and the positive attitudes of industry participants toward such approaches. These include the following:

Table 4. Importance of Various Factors for Developing Successful Relational Contract for Implementing Joint Risk Management

Items/factors	ALL (87)	R (all)	SD (all)	AC (13)	R (ac)	CS (12)	R (cs)	CT (43)	R (ct)	OW (19)	R (ow)	OC (28)	R (oc)	HK (59)	R (HK)
Mutual trust	9.10	1	1.25	8.77	3	9.50	2e	9.28	1	8.68	2	9.07	2	9.12	1
Open communication among parties	8.85	2	1.29	8.85	1e	9.50	2e	8.84	2	8.47	3	9.36	1	8.61	4
Understanding each other's objectives	8.76	3	1.32	8.85	1e	9.25	4	8.77	3	8.37	4	8.93	3	8.68	3
Equitable and clear allocation of foreseeable and quantifiable risks	8.69	4	1.58	8.38	5	8.67	9	8.70	4e	8.89	1	8.54	5	8.76	2
Attitude of project participants	8.57	5	1.50	8.54	4	9.58	1	8.70	4e	7.68	6	8.57	4	8.58	5
Readiness to compromise on unclear issues	8.28	6	1.26	8.31	6	8.25	11	8.42	6	7.95	5	8.43	6	8.20	7
Awareness of risks and rewards	8.24	7	1.35	8.08	7	9.08	5	8.33	7	7.63	7	8.18	7e	8.27	6
Effective coordination	7.94	8	1.54	7.92	8	8.50	10	8.02	11	7.42	8	8.18	7e	7.83	8e
Collective responsibility instead of personal responsibility	7.87	9	1.72	7.46	14	8.00	13	8.26	8	7.21	9	7.96	9	7.83	8e
Alignment of objectives	7.83	10	1.86	7.62	12	9.00	6	8.07	9e	6.68	13	7.89	11e	7.80	10
Professional ethics	7.79	11	1.84	7.69	11	8.08	12	8.07	9e	7.05	11	7.93	10	7.73	12
Agreed process for dispute resolution	7.69	12	1.72	7.85	9	8.92	7	7.53	14	7.16	10	7.57	13	7.75	11
Frequent formal and informal meetings	7.55	13	1.55	7.15	16e	7.92	14	7.88	12	6.84	12	7.89	11e	7.39	13
Developing partnering culture first within organization	7.28	14	1.87	7.23	15	7.33	18e	7.58	13	6.58	15	7.21	15	7.31	14
Agreed mechanism for performance appraisal	7.20	15	1.82	7.54	13	8.75	8	7.02	17	6.37	17e	7.54	14	7.03	16
Compatible organizational cultures	6.94	16	1.91	7.77	10	7.75	15e	6.95	18	5.84	21e	7.14	16	6.85	19
Pioneering role of owner/client	6.91	17e	2.08	6.23	22	7.75	15e	7.21	16	6.16	19e	6.50	21	7.10	15
Possibility of future work	6.91	17e	2.03	7.15	16e	7.17	20	7.28	15	5.74	23	7.00	17	6.86	18
Partnering workshop	6.77	19	1.86	6.31	21	7.75	15e	6.81	19	6.37	17e	6.54	20	6.88	17
Partnering experience	6.75	20	1.86	6.77	19	7.33	18e	6.63	20	6.63	14	6.93	18	6.66	20
Role of partnering facilitator	6.52	21	2.00	6.92	18	6.67	22	6.51	21	6.16	19e	6.32	22	6.61	21
Legal implications	6.29	22	2.02	6.54	20	6.75	21	6.00	22	6.47	16	6.89	19	6.00	22
Cost of implementing partnering	5.69	23	2.25	6.08	23	6.42	23	5.30	24	5.84	21e	6.04	23	5.53	23
Jointly organized social/cultural activities (e.g., karaoke, sports)	5.17	24	2.25	5.54	24	6.08	24	5.60	23	3.37	25	4.96	24	5.27	24
Traditional owner, contractor, subcontractor hierarchy	4.05	25	2.20	2.92	25	3.75	25	4.44	25	4.11	24	3.21	25	4.44	25
Percentage agreement ^a	—	—	—	—	86	—	81	—	93	—	84	—	93	—	94
Average experience at present organization (years)	10.00	—	—	7.10	—	10.30	—	11.80	—	7.50	—	9.60	—	10.10	—
Average total experience (years)	20.60	—	—	18.80	—	20.30	—	21.30	—	20.30	—	21.30	—	20.20	—

Note: (1) Figures in parentheses in title row represent number of respondents in corresponding groups; (2) compared in terms of average scores on a scale of 1 to 10, 1 being least important and 10 being most important; (3) ALL=whole sample, AC=academia, CS=consultants, CT=contractors, OW=owners, OC=other countries, HK=Hong Kong, SD=standard deviation, and relative ranks of factors/items within different groups, as mentioned; and (4) e signifies equal rank, whereas next rank(s) is/are omitted.

^aCompard with "all" sample.

Table 5. Perceptions of Various Options for Managing Different Unforeseen Risks

Options	ALL	SD	AC	CS	CT	OW	OC	HK
How to deal with risks that are not foreseeable and quantifiable at planning stage								
Number of respondents	87	—	13	12	43	19	28	59
Provide contingency in contract and assign to contractor when they materialize	5.71	2.47	4.62	3.83	6.42	6.05	5.25	5.93
Provide contingency in contract and assign to party best able to handle when they occur	7.79	1.82	7.69	8.67	7.63	7.68	7.79	7.80
Risk sharing or JRM if needed	8.43	1.82	9.31	8.17	8.40	8.05	8.14	8.56
Average experience at present organization (years)	10.00	—	7.10	10.30	11.80	7.50	9.60	10.10
Average total experience (years)	20.60	—	18.80	20.30	21.30	20.30	21.30	20.20
How to deal with risks that are foreseeable and quantifiable but need joint efforts								
Number of respondents	87	—	13	12	43	19	28	59
No need to take any burden; assign it to other party(ies) by contract	3.45	2.38	2.69	2.50	3.74	3.89	3.89	3.24
If given opportunity, assume risk; reluctance of other party will help to profit more (i.e., opportunism)	4.60	2.25	4.23	3.42	5.16	4.32	4.86	4.47
Risk sharing or JRM as needed	8.69	1.39	9.23	8.50	8.810	8.16	8.43	8.81
Average experience at present organization (years)	10.00	—	7.10	10.30	11.80	7.50	9.60	10.10
Average total experience (years)	20.60	—	18.80	20.30	21.30	20.30	21.30	20.20
How to deal with risks that unforeseeably change in nature during project progress								
Number of respondents	86	—	13	12	43	18	28	58
Adjust and/or extend contract provision (e.g., variation order)	6.43	2.52	5.15	6.17	6.49	7.90	6.14	6.57
Reallocation of risks at their occurrence if needed	6.56	2.25	5.85	6.83	6.84	6.22	6.29	6.69
Risk sharing or JRM if needed	8.21	1.88	8.00	8.08	8.26	8.33	7.86	8.38
Average experience at present organization (years)	10.00	—	7.10	10.30	11.80	7.40	9.60	10.10
Average total experience (years)	20.50	—	18.80	20.30	21.30	20.20	21.30	20.20

Note: (1) Compared in terms of average scores on a scale of 1 to 10, 1 being least important and 10 being most important; and (2) ALL=whole sample, SD=standard deviation (relates to "ALL" sample), AC=academia, CS=consultants, CT=contractors, OW=owners, OC=other countries, HK=Hong Kong, and JRM=joint risk management.

- Consultants should have a mixture of both hard/technical and soft/relational factors to select among for an RC approach, with less importance placed on price. However, academics and consultants placed somewhat more emphasis on the relational qualities required from consultants, whereas owners were seen to slightly favor the harder qualities.
- To be selected for the team, respondents recommend that contractors must have very high capabilities in terms of all the factors identified in the survey.
- For selecting subcontractors, although respondents generally prefer hard to soft qualities, they also lay greater importance on soft qualities. However, academics seem to slightly prefer soft to hard qualities.
- Respondents consistently recommend three hard factors—quality, time, and price—for selecting suppliers, and ascribe comparatively less importance to most of the soft factors. However, academics seem to prefer relational to hard qualities, whereas consultants prefer hard to relational qualities when selecting suppliers. Responses to most of the factors are more diverse than those for some other project partners, implying less confidence in using some unknown factors for selecting suppliers.
- Though financial strength is seen to be the most important factor for owners, respondents also recommend good relational qualities for building RC. However, the owners group itself prefers some hard to relational qualities for themselves, and academics consider adequate resources the most important factor for them. Responses to different factors are more di-

- verse than those for some other project partners, indicating less consideration being given by other contracting parties to any specific quality of owners when seeking a contract.
- On the whole (for selecting all team members in general), academics are seen to clearly favor more relational qualities, but owners and consultants are seen to slightly favor hard qualities while still placing quite high importance on relational qualities.
- Both consultants and contractors should be appointed before the construction contract award, and mostly at earlier stages of the project. However, responses from other countries are seen to be slightly more enthusiastic than Hong Kong in mobilizing contractors at earlier stages.
- Both subcontractors and suppliers should be mobilized before the contract award, according to most of the respondents, depending on the nature of the projects. However, Hong Kong respondents seem less ready for this than those from other countries.
- Trust and business ethics-related factors, with mutual trust on the top of the list, are seen to be more conducive factors for building a relational contract. Moreover, attitudes of project participants are seen as far more important than legal implications, whereas collective responsibility is very important. In addition, the traditional contractual hierarchy is perceived as the least conducive factor for building a successful relational contract.
- Respondents consistently recommend JRM as the best option for managing unforeseen risks.

- For managing risks that are unforeseen and unquantifiable at the planning stage, JRM is the slightly favored option over providing contingencies in contracts and allocating the risks on their occurrence to the party best able to handle them. However, consultants are seen to slightly favor allocating these risks to the party best able to handle them, rather than the JRM option. Furthermore, respondents neither support nor reject the option of blindly allocating these risks to contractors upon their occurrence.
- For the management of risks that are foreseeable and quantifiable but need joint effort, respondents consider JRM a far better option than others and almost reject the option of contractually assigning the risks to other parties. Moreover, respondents do not consider opportunism (assuming the risks for more profit and at the expense of other parties) a good option for managing such risks.
- Respondents strongly recommend JRM for managing risks that unforeseeably change in nature during a project's progress. They also recommend (albeit not strongly) the options of adjustment/extension of contract provisions and reallocation of risks at their occurrence, if needed.
- On the whole, the survey results may be taken as indicative of recent developments in the construction industries, including that of Hong Kong, which are in the process of being transformed through a paradigmatic cultural shift toward JRM for the more effective joint management of unforeseen risks during project execution.
- Although most of the responses to the survey were from Hong Kong, they were mostly consistent with the responses from other countries, as indicated in the previous section, as well as with the recent international literature. Therefore, the survey results may be taken to be generalizable.

Conclusions and Recommendations

It is apparent from the results that owners' concerns in selecting other team members have gravitated toward hard/technical factors. However, owners have also shown their interest in nontraditional delivery methods by recognizing those soft/relational factors that are recognizable from their high scores. Moreover, along with other respondents, owners have indicated their emerging interest in RC-based approaches by choosing earlier mobilization of different project partners. This clearly shows owners' realization that a price-only-based selection strategy is not conducive to project delivery. It is therefore expected that owners will increasingly select other team members by using more relational factors and bringing them into earlier stages of projects. What is expected from contractors is seen to be higher than from other project partners, which contractors themselves have also acknowledged by giving higher scores (to various factors) in selecting themselves compared to other groups of respondents. This demonstrates the realization and willingness of contractors to undertake greater responsibility. However, such increased responsibilities have to be entrusted to the contractors by the owners and any such initiative must come from the owners as they effectively control the project organization, team selection, and contract conditions. The overall enthusiasm of the industry toward RC, as evidenced in this study, can therefore only be translated into meaningful action and desired results through well-coordinated initiatives by owners.

The above imperatives require owners to develop a sound understanding of the process and overcome any shortfalls by con-

tinuous learning, even from other project partners. Depending on the nature and requirements of different projects, such enlightened owners may carefully choose effective selection criteria, also assigning appropriate weight according to project priorities and bringing in the selected project partners at earlier stages. This will give the team members greater opportunities to interact meaningfully and get to know each other, which in turn is expected to create trust, a sense of joint responsibility, and better scope for teambuilding, and more important, to work under flexible contract conditions. This will also give more opportunities for learning by team members who would ideally form mutual learning alliances (Love et al. 2002). On the other hand, inputs from experiential knowledge of different team members on constructibility, construction methods, availability of materials, and options for using alternative materials will improve the design and planning, which in turn will speed up material supplies, smooth construction, shorten project time, minimize wastage, reduce reworking, and enhance quality. These factors are all expected to reduce cost and improve productivity.

The strong support for JRM, as evidenced in this study, indicates that efforts of all related parties may be mobilized more efficiently under flexible contract conditions, as and when unforeseen events eventualize. However, respondents have also recommended adjustments and/or extensions of contract provisions for managing unforeseen events. This suggests joint and dynamic identification of all risks, dynamic assessment of their implications, and formulation of risk management/mitigation measures by the team using the best available opportunities at the time, which may further require adjustment and/or extension of the flexible contract provisions. Apart from mutual trust, this approach requires unconditional loyalty of the team to the project, and also the integrity of all parties concerned. The detailed formulation and validation of a viable JRM model were recently carried out using a Delphi-type survey that elicited generalizable areas of common perception. This will be reinforced by a case study of a relevant railway modification and extension project that commenced recently. The observations emerging from this ongoing case study support the propositions made and strategies suggested in this paper. After its completion this case study will be reported in detail in a follow-up publication.

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Appendix. Percentage Agreement

Okpala and Aniekwu (1988) used a rank agreement factor (RAF) to evaluate the agreement in ranking between different groups of project participants. A RAF of zero indicates perfect agreement between the two groups, whereas a higher value of RAF gives a lesser agreement. The percentage disagreement and percentage agreement could also be obtained from the RAFs.

For any two groups, let the rank of the i th items in Group 1 be

R_{i1} and in Group 2 be R_{i2} ; let N be the number of items; and $j = N - i + 1$. The rank agreement factor is then defined as

$$RAF = \frac{\left(\sum_{i=1}^N |R_{i1} - R_{i2}| \right)}{N}$$

with a maximum

$$RAF = RAF_{\max} = \frac{\left(\sum_{i=1}^N |R_{i1} - R_{j2}| \right)}{N}$$

The percentage disagreement is defined as

$$PD = \frac{\sum_{i=1}^N (|R_{i1} - R_{i2}|)}{N} \times 100$$

The percentage agreement is then given as $PA = 100 - PD$.

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