

Relational Contracting and Teambuilding: Assessing Potential Contractual and Noncontractual Incentives

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Abstract: Integration in construction projects implies alignment of both structural arrangements and operational mechanisms, in order to effectively coordinate and streamline the combined efforts of various interacting parties, for improved project outcomes. Appropriate use of relational contracting (RC) principles may help achieve such integration. As such, the aims of the reported study are to examine the relative usefulness of various potential strategies and factors, to provide suitable contractual and noncontractual incentives, for building a RC culture, and nurturing effective teamwork in construction. Results from statistical analyses of 83 questionnaire responses from Hong Kong are presented. These results attribute various degrees of importance to different factors and strategies, both for RC and teamworking. The outcomes also suggest the need for a highly interactive and consolidated approach, both for propagating RC and building integrated project teams. It is observed that trust and trust based operational and contractual arrangements can effectively provide the required incentives, for implementing various RC-based working arrangements in construction. These should extend to assessing “relational” attributes during team selection, under client initiative and top management support. Outcomes of this study are expected to benefit both industry practitioners and researchers, in exploring, designing, and implementing suitable RC-based working arrangements.

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Introduction

The vision of the Construction Industry Review Committee (CIRC) report in Hong Kong targets an integrated construction industry that is capable of continuous improvement towards excellence in a market-driven environment (CIRC 2001). As in many other reports, the objective is to achieve appropriate value and improve overall performance in construction, through developing a new relationship based culture. In order to achieve the best project outcomes, the report (i.e., CIRC 2001) recommends an integrated approach of teamworking and wider adoption of partnering, where the interests, needs, expectations, constraints, and risks of every stakeholder must be given fair consideration. Clearly, traditional contracting systems are inappropriate for such integration, since those are static in nature (Eisenberg 2000), and are based on segregating the roles and tasks of project stakeholders (Macneil 1974). Moreover, they neither support nor envisage contractual incentives and/or flexibilities that are now considered essential in inherently dynamic construction scenarios, especially in the face of uncertainty and complexity (Rahman and Kumaraswamy 2002a).

Given the dynamic nature of construction projects, the dy-

namic relational contracting (RC) principles (Eisenberg 2000) may be mobilized to develop contractual incentives/flexibilities, improve relationships among contracting parties, and smoothen any transactional difficulties. RC is based on a recognition of mutual benefits and win-win scenarios through more cooperative relationships between contracting parties. RC theorizes that collaborative working arrangements occur in “mutual reciprocity” and therefore takes into consideration the interests, needs, expectations, and constraints of contracting parties (Macneil 1974). RC allows mutual future planning and considers contracts to be relationships among the parties, in the process of projecting exchange into the future. RC underpins various approaches, such as partnering, alliancing, joint venturing, long-term contracting, and other collaborative working arrangements and better risk sharing mechanisms (Rahman and Kumaraswamy 2004a).

Previous research has identified RC as an appropriate way forward to provide the necessary flexibility in smoothening contractual relationships and overcoming transactional barriers to teambuilding (Rahman and Kumaraswamy 2002a). Based on wider international industry perceptions, Rahman and Kumaraswamy (2004a,b, 2005a) documented that RC is better than traditional contracting methods, and demonstrated how RC can be implemented. Other researchers have widely documented the practice of and benefits from RC approaches (e.g., project partnering) for example, in Hong Kong (Bayliss et al. 2004), United Kingdom (Black et al. 2000), and the United States (Larson 1995; Thompson and Sanders 1998; Crane et al. 1997; Glagola and Sheedy 2002). Yet, construction firms appear to be hesitant in adopting RC, probably because of the perceived uncertainties, e.g., in possibly unclear responsibility allocations, and the potential for collusion, when operating under noncontractual collaborative efforts. For example, a sample of contractors in Canada were found to add a staggering 8–20% extra costs to their bids, in order to cover their perceptions of high risk related to the five most

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common exculpatory clauses in current contracts (Zaghoul and Hartman 2003). However, it was also found that contractors and clients were ready to change to a different mechanism for risk allocation based on a “trust relationship” depending on whether the parties have cooperated before, and whether each has a good reputation and the knowledge to manage risk. The emphasis is on appropriate trust-based contractual arrangements.

The above is in agreement with the calls to include trust and trust-based factors and strategies (i.e., elements of RC) in construction contracts (PSIB 2004); and also to develop a new form of contract, in order to accommodate RC-based collaborative approaches (CIRC 2001). Hence, the purpose of this paper is to identify and assess various contractual and noncontractual incentives, taking Hong Kong as an example “test bed” in terms of RC and integrated teamworking. In this respect, contractual incentives may include clear and equitable risk allocation in contract documents, whereas noncontractual incentives may include a change in the attitude for such equitable risk allocation. The target is to build a general guideline for propagating the practice of RC and teambuilding in multiparticipant construction projects, targeting relational integration in various professional, organizational, operational, and regional/national cultures. Such an exercise is expected to benefit industry practitioners and organizations, including clients, both in Hong Kong and elsewhere, in crafting appropriate RC-based procurement arrangements, devising suitable contract conditions, incorporating trusts and trust-based operational strategies, and exercising project specific RC-based collaborative approaches. This paper is also expected to benefit researchers in documenting and comparing the various RC-based factors and strategies, providing relevant empirical evidence, adding to the growing body of knowledge, and laying the basis for further explorations.

Methodology

Questionnaire Survey

The questionnaire was developed on the basis of a recent study on “revitalized procurement strategies” that included an extensive literature review: (1) both on: “contract theory”—in the context of mainstream “socioeconomic” (i.e., transaction cost economics) and “sociolegal” (i.e., relational contracting—RC) approaches; and practice of various types of contracting approaches in construction, and also (2) Hong Kong based surveys on risk allocation, and collaborative working arrangements, including assessing the potential for implementing RC and various RC-based teambuilding protocols, such as joint risk management (Rahman 2003; Rahman and Kumaraswamy 2002b, 2004b, 2005a,b). The questionnaire survey was conducted in 2003–2004.

Proceeding to the next ‘level’ of practical implementation, the present study specifically attempts to identify appropriate contractual and noncontractual incentives, that would help in promoting RC in construction and for building project-based integrated teams for such RC in practice. As such, the individual items used in the questionnaire were consolidated and refined from the above-mentioned previous studies, and then fine tuned to fit the specific purposes of the present study. These items and strategies are expected to be used (prioritized or avoided) in crafting various contractual incentives, e.g., encouraging and motivating risk-reward plans, for which clients may need to mobilize some non-

contractual incentives, e.g., adequate knowledge and attitude of devising such risk-reward plans, in formulating various RC-based contracts.

The questionnaire included a total of five sections. Section 1 of the questionnaire requested general information of the respondents for mapping the survey sample composition. The subsequent four sections of the questionnaire requested the respondents to express their perceived importance on a scale from 0 to 6 (varying from lowest to highest) on four categories of factors: 24 factors facilitating RC (Category one), 28 factors deterring RC (Category two), 28 factors facilitating the building of integrated project teams (Category three), and 31 factors deterring the building of integrated project teams (Category four). These factors are shown in the corresponding Tables 3–6. As identified by industry reports in many countries, and as documented by Rahman and Kumaraswamy (2004a, b, 2005a), the study reported in this paper assumed that RC is a better option over the traditional contracting methods. However, some of the previously studied factors and/or strategies were included in the present study, either as single items related to traditional contracting methods (e.g., “price only selection methods”—Items b04 and d08, bureaucratic client organization—b27 and d05), or in groups of a number of interrelated items under different strategies (e.g., team selection and teambuilding methodologies, as in Items c11–c20) that reflect contrasts between traditional contracting methods and RC approaches. It was intended to allow further comparison of industry perceptions on the two opposing (i.e., traditional and RC) contracting philosophies. The questionnaire also included introductory notes, explaining the purposes of different sections, as well as the questionnaire “as a whole.” Respondents were also asked to add any suitable factors in each category.

Given the nature of the questionnaire, the length of experience of the potential respondents in the construction industry was considered critical. Academics with research works in collaborative working arrangements (e.g., partnering) were also considered suitable. Therefore, the questionnaire was sent only to the selected cross sections of potential respondent groups of contractors, consultants, clients, and academics. As such a total of 400 questionnaires were distributed. This is an indicative figure only, since potential respondents were requested to circulate the questionnaire to whom they believed competent to respond. Moreover, a single distribution point produced more than one response in several cases. Furthermore, the questionnaire was also posted to the CNBR list for any international feedback. However, such indicative numbers of questionnaires distributed, responses received, and experiences of the respondents are shown in Table 1. A total of 83 usable/complete responses were received from within Hong Kong, with an overall response rate of 20.75%, 19.1 years of average experience in construction, and 4.7 years of average experience in RC approaches that ranges from 0 to 20 years. These would hopefully substantiate the quality of the responses, since they can be taken to be based on substantial experiential knowledge.

Data Analysis

Data were analyzed using the STATISTICAL PACKAGE FOR SOCIAL SCIENCES (SPSS) software. The mean scores of different groups of respondents on individual factors were ranked and compared. Statistical *t*-tests of the mean were undertaken to establish whether each factor is significantly important. One-sample *t*-test with significance level 0.05 was conducted against a test value of 3. It was intended to test the consistency of responses

Table 1. Questionnaire Distribution and Respondent Profile

	Contractor	Consultant	Client	Academics	Unknown ^a	Total
Questionnaire:						
Distribution	200	100	90	10	(CNBR)	400
Usable responses	31	18	32	2	—	83
Response rate (%)	15.5	18.0	35.56	20.0	—	20.75
Total experience (years):						
Persons responded	26	17	28	2	(10)	73
Average experience	18.1	20.9	19.0	18.0	—	19.1
Range of experience	6–33	8–40	8–32	1–35	—	1–40
Experience in RC (years):						
Persons responded	22	13	21	2	(25)	58
Average experience	4.1	4.2	4.9	12.5	—	4.7
0–5 years	15	10	15	1	—	41
6–10 years	6	3	4	—	—	13
Over 10 years	1	—	2	1	—	4
Overall range	0–12	0–10	0–15	5–20	—	0–20
Experience in RC (number of projects):						
Person responded	20	14	18	1	(30)	53
0–5 projects	17	11	12	—	—	40
6–10 projects	3	2	3	1	—	9
Over 10 projects	—	1	3	—	—	4
Overall range	0–10	0–15	1–200	10–10	—	0–200

^aFigures/information in parentheses are not counted towards the total, those are shown for reference purposes only.

for the whole sample, as well as within the population of various groups of respondents. As such the one sample *t*-tests were carried out for the population of whole sample (i.e., $n=83$), and groups of contractors (i.e., $n=31$), consultants (i.e., $n=18$), and clients (i.e., $n=32$). Apart from considering within the whole sample, the responses from the two academic respondents were not analyzed as a specific group. However, the null hypothesis (H_0) was that the factor identified was not important. If $p < 0.05$, the decision was to reject H_0 and accept H_1 . It was then concluded that the population would regard the statement to be significantly important.

In order to find out whether different respondent groups had different perceptions on the relative importance of various factors, *independent samples tests* at 95% confidence level were carried out between the groups of contractors and consultants, contractors and clients, and consultants and clients. Moreover, analysis of variance (ANOVA) was carried out at 95% confidence level to verify whether the three groups of respondents had different perceptions on the relative importance of various factors. The null hypothesis (H_0) was that the corresponding two (in the case of *independent samples tests*) or three (in the case of ANOVA) groups of respondents had the same perceptions toward different factors. If $p < 0.05$, the decision was to accept H_1 and reject H_0 . To accept H_1 for a specific factor is to say that respondents from two/three groups had different perceptions of that factor. Along with the means and ranks of different factors within different groups of respondents for factors facilitating RC, the significance levels obtained from corresponding one sample *t*-tests, independent samples tests, and ANOVA are also shown in Table 2.

Finally, “factor analysis” was carried out to narrow down the long list of factors into a smaller number of representative “broad factors” or “components” (as shown in Table 3 for factors facilitating RC). For the purpose of this exercise, the “principal component” method of extraction was applied, coupled with “Varimax with Kaiser normalization” methods of rotation. “Eigenvalues”

for the extracted components of ≥ 1.0 were considered, and “factor loadings” of < 0.30 were suppressed. This last cutoff decision of displaying the factor loadings of ≥ 0.30 was taken to show the contributions from the significant factor d12: unwilling/unenthusiastic participation of contracting parties (Table 6). Moreover, all the extracted components in all four categories of factors are seen to draw on and relate to “primary” and “secondary” contributions of different factors. In the case of contributions to more than one component, factors with the highest factor loadings were considered as “primary” contributors, while other factors were considered as “secondary” contributors. For the purposes of this paper and except for the factor d12, secondary contributions of ≥ 0.40 have been considered as “considerable.” However, the nomenclature of different components is mainly based on the corresponding primary contributing factors.

In the interest of brevity, Tables 4–6 summarize the results of factor analysis—along with means and ranks of different factors for the total sample only, for: factors deterring RC (Category two), factors facilitating the building of integrated project teams for effective RC (Category three), and factors deterring the building of integrated project teams for effective RC (Category four), respectively.

Survey Results

Factors Facilitating RC: Relative Importance

Table 2 compares the perceptions of respondents on 24 facilitating factors for RC. “Client’s top management support” surfaces as the most important factor for facilitating RC, followed by “top management support of all contracting parties,” “mutual trust,” “open communication,” and “enlightened client.” “Effective coordination,” “teamworking and can do spirit,” and “long-term commitment” possess the ranks of sixth, seventh, and eighth, re-

Table 2. Comparison of Means and Results from *t*-Test, Independent Samples Test, and ANOVA for Factors Facilitating RC

Factor code	Factors	Total			Contractor			Consultant			Client			Sig. ^b			ANOVA
		Mean	Rank	Sig. ^a	Mean	Rank	Sig. ^a	Mean	Rank	Sig. ^a	Mean	Rank	Sig. ^a	CT-CS	CT-CL	CS-CL	
a03	Client's top management support	5.24	1	0.000	5.10	1	0.000	5.28	2	0.000	5.34	1	0.000	0.541	0.350	0.822	0.613
a04	Top management support of all contracting parties	5.20	2	0.000	5.03	2	0.000	5.22	3	0.000	5.31	2	0.000	0.480	0.223	0.745	0.470
a07	Mutual trust among all contracting parties	5.10	3	0.000	4.84	3e	0.000	5.33	1	0.000	5.16	3	0.000	0.134	0.265	0.492	0.240
a06	Open communication among all contracting parties	4.87	4	0.000	4.84	3e	0.000	4.94	5e	0.000	4.88	4e	0.000	0.705	0.887	0.803	0.934
a01	Enlightened and enthusiastic client	4.81	5	0.000	4.68	7	0.000	5.11	4	0.000	4.88	4e	0.000	0.189	0.517	0.489	0.447
a08	Effective coordination among all contracting parties	4.76	6	0.000	4.55	9e	0.000	4.94	5e	0.000	4.84	7	0.000	0.126	0.182	0.663	0.213
a10	Teamworking & can do spirit of all contracting parties	4.69	7	0.000	4.45	15e	0.000	4.72	7	0.000	4.88	4e	0.000	0.449	0.125	0.587	0.298
a11	Long-term commitment to each other: all parties	4.60	8	0.000	4.77	5e	0.000	4.67	8	0.000	4.41	11e	0.000	0.735	0.143	0.370	0.340
a20	Clearly defined risk allocation/sharing arrangements	4.57	9	0.000	4.65	8	0.000	4.44	17e	0.000	4.53	9	0.000	0.550	0.681	0.783	0.816
a02	Knowledgeable client (about project processes)	4.53	10e	0.000	4.77	5e	0.000	4.61	9	0.000	4.38	13e	0.000	0.552	0.100	0.406	0.246
a21	Equitable risk allocation/sharing arrangements	4.53	10e	0.000	4.48	13e	0.000	4.50	12e	0.000	4.59	8	0.000	0.961	0.711	0.788	0.924
a15	Alignment of project objectives of different parties	4.49	12	0.000	4.55	9e	0.000	4.56	10e	0.000	4.41	11e	0.000	0.982	0.609	0.608	0.832
a19	Positive attitude towards continuous improvement	4.47	13	0.000	4.52	12	0.000	4.44	17e	0.000	4.47	10	0.000	0.826	0.861	0.939	0.971
a13	Mutually agreed issue resolution mechanisms	4.46	14	0.000	4.55	9e	0.000	4.56	10e	0.000	4.28	17	0.000	0.983	0.353	0.341	0.555
a22	Flexible/adjustable contracts to address uncertainties	4.43	15	0.000	4.48	13e	0.000	4.50	12e	0.000	4.38	13e	0.000	0.953	0.639	0.660	0.862
a09	Combined responsibility of all contracting parties	4.37	16	0.000	4.45	15e	0.000	4.33	19e	0.000	4.31	15e	0.000	0.700	0.575	0.939	0.839
a24	Inclusion of all key parties in risk-reward plans	4.35	17e	0.000	4.39	19	0.000	4.50	12e	0.000	4.25	18	0.000	0.753	0.665	0.438	0.764
a23	Encouraging and motivating risk-reward plans	4.35	17e	0.000	4.45	15e	0.000	4.50	12e	0.000	4.19	21	0.000	0.873	0.320	0.247	0.457
a12	Adequate resources of all contracting parties	4.34	19e	0.000	4.35	20	0.000	4.50	12e	0.000	4.22	19e	0.000	0.649	0.612	0.381	0.666
a17	Alignment of mutual project & commercial objectives	4.34	19e	0.000	4.42	18	0.000	4.17	21e	0.000	4.31	15e	0.000	0.431	0.690	0.635	0.721
a16	Alignment of commercial objectives of different parties	4.24	21	0.000	4.26	22	0.000	4.17	21e	0.000	4.22	19e	0.000	0.772	0.890	0.873	0.961
a05	Experience in RC approaches (e.g., partnering)	4.10	22e	0.000	4.29	21	0.000	3.83	24	0.003	4.06	22	0.000	0.168	0.428	0.484	0.377
a14	Mutually agreed performance appraisal mechanisms	4.10	22e	0.000	4.16	23	0.000	4.33	19e	0.000	3.91	24	0.000	0.584	0.338	0.148	0.344
a18	Learning environment in project team organization	3.81	24	0.000	3.61	24	0.016	3.89	23	0.002	3.97	23	0.000	0.453	0.240	0.793	0.455

Note: "e" signifies equal rank, whereas the next rank(s) is/are omitted except the lowest rank where the previous rank(s) is/are omitted.

^aSig.=significance obtained from one-sample *t*-test.

^bSig.=significance obtained from Independent sample test.

Table 3. Factor Analysis Results of Factors Facilitating RC

Factor code	Factors	Components				
		1	2	3	4	5
a16	Alignment of commercial objectives of different parties	0.79	0.32	—	—	—
a17	Alignment of mutual project and commercial objectives	0.72	0.36	—	—	—
a24	Inclusion of all key parties in risk-reward plans	0.67	0.44	—	—	—
a23	Encouraging and motivating risk-reward plans	0.63	0.55	—	—	—
a11	Long-term commitment to each other: all parties	0.62	—	—	0.37	—
a18	Learning climate/environment in project team organization	0.50	—	0.49	—	—
a12	Adequate resources of all contracting parties	0.49	—	0.42	0.40	—
a20	Clearly defined risk allocation/sharing arrangements	—	0.86	—	—	—
a21	Equitable risk allocation/sharing arrangements	—	0.85	—	—	—
a15	Alignment of project objectives of different parties	0.35	0.58	—	—	—
a22	Flexible/adjustable contracts to address uncertainties	—	0.54	0.30	—	—
a01	Enlightened and enthusiastic client	—	—	0.69	—	0.41
a19	Positive attitude towards continuous improvement	—	0.35	0.64	0.37	—
a06	Open communication among all contracting parties	—	—	0.62	0.50	—
a02	Knowledgeable client (about project processes)	0.47	—	0.61	—	—
a14	Mutually agreed performance appraisal mechanisms	—	0.46	0.57	—	—
a13	Mutually agreed issue resolution mechanisms	—	0.37	0.53	0.48	—
a07	Mutual trust among all contracting parties	—	—	—	0.75	—
a10	Teamworking & “can do” spirit of all contracting parties	—	—	—	0.70	—
a08	Effective coordination among all contracting parties	—	—	0.35	0.68	—
a09	Combined responsibility of all contracting parties	0.45	—	—	0.49	—
a03	Client’s top management support	—	—	—	—	0.84
a04	Top management support of all contracting parties	—	—	—	0.41	0.64
a05	Experience in RC approaches (e.g., partnering, alliancing)	0.41	—	—	—	0.55
Eigenvalues		3.94	3.66	3.25	3.15	1.81
Percentage of variation explained		16.44	15.27	13.56	13.14	7.53
Cumulative percentage of variation explained		16.44	31.70	45.26	58.40	65.93

Note: Rotation converged in 12 iterations; Kaiser–Meyer–Olkin measure of sampling adequacy 0.785; Bartlett’s test of sphericity: approx. chi-square 1,268.526, df 276, Sig. 0.000.

spectively. “Clearly defined” (Rank 9) and “equitable” (Rank 10) risk allocation is more important than “inclusion of all key parties” in “encouraging and motivating risk-reward plans” (equal rank 17). On the other hand “alignment of project objectives of different parties” (Rank 12) is more important than “alignment of mutual project and commercial objectives” (Rank 19) and “commercial objectives of different parties” (Rank 21). “Experience in RC approaches” and “mutually agreed performance appraisal mechanisms” (equal Rank 22) are less important.

“Learning environment in project team organization” is the least important factor with a score of 3.81, which is higher than the average of the measuring scale (of 0–6 and test value of 3). This implies a general importance of all the factors, with some factors more important than some others. The significance levels obtained from the *t*-test of all the factors are less than 0.05, both within the total sample and individual respondent groups. This shows the consistency of responses, that is to say all the 24 factors are significant for facilitating RC, within the total sample, as well as within the individual respondent groups. The ranks of individual factors within different respondent groups are slightly different. But significance levels obtained from independent sample tests show that each pair of groups of respondents significantly considers the relative importance of all 24 factors in the same way. Moreover, ANOVA results show that three groups of respondents significantly agree on the importance levels of all the 24 factors. Although importance levels of individual factors vary,

the overall result is in agreement with previous studies from Hong Kong (Chan et al. 2004; Rahman and Kumaraswamy 2004b), United Kingdom (Bresnen and Marshall 2000), and the United States (Larson 1995; Thompson and Sanders 1998).

However, the general importance of all 24 factors may imply a gradual or stepwise focus of implementing different factors or strategies, according to their priority of relative importance. For example, the topmost priority of top management support (Ranks 1–2) may mean that initiation of any kind of RC-based approaches has to start from their top management. When parties have the support of their top management, they can then focus on building trust (Rank 3) and formulate trust-based operational arrangements, e.g., open communication (Rank 4). For example, enlightened and enthusiastic clients (Rank 5) may then first acquire appropriate knowledge (equal Rank 10) and then attempt to motivate other parties to trust each other by showing their commitment (Ranks 7–8). Clients can also begin such initiatives by devising an appropriate contract, where clear (a20, Rank 9) and equitable (a21, equal Rank 10) risk allocation/sharing are to be targeted before formulating (a23) and including (a24) all key parties in encouraging and motivating risk-reward plans (equal Rank 17). Such cliental initiatives will motivate parties to align their diverse objectives (a15–a17), to an integrated project objective, and also to devise mutually agreed issue resolution (a13, rank) and performance appraisal (a14, equal Rank 22) mechanisms. Such gradual or stepwise implementation of prioritized factors/

Table 4. Importance and Factor Analysis Outcomes of Factors Deterring RC

Factor code	Factors	Mean	Rank	Components						
				1	2	3	4	5	6	7
b23	Unrelated/separate risk-reward plans for different parties	3.84	25	0.80	—	—	—	—	—	0.32
b21	Exclusion of major subcontractors in risk-reward plan	4.00	22	0.80	—	—	—	—	—	—
b22	Exclusion of major suppliers in risk-reward plan	3.70	28	0.77	0.34	—	—	—	—	—
b20	Exclusion of consultants in risk-reward plan	3.76	26e	0.77	—	—	—	—	0.32	—
b13	Interpersonal/cultural clash (individual level)	4.25	18e	—	0.76	—	—	—	—	—
b14	Incompatible organizational cultures (corporate level)	4.34	13	0.36	0.66	—	—	—	—	—
b15	Inappropriate issue resolution mechanisms	4.25	18e	—	0.61	—	0.37	—	—	—
b19	Lack of confidence among all contracting parties	4.29	16	—	0.60	0.51	—	—	—	—
b16	Separate coordination and monitoring plans	4.01	21	—	0.57	—	—	0.37	0.32	—
b03	Improper/inappropriate risk allocation/sharing	4.58	6	0.38	0.45	—	0.44	0.30	—	—
b07	Lack of commitment: top management of all contracting parties	5.14	1	—	—	0.86	—	—	—	—
b08	Lack of client's initiatives	4.75	4	—	—	0.80	—	—	—	—
b11	Lack of teamworking attitude among all contracting parties	4.80	3	—	0.34	0.64	—	—	—	—
b18	Unwilling/unenthusiastic participation in RC approaches	4.46	9e	—	0.48	0.59	—	—	—	—
b12	Lack of trust/reliability among all contracting parties	4.99	2	0.33	—	0.54	—	0.37	—	—
b27	Bureaucratic client organization	4.45	11	—	—	0.34	0.78	—	—	—
b04	"Price" only' selection methods	4.57	7	—	—	—	0.65	—	—	—
b26	Win-lose environment among contracting parties	4.46	9e	0.37	—	—	0.65	—	—	—
b28	Incompatible public sector rules and regulations	4.30	15	—	—	0.30	0.61	—	—	—
b06	Absence of risk-reward plan	3.90	24	0.44	—	—	0.48	—	—	0.34
b01	Inappropriate project planning	4.33	14	—	—	—	—	0.90	—	—
b05	Ambiguous/unclear contract clauses/documents	4.48	8	—	—	—	—	0.71	—	—
b02	Inappropriate procurement/contract strategy	4.66	5	—	0.36	—	0.32	0.53	—	—
b09	Lack of contractor's capability	4.43	12	—	—	0.34	—	—	0.76	—
b10	Lack/absence of scope for innovations	3.92	23	—	0.30	—	—	—	0.68	—
b17	Lack of experience in RC approaches (e.g., partnering)	3.76	26e	—	0.49	—	0.31	—	0.54	—
b24	Potential legal liabilities (in resolving non-contractual issues)	4.05	20	—	—	—	—	—	—	0.80
b25	Commercial pressures of contracting parties	4.27	17	—	—	—	0.44	—	—	0.62
Eigenvalues		—	—	3.73	3.61	3.59	3.27	2.36	2.08	1.57
Percentage of variation explained		—	—	13.33	12.89	12.83	11.66	8.44	7.43	5.59
Cumulative percentage of variation explained		—	—	13.33	26.22	39.05	50.72	59.16	66.59	72.18

Note: Rotation converged in ten iterations; Kaiser–Meyer–Olkin measure of sampling adequacy 0.850; Bartlett's test of sphericity: approx. chi-square 1,451.460, df 378, Sig. 0.000.

strategies are expected to eventually create a learning environment in the project organization (a18, Rank 24), where all parties can learn from each other, not only to sustain such practice but also to build and propagate a relationally integrated culture in the industry.

Factors Facilitating RC: Factor Analysis

Table 3 shows the outcomes from "factor analysis" for factors facilitating RC. Five components emerged from this exercise and together they explained over 65% of the variations. The percentages of variations explained by different components are over 16, 15, 13, 13, and 7%, respectively. All the components are seen to feed on factors that contribute to more than one component. As such 19 (out of 24, or 79%) factors are seen to contribute to more than one component, and up to three components. Some of the factors are seen to contribute almost equally to more than one component. For example, the factor "learning climate in project team organization" contributes to Components 1 and 2 with factor loadings of 0.50 and 0.49, respectively. This may suggest a con-

solidated but interrelated approach for RC. Moreover, the "secondary" contribution of the factor "encouraging and motivating risk-reward plans" (0.55) is higher than the "primary" contributions of several other factors! This may imply that elements of RC are better invoked for collaboration through mechanisms/strategies that create expectations of (future) gain (Macneil 1974).

Component 1 (*integrated objectives and risk-reward plan*) is seen to be composed of primary contributions of seven factors and secondary contributions of four factors. This component seems to explain that "project objectives" (a15) and "commercial objectives" (a16) of different parties and their individual "project and commercial objectives" (a17) are better aligned when parties have a mutual "long-term commitment." Formulation of mutual objectives provides a deeper understanding of the project's overall goals and the difficulties and possibilities involved in their establishment (Kadefors 2004). More committed parties are also expected to balance the attainment of short-term objectives with long-term goals and achieve both individual and joint missions without raising the fear of opportunistic behavior (Parkhe 1993;

Table 5. Importance and Factor Analysis Outcomes of Factors Facilitating the Building of Integrated Project Teams

Factor code	Factors	Mean	Rank	Components						
				1	2	3	4	5	6	7
c16	Short-listing capable (as in items 11-12) & compatible (as in items 13-15) potential project partners, instead of price only considerations	4.28	11e	0.87	—	—	—	—	—	—
c19	Selecting the best possible “capable and compatible” project team from among potential partners (of item 16)	4.43	7e	0.73	—	—	—	—	—	—
c17	Disclosing project information to potential partners (as in item 16) at early stages of project for any optional feedback, as appropriate	4.01	23	0.65	—	—	—	0.32	—	—
c18	Seeking specific inputs on constructibility, construction methods, materials, etc. from among potential partners (of item 16), for better project planning	4.27	13	0.62	0.49	—	—	—	—	—
c15	Previous performance records on soft factors, e.g. joint decision making, joint problem solving, compromises on unclear issues, etc. (each party)	4.11	19	0.59	0.31	0.32	—	0.43	—	—
c20	Bringing contractor, major subcontractors and major suppliers into the project team, in appropriate cases, for longer-term interactions to build trust /reliability	4.45	6	0.45	—	—	0.33	0.34	—	0.41
c25	Role of Project Manager (PM) as facilitator as per item 24 above, given that PM has the best understanding and control of the project issues	4.43	7e	—	0.79	—	—	—	—	—
c26	Requirement for an independent full-time facilitator to supplement PM (Project manager) as per item 24 above	3.76	27	—	0.72	0.45	—	—	—	—
c24	Role of an independent full-time facilitator in building trust, teamworking & can do spirit, and enhancing cooperative learning among contracting parties	4.08	20	—	0.67	—	—	—	0.48	—
c22	Use of single point responsibility, e.g., only one QS from the contractor representing all contracting parties in the project, instead of different QS for various contracting parties	3.69	28	—	0.65	—	—	0.33	—	0.40
c23	Group/combined responsibility, as against individual responsibility, e.g., responsibility of binding decision making on “unclear issues” by a preselected group comprising of one person from each major party	4.23	15	—	0.55	—	—	—	—	0.51
c07	Familiarity/previous relationships with/among other parties	4.22	16	0.44	—	0.70	—	—	—	—
c08	Reputation in the industry (each party)	3.94	25	—	—	0.64	—	—	—	0.43
c05	Learning working in flexible contract/teamworking environment before contracting with others (all parties), e.g., through training	4.36	10	0.35	—	0.61	0.38	—	0.42	—
c10	Previous experience in RC approaches (each party)	3.86	26	0.32	—	0.60	—	0.36	—	—
c06	Cooperative learning within project organization	4.24	14	—	—	0.52	0.33	—	0.49	—
c04	Learning about RC approaches before contracting (all parties), e.g., at a workshop, seminar, or training within the company	4.41	9	0.35	—	0.50	0.34	—	0.34	—
c03	Client’s initiative	4.83	2	—	—	—	0.88	—	—	—
c01	Enlightened and enthusiastic client	4.98	1	—	—	—	0.83	—	—	—
c02	Knowledgeable client (about project processes and RC)	4.57	4	—	—	—	0.73	—	—	—
c12	Previous performance records on “hard factors,” e.g. time, quality, safety, etc. (each party)	3.95	24	—	—	—	—	0.78	—	—
c13	Compatible organizational culture of involved parties	4.18	18	0.35	—	—	—	0.66	—	—
c21	More workshops for better interactions to build trust/reliability	4.02	22	—	—	0.45	—	0.63	—	—
c27	Company training policy to build adaptable individuals for working with diverse partners (each party)	4.05	21	0.37	—	—	—	—	0.64	—
c28	Corporate strategy of building trust with potential partners by doing the “right” things and meeting time & cost targets	4.52	5	0.46	—	—	—	—	0.56	—
c11	Adequate resources and technical skills (each party)	4.19	17	—	—	—	—	0.46	0.55	0.37
c09	Willingness/ enthusiasm of involved parties	4.63	3	—	—	—	—	—	—	0.72
c14	Interpersonal relations/cultural harmony (individual level)	4.28	11e	—	—	—	—	0.41	—	0.55
Eigenvalues		—	—	4.07	3.56	3.16	2.93	2.78	2.40	2.25

Table 5. (Continued.)

Factor code	Factors	Mean	Rank	Components						
				1	2	3	4	5	6	7
Percentage of variation explained		—	—	14.52	12.72	11.28	10.46	9.94	8.56	8.04
Cumulative percentage of variation explained		—	—	14.52	27.24	38.52	48.98	58.92	67.48	75.52

Note: Rotation converged in ten iterations; Kaiser–Meyer–Olkin measure of sampling adequacy 0.844; Bartlett’s test of sphericity: approx. chi-square 1,706.140, df 378, Sig. 0.000.

Mohr and Spekman 1994). This will in turn change the attitude of participants and enable them to consider the interests of others by utilizing win/win thinking. Such an environment is expected to create a learning climate in a project team organization (a18). The project team is then expected to be motivated to assume “combined responsibility” (a09), jointly use their available resources—including knowledge, technology, information, and specific skills (a12), and address any unforeseen risks through encouraging and motivating risk-reward plans (a23, a24) (Crowley and Karim 1995; Rahman and Kumaraswamy 2005a; Tang et al. 2006). Of course, “knowledgeable clients” (a02) are ideal to lay the overall foundation, which can be enhanced by more “experiences in RC approaches” (a05).

Component 2 (*appropriate risk allocation/sharing*) seems to suggest that RC approaches are better facilitated when construction contracts are prepared with “clearly defined” (a20) and “equitable” (a21) risk allocation/sharing arrangements, and also appropriate “flexibility” is maintained (a22) to address unforeseen risks (Rahman and Kumaraswamy 2002b; Hartman et al. 1997). Such improved risk management is possible only under the umbrella of RC approaches, especially when different parties align their “objectives” (a15, a17) for a win-win scenario (Tang et al. 2006). Literature suggests that “encouraging and motivating risk-reward plans” (a23), mutually agreed “issue resolution” (a13), and “performance appraisal” (a14) mechanisms embracing “all key parties” (a24) are parts of RC approaches (Scheublin 2001; Bayliss et al. 2004).

Component 3 (*motivated client and encouraging supporting arrangements*) appears to explain that “enlightened and enthusiastic” (a01) and “knowledgeable” (a02) clients are more likely to devise mutually agreed “issue resolution” (a13) and “performance appraisal” (a14) mechanisms, with “open communication among all contracting parties” (a06) that may help build a “positive attitude towards continuous improvement” (a19). Secondary contributions from other factors (relate this component to Component 1 and) may explain that such mutuality may also create a “learning environment in project team organization” (a18) and may also motivate different parties to effectively share and utilize their resources (a12).

Component 4 (*trust and trust-based arrangements*) is fed from primary contributions of four factors, and considerable secondary contributions from several other factors. This component may be interpreted to explain that “combined responsibility” (a09) is better performed when all contracting parties have “mutual trust” (a07) and “teamworking and can do spirit” (a10), and when they are supported by “effective coordination” (a08). Secondary contributions may be interpreted to explain that combined responsibility is more effective when supported with “open communication” (a06), “mutually agreed issue resolution mechanisms,” and “top management support” (a04). Component 5 (*top management support*) seems to explain that “top management support” (a03, a04) may be stronger when they have some “experience in RC

approaches” (a05). However, “enlightened and enthusiastic client” (a01) behavior plays an important role.

The eigenvalues obtained and variations explained for the five components are different (Table 3), but their “vertical” differences from each other do not indicate any considerable priority over each other, especially for the former four components. Also Component five contains the topmost two factors (see Table 2), hence showing its obvious importance. Moreover, the interlinked nature of all five components, which suggest a holistic, consolidated, and highly coordinated approach, points to adopting appropriate strategies or tactics according to the degree of importance of each individual items/factors. This also includes prioritization of any more important item/factor from among a group of related factors. For example, from among four risk related factors included in Category one of this survey (a20–23), clear (rank 9) and equitable (equal rank 10) allocation of risks have to be targeted before devising (equal Rank 17) any risk-reward plan and including (equal Rank 17) key parties in such risk-reward plan.

Factors Deterring RC: Relative Importance

Table 4 shows the perceptions of respondents on 28 factors for deterring RC, along with the results from factor analysis. “Lack of top management commitment” (b07) is seen to top the list that deters RC, followed by a lack of “trust” (b12) and “teamworking attitude” (b11) among all contracting parties, and “lack of client’s initiative” (b08). The next four most important factors are: “inappropriate procurement/contract strategy” (b02, Rank 5), “improper/inappropriate risk allocation/sharing” (b03, Rank 6), “price only selection methods” (b04, Rank 7), and “ambiguous/unclear contract clauses/documents” (b05, Rank 8). These are related to “project planning” (b01, Rank 14), and perhaps resulting from a “lack of client’s initiative” (b08, Rank 4), “bureaucratic client organization” (b27, Rank 11), and “incompatible public sector rules and regulations” (b28, Rank 15). “Unwilling participation” (b18, Rank 9) is seen to deter RC more than a “lack of confidence among contracting parties” (b19, Rank 16). Similarly, “incompatible organizational culture” (b14, Rank 13) is seen to deter RC more than “cultural clash” at the individual level (b13, Rank 18).

“Absence of risk-reward plan” (b06, Rank 24) is relatively less important. However, “exclusion of major subcontractors” (b21, Rank 22) is slightly more important than “exclusion of consultants” (b20, Rank 26) in any risk-reward plan, with “exclusion of major suppliers” (b22) as the least important factor with a score of 3.70 (out of a maximum of 6.00). This implies a general importance of all the 28 factors in deterring RC, with some factors more important than others, pointing to the stepwise or gradual implementation of various strategies according to their relative priorities, or various factors where there is more than one factor in any strategy. The significance levels obtained from the one sample *t*-test show that all 28 factors are significant, both within

Table 6. Importance and Factor Analysis Outcomes of Factors Deterring the Building of Integrated Project Teams

Factor code	Factors	Total	Rank	Components						
				1	2	3	4	5	6	7
d26	Failure to share information among contracting parties	4.60	9	0.85	—	—	—	—	—	—
d29	Discontinuation of open and honest communication	4.70	6	0.85	—	—	—	—	—	—
d11	Lack of trust/reliability among contracting parties	4.96	3	0.82	—	—	—	—	—	—
d08	“Price only” selection methods	4.64	7e	0.62	—	—	—	—	0.38	—
d20	Unfair risk-reward plan	4.43	12e	0.62	0.47	—	—	—	—	—
d30	Improper planning, design errors, and omissions	4.27	20	0.61	—	—	—	—	0.37	—
d27	Persistence of “master” and “slave” concept	4.64	7e	0.52	—	0.42	—	—	—	—
d28	Uneven commitment of contracting parties	4.43	12e	0.44	0.40	0.33	—	—	—	—
d12	Unwilling/unenthusiastic participation of contracting parties	4.78	5	0.39	0.38	0.38	—	—	—	—
d15	Absence of any risk-reward plan	4.16	22	—	0.80	—	—	—	—	—
d18	Exclusion of (major) subcontractors in risk-reward plan	4.14	23	—	0.79	—	—	—	—	—
d16	Separate/unrelated risk-reward plans for different parties	4.08	25	—	0.77	—	—	—	—	—
d19	Exclusion of (major) suppliers in risk-reward plan	3.94	31	—	0.60	—	0.38	—	—	—
d17	Exclusion of consultants in risk-reward plan	3.95	30	—	0.58	—	0.33	—	—	0.47
d10	Opportunistic behavior of one or more contracting parties	4.23	21	—	0.56	0.43	—	—	—	—
d25	Resistance of contracting parties to integrated project culture	4.43	12e	0.33	0.52	0.40	—	—	—	—
d07	Public sector accountability concerns	4.45	11	—	—	0.83	—	—	—	—
d06	Stringent/incompatible public sector rules and regulations	4.43	12e	—	—	0.81	—	—	—	—
d05	Bureaucratic client organization	4.48	10	—	—	0.78	—	0.31	—	—
d13	Inter-personal/cultural clash (individual level)	4.10	24	—	—	0.73	—	—	—	—
d14	Incompatible organizational culture (corporate level)	4.28	19	0.32	0.36	0.53	—	—	—	—
d23	Lack of relationships/communications between consultants and suppliers	4.07	26	—	—	—	0.90	—	—	—
d22	Lack of any relationships between client & major suppliers	4.06	27e	—	—	—	0.88	—	—	—
d21	Lack of contractual relations between client & major subcontractors	4.06	27e	—	—	—	0.81	—	—	—
d24	Lack of relationships/communications between subcontractors & suppliers	4.01	29	—	0.32	—	0.76	—	—	—
d02	Lack of commitment from top management: client	5.19	1	—	—	—	—	0.90	—	—
d03	Lack of commitment from top management: other parties	5.07	2	—	—	—	—	0.86	—	—
d04	Lack of client’s initiatives	4.82	4	—	—	0.45	—	0.55	—	0.47
d31	Potential legal liabilities (in resolving noncontractual issues)	4.37	17	—	—	—	—	—	0.79	—
d09	Commercial pressures on contracting parties	4.39	16	—	0.36	—	0.31	—	0.46	—
d01	Lack of client’s knowledge (about project processes and RC)	4.30	18	0.35	—	—	—	—	—	0.74
Eigenvalues		—	—	4.64	4.57	4.34	3.92	2.56	1.63	1.55
Percentage of variation explained		—	—	14.97	14.74	13.99	12.66	8.25	5.25	5.00
Cumulative percentage of variation explained		—	—	14.97	29.72	43.70	56.36	64.61	69.86	74.86

Note: Rotation converged in eight iterations; Kaiser–Meyer–Olkin measure of sampling adequacy 0.849; Bartlett’s test of sphericity: Approx. chi-square 2,015.884, df 465, Sig. 0.000.

total sample and three groups of respondents, except for the factor “exclusion of major suppliers in risk-reward plan” (b22) within the group of contractors. Although the ranks of different factors are slightly different within different groups of respondents, ANOVA results show that three groups of respondents significantly agree on the relative importance of all 28 factors that deter RC. On the whole, the result is in agreement with existing literature, as in the case of a set of facilitating factors for RC (Chan et al. 2004; Hartman et al. 1997; Rahman and Kumaraswamy 2005b).

However, disagreement exists among the three groups of respondents on two factors (b09, b20), when they are compared pairwise. Consultants significantly disagree with both contractors and clients in terms of the importance levels of lack of contractor’s capability (b09), and exclusion of consultants in risk-reward

plan (b20). They assigned the fourth highest importance level to the “lack of contractor’s capability” with a score of 4.94, compared to Rank 12 with a score of 4.26 by contractors, and Rank 17 with a score of 4.28 by clients. The ranks within the groups of contractors and clients are different (12 and 17), but their scores are very close (4.26 and 4.28), which suggests agreement on importance. This agreement may be due to the reason that contractors and clients work as a team in most of the RC-based working arrangements (e.g., postcontract project partnering), which gives them more opportunity to know each other in terms of their capability, and also in terms of solving problems, overcoming many barriers, and perhaps most importantly, sharing any benefits (or burdens).

On the other hand, consultants are not usually a part of the “team.” They work with much less interaction with contractors,

mostly with their “theoretical” knowledge, and thus allowing far less opportunity to know the actual capability of contractors. There might also be some underlying ego-type feeling of being superior (to contractors and clients—due to their reliance on consultants, e.g., for architectural and engineering design works). Consultants may also be dissatisfied for not being considered within the “team,” for the very realistic reason of not getting any share of any savings derived from RC-based collaboration; although they work more (e.g., in design changes, etc.) compared to pure working arrangements, and only in consideration of their original contract sum. This has perhaps been reflected through the factor b20: exclusion of consultants in risk-reward plan. Contractors and clients prioritized this factor as the lowest but one of importance (i.e., 27) with similar scores of 3.55 and 3.69, respectively. On the other hand, consultants have perhaps expressed their desire for inclusion in the “team” by a comparatively higher score of 4.33 that ranks 17 out of 28 factors. Consultants also disagree with contractors on the importance level of excluding major subcontractors in a risk-reward plan in deterring RC, perhaps due to the same or similar justification. They placed an importance level of 14 on this factor with a score of 4.39, in comparison to rank 24 with a score of 3.74 by contractors. Consultants consider better results/project outcomes could be achieved if subcontractors are included in any risk-reward plan. On the other hand, contractors might not be willing to share any benefits from a risk-reward plan with their subcontractors, and therefore undermine their inclusion in the “team.”

Factors Deterring RC: Factor Analysis

This factor analysis exercise surfaced seven interrelated components and together they explained over 72% of variations. It is seen from Table 4 that 20 factors contribute to more than one component, even up to four components (i.e., the factor “improper/inappropriate risk allocation/sharing”). The secondary contributions from each of two factors to Component 2 is higher than the principal contribution from one of its factors. Also the secondary contribution of the factor “lack of confidence among all contracting parties” (b19) to Component 3 is more than the principal contribution of factor “improper/inappropriate risk allocation/sharing” to Component 2 and the factor “absence of risk-reward plan” (b06) to Component 4. These last two factors, along with the factor “lack of experience in RC approaches” (b17), also contribute almost equally to more than one component. Thus, like the factors facilitating RC, such multiple roles of different factors clearly indicate an interrelated but consolidated approach of the factors deterring RC as well.

Component 1 (*incomplete risk-reward scheme*) seems to focus on risk-reward plans. It explains that unrelated/separate risk-reward plans for different parties (b23), and/or exclusion of “consultants” (b20), “major subcontractors” (b21), and “major suppliers” (b22) in a risk-reward plan deter RC. Considerable secondary contribution from the factor “absence of risk-reward plan” (b06) relates it to Component 4. Chan et al. (2003) argue that two major barriers for implementing partnering type RC approaches are lack of involvement of key parties and failure to share risks. Component 2 (*persisting behavioral barriers*) tends to clarify that in the presence of interpersonal (b13) and interorganizational (b14) cultural clashes/incompatibilities, together with “improper/inappropriate risk allocation/sharing” (b03) and “separate coordination and monitoring plans,” contracting parties are unlikely to build “confidence” (b19) in each other. Under such incompatibilities, it is also unlikely to devise any “appropriate

issue resolution mechanisms” (b15). Glagola and Sheedy (2002) argue that such barriers originating from past experiences work against the key elements of trust and move parties toward “unwilling participation” (b18, relating to Component 3). Dissanayaka and Kumaraswamy (1999) argue that parties with such attitudes may be motivated through better relationships and cooperative teamwork, and by gaining more “experience in RC approaches” (b17, relating to Component 6).

Component 3 (*lack of trust, commitment, and initiative*) seems to explain that lack of “trust” (b12) and “top management commitment” (b07) are likely to lead to “unwilling participation” (b18) of the contracting parties in RC approaches. However, appropriate “initiatives” (b08) from the client may help build a “teamworking attitude” (b11) among contracting parties for RC to be successful. Considerable secondary contribution from “lack of confidence” (b19) strengthens the relationships between Components 2 and 3. This may also imply that top management commitment from all contracting parties and client’s initiatives are critical to inculcate trust and teamworking attitude (Component 3), and to harmonize any existing behavioral barriers (Component 2) within the project team.

Component 4 (*persisting adversarial setting*) seems to summarize the factors that are reported to continuously contribute to creating an adversarial setting, thereby deterring RC. This component appears to explain that “incompatible rules and regulations” (b28) direct public sector clients to behave bureaucratically (b27), to rely on “price only selection methods” (b04), and to prepare contracts that do not contain “risk-reward plan” (b06). Such an adversarial setting may compel the contracting parties into a “win-lose environment” (b26). Literature suggests that a clear and motivated client lead is necessary and which can eventually overcome such adversarial settings (Hartman et al. 1997; Lownds 1998; Bourne and Higginbottom 2001; Zaghoul and Hartman 2003; Rahman and Kumaraswamy 2004a). Secondary contributions show the relationship of this component to other components.

Component 5 (*improper planning*) seems to describe that “inappropriate project planning” (b01), “inappropriate procurement/contract strategy” (b02), and “ambiguous/unclear contract clauses/documents” (b05) work together in deterring RC (Latham 1994; CIRC 2001). Component 6 (*lack of capability and experience*) tends to illustrate that a lack of “contractor’s capability” (b09), “scope for innovations” (b10), and “experience in RC approaches” (b17) may work together to deter RC. Considerable secondary contribution from the factor “commercial pressures” (b25) links Components 7 (*commercial pressure and legal liability*) and 4 (*persisting adversarial setting*), to apparently explaining that “potential legal liabilities” (b24) may provoke the existing adversarial setting (i.e., Component 4).

Although all seven components obtained from the factor analysis exercise are interrelated, either directly or indirectly, and through primary and secondary contributions of 20 factors, the eigenvalues obtained and their respective explained variations appear to suggest the need for a prioritized focus on the first four components over the later three. This means that the primary broad focus to creating conducive environment for RC should be to remove or ease out the problems or shortfalls related to the risk-reward scheme (Component 1), behavioral aspects (Component 2), trust and commitment (Component 3), and adversarial mindsets (Component 4). After successfully addressing these four broad components, the other three components are expected to be addressed more successfully.

Factors Facilitating Building of Integrated Project Teams: Relative Importance

Along with the results from factor analysis, Table 5 summarizes the perceptions of respondents on 28 factors for facilitating the building of integrated project teams for RC. In agreement with previous recommendations (e.g., Latham 1994; CIRC 2001) and observations (e.g., Hartman et al. 1997; Rahman and Kumaraswamy 2004a), the results clearly indicate a prioritization of the pioneering role by clients, with “enlightened and enthusiastic client” (c01) topping the list, “client’s initiative” ranking 2, and “knowledgeable client” ranking 4. “Willingness of involved parties” (c09, Rank 3) is also very important. A trust-building “corporate strategy” (c28, Rank 5) and “early mobilization” of major contracting parties (c20, Rank 6) are critical for building integrated teams. This is also in agreement with a previous observation (Rahman and Kumaraswamy 2004b). However, project manager (PM) is seen in a better position (c25, equal Rank 7) than an independent full-time facilitator (c24, Rank 20), in building trust, developing teamworking and “can do” spirit, and enhancing cooperative learning among contracting parties. This is contrary to the wider use of an independent facilitator in partnering type RC approaches in Hong Kong (Chan et al. 2004; Bayliss et al. 2004). The reason may be the PM has the best understanding and control of the project issues, whereas an independent facilitator is external to the project. Therefore, respondents placed an importance level of least but one for “an independent full-time facilitator to supplement PM” (c26, Rank 27). This may perhaps add a new dimension to industry participants about the roles of PM and “partnering facilitator” in RC approaches in Hong Kong.

Respondents placed a relatively high importance on selecting the best possible “capable and compatible project team” (c19, equal Rank 7), and from among short-listed “capable and compatible potential project partners” (c16, equal Rank 11), instead of price only considerations. This confirms the emphasis on selecting an effective team for a project to be successful, i.e., to consider not only individuals’ technical skills, knowledge, and experience but also their ability to coordinate actions and their interpersonal qualities (Crane et al. 1997; Constructing Excellence 2004; Rahman and Kumaraswamy 2005b). As mentioned in the questionnaire, “capable” refers to “adequate resources and technical skills” (c11, Rank 17), and “previous performance records on ‘hard factors,’ e.g., time, quality, safety, etc.” (c12, Rank 24). On the other hand, “compatible” refers to “compatible organizational culture” (c13, Rank 18), “interpersonal relations/cultural harmony” (c14, equal Rank 11), and “performance records on ‘soft factors,’ e.g., joint decision making” (c15, Rank 19). Respondents prefer “seeking specific inputs on constructibility, construction methods, materials, etc.” (c18, Rank 13) over “disclosing project information” (c17, Rank 23) to the above short-listed potential partners. Like the “previous performance records on hard factors,” respondents interestingly placed a relatively lower level of importance on “experience in RC approaches” (c10, Rank 26). This may point out that “present” attitude and commitment outplays previous experiences. On the whole, the preference for the team selection (c19) is short listing (c16) with more importance on interpersonal relations (c14), present skill sets (c11), and compatible organizational culture (c13). This clearly refers to the previous proposition that prior understanding/relationships among contracting parties (c07, Rank 16) help build integrated teams. The preference is thus on relational selection (Rahman and Kumaraswamy 2005b).

It was also observed that learning about “RC approaches be-

fore contracting” (c04, Rank 9) and “working in flexible contract/teamworking environment” (c05, Rank 10), and “cooperative learning within project organization” (c06, Rank 14) are more important than “company training policy to build adaptable individuals for working with diverse partners” (c27, Rank 21) and “more workshops for better interactions to build trust/reliability” (c21, Rank 22). Clearly, the priority is to acquire related knowledge before contracting (c04 and c05), compared to orientation-type superficial learning after contracting (e.g., through workshops, c21). However, “group responsibility” (c23, Rank 15) is of moderate importance, and “use of single point responsibility” (c22) is the least important, with a score of 3.69. This implies a general importance of all the factors, while suggesting a stepwise or prioritized implementation (especially where there is more than one factor in one specific strategy, e.g., team selection).

Significance levels obtained from the one sample *t*-test show that all the factors are significant, both within the total sample and three groups of respondents, except for the “use of single point responsibility” (c22) within the contractors group. Although all contractor respondents have prior knowledge in RC approaches (see Table 1), this disagreement points to the fact that some respondents have diverse (i.e., good or bad) experiential perceptions on using such a strategy, while some others might not have used such a strategy in their known RC approaches. Moreover, although the ranks of individual factors within various respondent groups are slightly different, ANOVA results show that all three groups of respondents significantly agree on the relative importance of different factors. Furthermore, significance levels obtained from the independent sample test show that each pair of respondent groups significantly agree on the importance levels of all 28 factors, except for “knowledgeable client” (c04) by contractors and clients. Contractors are seen to place a higher level of importance (Rank 3, Score 4.77) than clients (Rank 13, Score 4.31). This may be due to the reliance of clients on their consultant representatives, where contractors feel that clients’ knowledge and/or involvement would potentially solve some of their problems, since they work more closely (and perhaps directly) with the clients in most RC-based approaches during project executions, e.g., in postcontract partnering type RC approaches.

Factors Facilitating Building of Integrated Project Teams: Factor Analysis

Factor analysis exercise extracted seven interrelated components and together they explained over 75% of variations (see Table 5). Twenty factors are seen to contribute to more than one component, with four factors (c15, c20, c05, and c04) contributing to four components, and the other four factors (c22, c10, c06, and c11) contributing to three components. Primary and secondary contributions of Factors c20, c23, c06, c28, and c11 are close. Also, secondary contributions of eight factors (c18, c26, c24, c23, c06, c21, c28, and c11) are either equal to or higher than the lowest primary contribution of 0.45 (from c20 to Component 1). All these clearly indicate a consolidated but interrelated approach for building integrated project teams for more effective RC.

Component 1 seems to portray the “*team selection and mobilization strategy*.” This focuses on “selecting the best possible team” (c19) from among “capable and compatible potential project partners” (c16), whose short listing considerably takes into account their “previous performance records on soft factors” (c15). For more effective teamworking, clients can “disclose project information” (c17) to such short-listed potential partners at early stages of the project for their optional feedback, “seeking

specific inputs” (e.g., on constructability, construction methods, materials, etc.) for “better project planning” (c18). This component also suggests bringing major parties into the project team early for longer-term interactions to build trust (c20). Considerable secondary contributions indicate that such a strategy may be more effective when the team partners have “previous relationships” (c07) and “corporate strategy of building trust with potential partners by doing the right things and meeting time and cost targets” (c28). This component shows that RC approaches are better than traditional contracting methods, since all the factors of this component are based on RC principles, and also contrast with the traditional methods.

Component 2 (*facilitating responsibility allocation*) appears to focus on improved responsibility allocation within the project team organization to facilitate the building of trust, teamworking and can do spirit, and enhancing cooperative learning by an “independent full-time facilitator” (c24), or the PM (c25) since he has the best understanding and control of the project issues, or both (c26). This component also explains that such a facilitated team may be able to effectively practice both “single point” (c22) and “group” (c23) responsibility. Considerable secondary contribution (from Factor c18) may be considered to infer that such facilitated teams may respond well when “seeking any specific inputs” (c18). Component 3 (*appropriate preparation for teamworking*) seems to summarize the preparatory activities for different parties before engaging in RC-based integrated and collaborative approaches. Those include: learning about RC approaches (c04), learning working in flexible contract (c05), cooperative learning within project organization’ (c06), previous relationships with other parties (c07), reputation in the industry (c08), and previous experience in RC approaches (c10). Considerable secondary contributions may indicate that “more workshops for better interactions” (c21) among the contracting parties with joint facilitating efforts of both the PM and an independent facilitator (c26) will help build trust/reliability.

Component 4 (*enlightened and knowledgeable client*) appears to explain that “initiative” (c03) from “enlightened and enthusiastic” (c01) and “knowledgeable client” (c02) plays a pivotal role in building integrated teams. Component 5 (*harmonizing the team*) suggests that “previous performance records on hard factors” (c12) of different potential partners, and their compatible “organizational culture” (c13) should further be blended together through more workshops (c21), for better interactions to build trust, and to maintain harmonious team behavior. Considerable secondary contributions point to further consideration for team selection on “adequate resources and technical skills” (c11), “performance records on soft factors,” (c15) and “interpersonal relations/cultural harmony” (c14).

Component 6 (*corporate strategy and skills*) appears to explain that companies with trust-building “corporate strategy” (c28), teambuilding “training policy” (c27), and “adequate resources and skills” (c11) are expected to play an important role in building integrated teams. Such companies with prior training of “working in flexible contract environment” (c05) under the favorable role of facilitator (c24) can also build a “cooperative learning” (c06) environment within the project organization. Component 7 (*harmonious participation*) highlights the importance of the “willingness of involved parties” (c09) and their harmonious “interpersonal relations” (c14) for building integrated teams. Considerable contributions from four factors relate this component to Components 1, 2, and 3.

Despite the interrelated nature of all the seven components, as has been demonstrated above, the factor analysis results suggest a

prioritized focus on different components; although their sequential vertical distances in eigenvalues are not very high (see Table 5). However, coupled with the importance of various individual factors and in order to build integrated project teams, it may imply that enlightened and knowledgeable clients (Component 4) first focus on team selection and mobilization strategy (Component 1), with appropriate facilitating responsibility allocation (Component 2) and other preparatory works for teamworking (Component 3). For this to happen, clients also need to harmonize the team (Component 5) by selecting capable and compatible team members, with suitable corporate strategy (Component 6), and motivating each other for their harmonious participation (Component 7).

Factors Deterring Building of Integrated Project Teams: Relative Importance

Lack of commitment from top management of “client” (d02) and “other parties” (d03) are the topmost two barriers for building integrated project teams, followed by lack of trust (d11, Rank 3), client’s initiative (d04, Rank 4), and unwilling participation (d012, Rank 5) (see Table 6). Literature suggests that lack of top management support is an obstacle to initiating RC type approaches. Their full support and commitment are vital for success in RC approaches, since they formulate the strategy and direction of business activities (Chan et al. 2003; Cheng et al. 2000). Trust is critical to any RC based approaches and the client is to initiate it by adopting an appropriate contracting strategy (Zaghloul and Hartman 2003; Rahman and Kumaraswamy 2005b). Mutual trust opens the boundaries of the relationship, enhances adaptability, increases information exchange and joint problem solving, and promises better outcomes (Mohr and Spekman 1994; Cheng et al. 2000; Rahman and Kumaraswamy 2005b; Tang et al. 2006).

“Persistence of master and slave concept” (d27) and “price only selection method” (d08) share Rank 7. Failure to continue “open and honest communication” (d29) and “share information” (d26), respectively, Rank 6 and 9. In this respect, Chan et al. (2003) emphasize the solution of problems associated with communication and argue that open, honest, and effective communication is one of the key elements for success in RC based approaches. “Bureaucratic client organization” (d05, Rank 10), “public sector accountability concerns” (d07, Rank 11), and “stringent/ incompatible public sector rules and regulations” (d06, equal Rank 12) are more important than “improper planning, design errors, and omissions” (d30, Rank 20). On the other hand, “unfair risk-reward plan” (d20, equal Rank 12) is more important than “absence of any risk-reward plan” (d15, Rank 22) and “separate/ unrelated risk-reward plans for different parties” (d16, Rank 25). “Lack of relationships” between different contracting parties (d21–d24) is of lower importance (Ranks 26–29). “Exclusion of (major) suppliers in risk-reward plan” (d19) is the least important factor with a score of 3.94. This implies a general importance of all the factors in deterring the building of integrated project teams.

Results from the one sample *t*-test confirmed that all the factors are significant, both in the total sample and individual groups of respondents. Ranks of various factors are slightly different within three groups of respondents, but ANOVA results showed that they significantly disagree on the relative importance of only one factor: “lack of client’s knowledge” (d01). Results from the independent sample test showed that contractors and clients significantly agree on the importance level of this factor, but consultants significantly disagree with them. Consultants placed a

much higher importance level (Score 5.00, equal Rank 4), compared to lower importance level by clients (Score 4.09, equal Rank 21), and contractors (Score 4.10, equal Rank 23), leading to the combined Rank of 18 with a score of 4.30. This might be due to the reason that consultants frequently interact with clients during design, documentation, and contract preparation, where clients' knowledge about the project might not be clear. Many clients also do not have sufficient technical knowledge at the level of the consultants that might lead consultants to rank this item higher as a deterring factor. On the other hand, contractors have little chance to directly interact with clients at the precontract stage of most RC-based approaches (e.g., in postcontract partnering type arrangements). However, they work directly with clients in such RC approaches, mostly with satisfaction and success, and where the consultant is not within the "team." So, contractors are less aware of any lack in the knowledge of clients, while clients themselves do not consider themselves unknowledgeable.

Factors Deterring Building of Integrated Project Teams: Factor Analysis

Seven interrelated components, through the primary and secondary contributions of 16 factors, emerged from the factor analysis exercise and together they explained over 74% of variations. Eigenvalues obtained and respective variations explained by the components appear to suggest a priority focus of the first four components over the other three. However, Component 5 contains three of the most important four factors, indicating its priority over other components. This also suggests a simultaneous consideration of the importance of individual factors, as well as the size of different components.

Component 1 (*persisting adversarial setting*) seems to summarize the factors that are claimed to provoke adversarial behavior among contracting parties. Those are: lack of trust/reliability among contracting parties (d11); price only selection methods (d08); unfair risk-reward plan (d20); improper planning, design errors, and omissions (d30); persistence of master and slave concept (d27); uneven commitment (d28); and unwilling/unenthusiastic participation (d12). This component also seems to explain that any collaborative functional arrangements in such an adversarial setting also lead to failure to share information (d26) through open and honest communication (d29) among contracting parties. Component 2 (*lack of integrated risk-reward scheme*) appears to explain the inconsistencies of risk management approaches, including absence (d15) and/or separate risk-reward plans (d16). Conflicting risk management approaches also include exclusion of consultants (d17), major suppliers (d19), and/or major subcontractors (d18)—if there is any risk-reward plan. Such segregated approaches may lead contracting parties to resist integrated project culture (d25), and to behave opportunistically (d10). Considerable secondary contributions show a relationship between Components 1 and 2.

Component 3 (*persisting regulatory incompatibilities*) seems to explain that persisting bureaucratic behavior (d05), stringent/incompatible rules and regulations (d06), and accountability concerns (d07) of public sector decrease both interpersonal (d13) and organizational (d14) cultural harmony. Considerable secondary contributions from various factors show relationships between Components 1, 2, 3, 5, and 7. Component 4 (*incomplete relationships/ communications*) appears to describe the lack of communications/ relationships of client with major subcontractors (d21) and major suppliers (d22); and also communications/

relationships between consultants and suppliers (d23) and subcontractors and suppliers (d24).

Component 5 (*lack of top management commitment*) seems to explain that client's initiative (d04) may not be effective if there is a lack of commitment from top management of all contracting parties (d02, d03). Component 6 (*commercial pressure and legal concern*) appears to indicate that commercial pressures of contracting parties (d09) may invoke their concerns on potential legal liabilities (d31) in resolving noncontractual issues. Component 7 (*lack of client's knowledge*) is composed of only one factor: lack of client's knowledge about project processes and RC (d01), indicating its obvious importance in building integrated teams. Considerable secondary contributions may be indicative of an explanation that clients without sufficient related knowledge may not be able to take any initiative. Secondary contributions also relate to Component 2 (lack of integrated risk-reward scheme), Component 3 (persisting regulatory incompatibilities), Component 5 (lack of top management commitment), and Component 7.

Analysis of Results

The survey presented in this paper evaluated a variety of facilitating and deterring factors for developing a wider culture of RC and building integrated teams for more effective RC in construction. The target is to invoke serious considerations of industry participants for providing various contractual and noncontractual incentives in construction projects. For example, contractual incentives may include equitable risk allocation in contract documents, whereas a noncontractual incentive may include a client's attitude and initiative for such equitable risk allocation. Such contractual and noncontractual incentives may be used in designing procurement arrangements, selecting and mobilizing different project team members, and adjusting the conditions of the contract in aligning specific project objectives and/or requirements. However, some of the factors/strategies and corresponding incentives are for long-term consideration, whereas some others are for short-term and project specific usage. The study recognized some general trends and revealed the positive attitudes of the surveyed sample of Hong Kong contractors, consultants, and clients, both for RC and integrated teams. These include the following:

1. For the category one (i.e., factors facilitating RC), all 24 factors/strategies are significant, both across the total sample and within the groups of contractors, consultants, and clients. Respondents significantly agree on the relative importance of all the factors. Top management support, trust, and trust-based operational arrangements are more important than other factors. Factor analysis yielded five interrelated "broad factors" or components. Those are as follows: integrated objectives and risk-reward plan; appropriate risk allocation/sharing; motivated client and encouraging supporting arrangements; trust and trust-based arrangements; and top management support. Comparatively smaller sequential vertical distances among the five components suggest a focus on different factors based on their relative importance, including prioritization of any more important factors from among a group of related factors;
2. For Category two (i.e., factors deterring RC), lack of commitment, trust, and initiative related factors top the list, followed by a group of factors related to contractual arrangements and project planning. All the factors are significant both within the total sample and within individual respondent groups, except for the factor "exclusion of major suppliers in

risk-reward plan” (b22) in contractors group. Three groups of respondents significantly agree on the relative importance of all the factors. However, consultants significantly disagree with contractors on the relative importance of three factors, and with clients on two of those three factors. Seven interrelated components emerged from the factor analysis exercise. Those are as follows: incomplete risk-reward scheme; persisting behavioral barriers; lack of trust, commitment, and initiative; persisting adversarial setting; improper planning; lack of capability and experience; and commercial pressure and legal liability. In addition to the relative importance of various factors, the eigenvalues obtained in the factor analysis exercise appear to suggest a prioritized focus on the first four components over the other three;

3. Factors facilitating and deterring RC (i.e., Categories one and two) are seen to play complementary roles, since similar types of factors top the list in both categories. Moreover, any trust-based operational arrangement (e.g., open communication, in Category one) must be supported by contract documents, in order to strike a balance between flexibility and control, and to arrest any opportunistic behavior (Rahman and Kumaraswamy 2004a);
4. For factors/strategies facilitating the building of integrated project teams (i.e., Category three), a cliental pioneering role is more important than other factors. The trend is followed by a preference for building a capable and compatible project team and learning about collaborative working arrangements before contracting. Interestingly, PM is expected to play a more important role in building integrated teams than an independent facilitator. All the factors are significant both within the total sample and different groups of respondents, except the factor “use of single point responsibility” (c22) within the group of contractors. Three groups of respondents significantly agree on the relative importance of all the factors, although contractors significantly disagree with clients on the importance level of “knowledgeable client” (c02). The factor analysis exercise extracted seven interrelated components. Those are: team selection and mobilization strategy; facilitating responsibility allocation; appropriate preparation for teamwork; enlightened and knowledgeable client; harmonizing the team; corporate strategy and skills; and harmonious participation. The relative importance of individual factors and the size of different components as per eigenvalues obtained from factor analysis exercise, suggest considering both when prioritizing the focus areas;
5. The trend of preference in Category three may be considered to complement that of Category one (i.e., in the two categories of “facilitating” factors), in the sense that clients can “pioneer” or take the initiative of selecting capable team members (as in Category three) and in devising trust-based operational arrangements (as in Category one, e.g., open communication), but contracting parties will be able to “compatibly” work in such an “open” environment only after necessary “learning” (that refers to Category three) (Rahman and Kumaraswamy 2004b);
6. For Category four, all 31 factors/strategies are significant, both within the total sample and within each of the three groups of respondents. However, they significantly disagree on the relative importance of “lack of client’s knowledge” (d01). Also, consultants significantly disagree on the importance level of this factor with contractors and clients. The factor analysis exercise extracted seven interrelated components. Those are: persisting adversarial setting; lack of integrated risk-reward scheme; persisting regulatory incompatibilities; incomplete relationships/communications; lack of top management commitment; commercial pressure, and legal concern; and lack of client’s knowledge. If considered together, the rankings and eigenvalues appear to suggest a simultaneous consideration of the importance of individual factors, as well as the size of different components;
7. Similar to Category two, lack of commitment, trust, and initiative related factors are more important in deterring building integrated project teams (i.e., Category four). A group of factors related to operational arrangements, project planning, and causes of their failure follow the trend. Except for clients and contractors, factors/strategies related to lack of interparty relationships/communications, and their inclusion in a risk-reward plan take their positions at the bottom of the list in both the categories. Thus, the two categories of deterring factors/strategies are complementary;
8. The preference of individual factors/strategies in Category three highlights a motivated cliental role in building an integrated team, through partner selection processes, with emphasis on proven (i.e., previous performance records on) soft qualities and “present” resources and skill sets. For Category four, the priority is on commitment and trust, which also highlights certain behavior pattern of clients (e.g., master and slave concept, price only selection, bureaucracy, accountability concern, etc.) in deterring the building of integrated teams. Without addressing such a behavior pattern, a cliental role in improved team selection (as in Category three) and building integrated teams can hardly be achieved. Thus, facilitating and deterring factors for building integrated project teams for more effective RC may also be considered as complementary;
9. The general importance of all the factors used in the survey, in all four categories, as well as the smaller range of sequential vertical distances of eigenvalues of different “broad factors” or components obtained from factor analysis exercises, appear to broadly suggest a simultaneous consideration of the importance of individual factors, as well as the size of different components, in order to prioritize any focus area;
10. The general importance of all the factors used in the study also testify to the importance of all the factors that feature comparisons and contrasts between traditional and RC-based procurement methodologies, and so contribute to validating the previous observations of the same authors (Rahman and Kumaraswamy 2005a, b) that RC approaches are better than traditional contracting methods;
11. The survey results presented in this paper may be considered to be reasonably representative of the Hong Kong construction industry, since diverse groups of respondents are seen to have consistently suggested the development of a RC culture and building integrated project teams in construction with a similar approach. This is based on their long (over 19 years, see Table 1) and diverse experience, and consequential distilled knowledge. The results may also be considered to be reasonably free of bias, since respondents from diverse contracting affiliations (e.g., contractors, consultants, and clients) are seen to consistently agree on prioritizing various factors. This has been clearly seen to be reflected through the scientifically acceptable *t*-test and ANOVA results, as have been presented in this paper. Such consistency, as also has been seen in Australia, the Netherlands, and the United Kingdom (Rahman et al. 2005), and Singapore (Kumaraswamy et al. 2005; Ling et al. 2006), may be taken to be indicative

of a growing global awareness towards embracing RC and teambuilding in construction, although country specific strategies may vary;

12. As has been seen from factor analysis results that all the components are interrelated, and as has been seen from the above analyses that different categories of factors are complementary, a holistic but consolidated approach is called for. The results also suggest that clients are in a better position to pioneer such a trust-based approach, which must also be supported by top management commitment of all parties; and
13. Although levels of importance of various individual factors and strategies vary, the overall results of this study are in agreement with relevant previous studies in Hong Kong by the same authors (Rahman and Kumaraswamy 2005a,b), and others (Cheng et al. 2000; Chan et al. 2003, 2004); and elsewhere, for example in Singapore (Kumaraswamy et al. 2005; Ling et al. 2006), the United Kingdom (Black et al. 2000; Bresnen and Marshall 2000), and North America (Crowley and Karim 1995; Larson 1995; Crane et al. 1997; Hartman et al. 1997; Glagola and Sheedy 2002).

Conclusions

Integration in construction implies the efficient merger of collaborative efforts from various professional, organizational, operational, and regional/national cultures, and fostering of harmonious relationships during project execution, so as to ensure optimized project outcomes and higher performance levels. This requires coordinated efforts in terms of both contractual and noncontractual requirements, practice, and their relevant protocols. As such, various factors and strategies were identified, in order to assess their relative usefulness and to offer any contractual or noncontractual incentives for designing appropriate RC-based project teams.

Data were collected from the Hong Kong construction industry and were statistically analyzed. Only two factors are statistically insignificant within the group of contractors: “exclusion of major suppliers in risk-reward plan” (b22), and “use of single point responsibility” (c22). Ranks of different individual factors are slightly different within three groups of respondents, but ANOVA results showed that they significantly disagree on the relative importance of just one factor: lack of client’s knowledge (d01). In addition to this factor (i.e., d01) and when different groups of respondents are compared pairwise, consultants significantly disagree with both contractors and clients on two more factors: lack of contractor’s capability (b09) and exclusion of consultants in risk-reward plan (b20). Consultants also disagree with contractors on the relative importance of “exclusion of major subcontractors in risk-reward plan” (b21). On the other hand, contractors significantly disagree with clients on the relative importance of only one factor: knowledgeable client—about project processes and RC (c02).

Except for the above few disagreements, the results show that all the factors and strategies identified in the survey are significantly important to different degrees, both within the total sample and within the three groups of respondents. The survey results may therefore be taken to indicate a general consensus of the construction industry in Hong Kong. Accordingly, identified factors and strategies may be used as the basis for developing appropriate contractual and noncontractual incentives. For example, contractual incentives may include a provision in the contract for

“open communication among all contracting parties” during the project execution, whereas noncontractual incentives may include a client’s initiative and support for devising such an arrangement, and also require support from top management of all parties for such open communication to work in reality.

On the whole, it is observed that trust and trust based operational and contractual arrangements can effectively provide the required incentives for the Hong Kong construction industry to exercise various RC-based working arrangements, through extended attention to “relational” qualities in team selection, where top management support and client initiative are critical. Based on the overall responses, it was noted that both pairs of facilitating and deterring factors complement each other. Moreover, both pairs of facilitating and deterring categories of factors exhibit a similar broad trend of importance of the various factors, indicating that RC and teambuilding complement each other.

The factor analysis exercise extracted five components for representing factors facilitating RC, seven components for factors deterring RC, seven components for factors facilitating building integrated project teams for RC, and seven components for factors deterring building integrated project teams for RC. However, at least half of the factors in each category were observed to play multiple roles: a few factors contribute to even four components and a few other factors contribute almost equally to more than one component. These may be taken to suggest the usefulness of highly interrelated and consolidated strategies and approaches, both for developing RC culture and building integrated project teams in the Hong Kong construction industry.

Although specific findings presented herein are based on a survey sample from Hong Kong, the outcomes are relevant to many other countries, including those in North America, given the many parallel construction industry experiences and lessons learned. Furthermore, the generalization (and indeed “globalization”) of many common construction industry issues, problems, and solutions is accelerated by the enhanced mobility of construction organizations (including contractors, consultants, suppliers, and multinational clients). Moreover, the Hong Kong construction industry, in particular, includes many overseas-based/linked construction organizations, and therefore reflects the strengths, current concerns, and ideas from a very broad experiential knowledge base. Finally, the research methodology and tools developed for this study can provide the basis for designing specific studies in any other construction industries, where particular differences may be perceived, e.g., in terms of barriers to RC and integrated teams, possibly due to other concerns and priorities. Of course different sets of factors (albeit somewhat overlapping) may be proposed and assessed in such specific scenarios, depending upon initial perceptions and a pilot survey. In summary, the methodology and findings of this reported study are expected to be of interest to academia and construction industries worldwide, in terms of potential contractual and noncontractual incentives for facilitating RC and teambuilding.

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References

- Bayliss, R., Cheung, S. O., Suen, H. C. H., and Wong, S. P. (2004). “Effective partnering tools in construction: A case study on MTRC

- TKE contract 604 in Hong Kong." *Int. J. Proj. Manage.* 22(2), 253–263.
- Black, C., Akintoye, A., and Fitzgerald, E. (2000). "An analysis of success factors and benefits of partnering in construction." *Int. J. Proj. Manage.* 18(6), 423–432.
- Bourne, R., and Higginbottom, S. (2001). "Powerful PM: The Stave Falls replacement project." *PM Network*, 16(10), 44–48.
- Bresnen, M., and Marshall, N. (2000). "Building partnerships: Case studies of client-contractor collaboration in the UK construction industry." *Constr. Manage. Econom.*, 18, 819–832.
- Chan, A. P. C., Chan, D. W. M., Chiang, Y. H., Tang, B. S., Chan, E. H. W., and Ho, K. S. K. (2004). "Exploring critical success factors for partnering in construction projects." *J. Constr. Eng. Manage.*, 130(2), 188–198.
- Chan, A. P. C., Chan, D. W. M., and Ho, K. S. K. (2003). "Partnering in construction: Critical study of problems for implementation." *J. Manage. Eng.*, 19(3), 126–135.
- Cheng, E. W. L., Li, H., and Love, P. E. D. (2000). "Establishment of critical success factors for construction partnering." *J. Manage. Eng.*, 16(2), 84–92.
- Construction Industry Review Committee (CIRC). (2001). "Construct for excellence." *Rep. of the Construction Industry Review Committee*, Hong Kong.
- Constructing Excellence. (2004). *Effective teamwork: A best practice guide for the construction industry*, Constructing Excellence, London, (<http://www.constructingexcellence.org.uk/>) (December 22, 2004).
- Crane, T. G., Felder, J. P., Thompson, P. J., Thompson, M. G., and Sanders, S. R. (1997). "Partnering process model." *J. Manage. Eng.*, 13(3), 57–63.
- Crowley, L. G., and Karim, M. A. (1995). "Conceptual model of partnering." *J. Manage. Eng.*, 11(5), 33–39.
- Dissanayaka, S. M., and Kumaraswamy, M. M. (1999). "Reconstructing procurement systems and team relationships." *Int. J. Comp. Integ. Des. and Const.*, 1(2), 10–19.
- Eisenberg, M. A. (2000). "The emergence of dynamic contract law." *Calif. Law Rev.*, 88(6), 1743–1814.
- Glagola, C. R., and Sheedy, W. M. (2002). "Partnering on defense contracts." *J. Constr. Eng. Manage.*, 128(2), 127–138.
- Hartman, F., Snelgrove, P., and Ashrafi, R. (1997). "Effective wording to improve risk allocation in lump sum contracts." *J. Constr. Eng. Manage.*, 123(4), 379–387.
- Kadefors, A. (2004). "Trust in project relationships—Inside the black box." *Int. J. Proj. Manage.*, 22, 175–182.
- Kumaraswamy, M. M., Rahman, M. M., Ling, F. Y. Y., and Phng, S. T. (2005). "Reconstructing Cultures for Relational Contracting." *J. Constr. Eng. Manage.*, 131(10), 1065–1075.
- Larson, E. (1995). "Project partnering: Results of study of 280 construction projects." *J. Manage. Eng.*, 11(2), 30–35.
- Latham, M. (1994). *Constructing the team: Joint review of procurement and contractual arrangements in the UK construction industry*, Dept. of the Environment, London.
- Ling, F. Y. Y., Rahman, M. M., and Ng, T. L. (2006). "Incorporating contractual incentives to facilitate relational contracting." *J. Prof. Issues Eng. Educ. Pract.*, 132(1), 57–66.
- Lownds, S. (1998). *Fast track to change on the Heathrow Express*, Institute for Personnel and Development, London.
- Macneil, I. R. (1974). "The many futures of contract." *South. Calif. Law Rev.*, 47(3), 691–816.
- Mohr, J., and Spekman, R. (1994). "Characteristics of partnership success: Partnership attributes, communication behavior, and conflict resolution techniques." *Strategic Manage. J.*, 15(2), 135–152.
- Parkhe, A. (1993). "Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm cooperation." *Acad. Manage. J.*, 34(4), 794–829.
- Process and System Innovation in Building and Construction Program (PSIB). (2004). "Inventory of international reforms in building and construction." *Publication No. PSIB017_S_04_2341*, Government Building Agency, The Netherlands Government, Hague, The Netherlands.
- Rahman, M. M. (2003). "Revitalizing construction project procurement through joint risk management." Ph.D. thesis, the University of Hong Kong, Hong Kong.
- Rahman, M. M., and Kumaraswamy, M. M. (2002a). "Joint risk management through transactionally efficient relational contracting." *Constr. Manage. Econom.*, 20(1), 45–54.
- Rahman, M. M., and Kumaraswamy, M. M. (2002b). "Risk management trends in the construction industry: Moving towards joint risk management." *Eng., Constr., Archit. Manage.*, 9(2), 131–151.
- Rahman, M. M., and Kumaraswamy, M. M. (2004a). "Contracting relationship trends and transitions." *J. Manage. Eng.*, 20(4), 147–161.
- Rahman, M. M., and Kumaraswamy, M. M. (2004b). "Potential for implementing relational contracting and joint risk management." *J. Manage. Eng.*, 20(4), 178–189.
- Rahman, M. M., and Kumaraswamy, M. M. (2005a). "Assembling integrated project teams for joint risk management." *Constr. Manage. Econom.*, 23, 365–375.
- Rahman, M. M., and Kumaraswamy, M. M. (2005b). "Relational selection for collaborative working arrangements." *J. Constr. Eng. Manage.*, 131(10), 1087–1098.
- Rahman, M. M., Kumaraswamy, M. M., Karim, K., Ang, G., and Dulaimi, M. (2005). "Cross-country perspectives on integrating construction project teams." *Proc. of the 6th Construction Specialty Conf. of the Canadian Society for Civil Engineering (CSCE)* (CD ROM), Toronto, Canada, Paper No. CT-140.
- Scheublin, F. J. M. (2001). "Project alliance contract in The Netherlands." *Build. Res. Inf.*, 29(6), 451–455.
- Tang, W., Duffield, C. F., and Young, D. M. (2006). "Partnering mechanism in construction: An empirical study on the Chinese construction industry." *J. Constr. Eng. Manage.*, 132(3), 217–229.
- Thompson, P. J., and Sanders, S. R. (1998). "Partnering continuum." *J. Manage. Eng.*, 14(5), 73–78.
- Zaghoul, R., and Hartman, F. (2003). "Construction contracts: The cost of mistrust." *Int. J. Proj. Manage.*, 21, 419–424.

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