

Constructing Relationally Integrated Teams

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Abstract: Worldwide initiatives to improve construction industry performance converge on the common need for more effective teamworking. This is increasingly critical in the context of complex multiparticipant construction projects. Clashes of organizational, operational, national, and/or professional cultures point to the need for “relational integration” as a prerequisite for such synergistic teamworking. This paper draws on recent approaches to promoting trust and cooperation through (1) basic teambuilding techniques in general and (2) partnering and alliancing in construction projects. It then focuses on analyzing the views of Singapore-based contractors as derived from a survey to elicit the hypothesized 28 factors facilitating relationally integrated teambuilding, and 31 factors deterring such integration in construction project teams. On the whole: (1) 27 of the 28 factors facilitating integrated project team, and 26 of the 31 factors deterring integrated project team, are significant; (2) these two sets of factors could be represented by four and five “broad factors,” respectively; and (3) except in a few cases, respondents from large and medium companies, as well as with and without experience in RC, have similar perceptions of the importance levels of different factors. These two sets of critical factors, as identified in this paper, complement two other previously isolated sets of factors that facilitate or deter a “relational contracting” culture. Taken together, they feed into a consolidated strategy for releasing the latent energies and potential synergies that should yield the much higher construction project performance levels that have been called for worldwide.

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Introduction

The widespread need for appropriately integrated teams has been confirmed in many construction industries. For example, a large part of industry low performance has been blamed on fragmented teams in the United Kingdom over the last few decades. However, the evident difficulties in reintegrating these teams, led to specific targets set in September 2002 by the “Strategic Forum for Construction”—that 20% construction projects by value should be undertaken by integrated teams and supply chains by end 2004, and that this should increase to 50% by 2007 (Constructing Excellence 2004). Industry reports in Australia (ISR 1999), Singapore (Construction 21 1999) and Hong Kong (CIRC 2001) have similarly called for integrated teams.

Calls for integrated teams in Singapore have focused more on

what, for the purposes of this paper, may be termed “functional” or “structural” integration. For example, Construction 21 (1999) highlighted the integration of the functions of “design” and “construction” in a “single point responsibility” contract. However, the United Kingdom, Australian, and Hong Kong reports recommend further needs in their own industries: to move toward what has more recently been termed “relational” integration—in teams, supply chains, and ultimately value networks (Palaneeswaran et al. 2003; Kumaraswamy et al. 2003a). For example, the “vision” behind the 109 recommendations of the Henry Tang Report (CIRC 2001) was “an integrated construction industry that is capable of continuous improvement towards excellence in a market-driven environment,” whereas a specific section of the report deals with “process re-engineering to achieve better integration”; and specific recommendations include those: for more integrated inputs from different disciplines, for both public and private clients to lead “a wider adoption of a partnering approach” in construction projects, and to consider a new form of contract which integrates a partnering approach into the contractual relationships (as in recommendations 2, 38, and 39).

The benefits of such moves away from rigid and dispute-ridden (and therefore often self-defeating) contracts toward relational contracting (RC) have been described by Rahman and Kumaraswamy (2002a) and Rahman (2003). First, RC has been found to give rise to more effective teambuilding. Second, partnering (a form of RC) has been found to engender cooperative teamworking. The partnering continuum is seen to progress from cooperation, through collaboration to coalescence (Thompson and Sanders 1998); or into more integrated alliancing, as in the National Museum project in Australia (Hauck et al. 2004). Third,

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teamworking models that evolved in general management theory provide extensive insights into team dynamics, formal, and informal group behavior patterns and role classifications (Mullins 1999; Belbin 2004).

Drawing on the above-mentioned three growing bodies of knowledge in RC, partnering/alliancing in construction, and teamworking in general, a study was launched from Hong Kong in 2003 to survey the potential for (1) developing a RC culture and (2) building project-based integrated teams. Since Singapore appeared to be more focused on functional/structural integration, rather than relational integration as discussed previously, the questionnaire survey was initially directed at Singapore-based contractors in order to assess their views on the potential for such relationally integrated teams. A companion paper focuses on the facilitators and deterrents of RC (Kumaraswamy et al. 2005). The aim of this paper is to identify and analyze facilitators and deterrents of integrated team building and also to consolidate the overall findings from this questionnaire survey. It concludes by summarizing the identified needs for more relational approaches and a synergistically integrated project culture.

Integrated Teams—Needs and Various Approaches

Costs of Segregation and Limitations of Classical Contracts

The high costs of segregated teams have been highlighted in recent years. These have many dimensions, e.g., (1) in the extra transaction costs between fragmented functions (e.g., of design separated from construction) and (2) the polarization arising from traditional contractual relationships. In the case of the latter, Zaghoul and Hartman (2003) focused on the cost of mistrust that is generated by the confrontational situations inherent in traditional contracts. They carried out two surveys in Canada that led them to assess the premium added by contractors to cover against the five most common exculpatory/disclaimer clauses in their current contracts. This was estimated at a staggering 8–20% because of their perception of high risks associated with, for example: “uncertainty of work conditions” or “sufficiency of contract documents.” They also found that contractors and owners were prepared to change to a different mechanism for risk allocation based on a “trust relationship,” depending on whether the parties have cooperated before, and each has a good reputation and the knowledge to manage risk.

A structured series of surveys in Hong Kong provided parallel insights into the growing enthusiasm for “joint risk management” and RC (Rahman and Kumaraswamy 2002b). RC itself is based on a previously developed philosophy that advocates more flexible contracts and less opportunistic contracting in general than in “classical” contracting (Macneil 1974, Coase 1988). RC for example, benefits from a flexibility to respond jointly to some special situations (e.g., unforeseen risks) in far more efficient integrated approaches, that could not have been detailed in classical contracts (Rahman and Kumaraswamy 2002a). Thus the classical/traditional contracts would have effectively precluded joint approaches, thereby excluding valuable contributions from, say, the contractor in one case, or the designer in another case, because the risk had been allocated to one party, whereas the other party could have helped to mitigate a particular situation, e.g., by redesign or by opening up some work, respectively. Fear of opening

up claims instead, may deter such sensible approaches in traditional contracts that leave no room for dynamic joint risk management or RC.

Relational Approaches through Partnering and Alliancing

RC can be recognized as the theoretical foundation for popular practices of partnering and alliancing in construction, that are now proliferating, following successes in many countries such as the United States, the United Kingdom, Australia, and Hong Kong. The birth, growth, and successes of construction project partnering in the United States are well documented (e.g., Crane et al. 1999; Glagola and Sheedy 2002). The development of progressive “generations” of partnering and corresponding levels of integration have been tracked by the Reading Construction Forum (1998), which identified key principles, including mutual objectives, joint problem solving, and continuous performance measurement, also indicating cost and time savings. Periodic reviews of partnering research have summarized important aspects progressively, e.g., by Li et al. (2000). Critical success factors for partnering in construction projects are being identified (Chan et al. 2004). A wider knowledge base of good practices in partnering are also being developed (Kumaraswamy et al. 2003b). Landmark cases of collaboration are also being documented, as in the National Museum project in Australia (Hauck et al. 2004). The underlying thread of the need for cooperation in achieving construction projects success is being continually reinforced, e.g., by Phua and Rowlinson (2004). More flexible forms of contract have been developed to facilitate effective project management and provide many delivery options. For example, the New Engineering Contract (now called the Engineering Construction Contracts), as developed by the Institution of Civil Engineers, London, in the early 1990s, provides a suite of flexible contracts (Eggleston 1996). This and other forms of contracts have been further developed to incorporate the “partnering option,” thereby legitimizing such relational approaches which were previously discounted as noncontractual.

Teamworking

It is increasingly evident that “structural integration” of functions and/or organizations, and even less rigid (and more relational) contracts are not enough. These are just a necessary prelude to the “relational integration” that must remove the major barriers to working effectively together, and empower potential synergies. The required change in “mind sets” and “culture” has been examined in the companion paper (Kumaraswamy et al. 2005).

Here it is worth drawing on the human relations based theories of “groups” and team dynamics, and general industry approaches to better team building and teamworking, as also well documented in parallel. For example: Mullins (1999) assigns importance to team building and various team roles in the context of better management and organizational performance; Belbin (2004) develops an interesting general teamworking model that could be adapted for construction, in, e.g., “improving workplace relationships”; and Rippin (2002) provides practical pointers to “getting the most from teams and teamworking.” Constructing Excellence (2004) sets out concepts and benefits of teamworking in the United Kingdom, whereas demonstration projects like Teamwork 2001, under the Rethinking Construction (Egan 1998) initiative, show how integrated working cuts waste and enhances

value. How these innovative concepts and good practices can be developed into “relationally integrated value networks” has been proposed by Kumaraswamy et al. (2003b).

Integrating Approaches to Building Integrated Teams

Taking partnering as the most common manifestation of RC at present, it may be noted that many researchers into partnering, such as Cheng and Li (2002) and Chan et al. (2004), have often focused on identifying the strengths, barriers, and critical success factors of various forms of such collaborative working arrangements. Useful findings have been generated on those aspects, and a further focus would now be useful, in identifying how stronger relationships can be generated in order to reach higher levels of more sustainable and rewarding partnering. Partnering and alliancing can be justified, even in the public sector, through the reduced transaction costs and increased efficiencies (Rahman and Kumaraswamy 2002a). Both RC and teamworking theories can thus be drawn upon in integrating approaches to such deeper and sustainable team building. Reinforcing these theoretical insights with an empirical approach, the factors facilitating and impeding the building of integrated project teams are explored from the perspectives of contractors presently operating in Singapore, as described in the following sections.

Research Method

Precursor Hong Kong based studies (Rahman and Kumaraswamy 2002b, Rahman 2003) had yielded interesting evidence of general industry enthusiasm for constructing relationally integrated supply chains and project teams. The present study provides opportunities to survey the potential for actual implementation in more depth, and in other countries. The particular emphasis is on assessing the potential for (1) the significant reconstruction of construction “cultures” in a RC-based framework and (2) the building up of relationally integrated teams within that framework.

It was decided to carry out this questionnaire survey in Singapore, since it was particularly interesting to gauge the perceptions of contractors in this country, where functional integration (e.g., of the design and “build” functions) had been emphasized more than teamworking, in their industry report (Construction 21 1999), whereas relational integration had been emphasized in many other recent industry reports as discussed previously, e.g., in the United Kingdom, Australia, and Hong Kong.

The questionnaire comprised various sections. The relevant sections that focus on the factors facilitating and impeding/detering the building of integrated teams are shown in the Appendix. The 7-point Likert scale solicits the perceived level of importance of various (1) facilitators and (2) deterrents/barriers to integrated teams. The proposed factors were themselves based on outputs from a precursor study (Rahman and Kumaraswamy 2002b, 2004; Rahman 2003) and the more recent literature review. Twenty-eight potential facilitators and 31 potential deterrents/barriers were identified in the questionnaire and any supplementary factors were also solicited.

The questionnaire was mailed for detailed data collection in Singapore. The target group of big and medium sized contractors was selected based on random sampling from the contractors’ registry of the Building and Construction Authority (BCA) (<http://www.bca.gov.sg>). The sample was broadly categorized into four main groups of contractors according to their financial grade

Table 1. Profile of Respondent Organization Categories

Contractor category	Tender limit (million Singapore \$)	Paid-up capital (million Singapore \$)	Number of respondents
A1	Unlimited	15.0	10
A2	65.0	6.5	14
B1	30.0	3.0	18
B2	10.0	1.0	17
Unknown			1
Total	200		60

under the BCA contractors’ registry. The selected groups were: A1 contractors—unlimited tendering limit, minimum S\$15 M paid-up capital; A2 contractors—S\$65 M tendering limit, minimum S\$6.5 M paid-up capital; B1 contractors—\$30 M tendering limit, minimum S\$3 M paid-up capital; and B2 contractors—S\$10 M tendering limit, minimum S\$1 million paid-up capital. A total of 200 questionnaires were issued to these four groups of contractors to gather the required data for analysis.

The mail and self-administered questionnaire data collection method was employed in this research. A covering letter explaining the purpose of the research was written to seek the understanding and cooperation of potential respondents. In order to secure a better response rate, a summary of the survey findings was offered to those interested. In addition, self-addressed and stamped envelopes were provided for the convenience of the respondents. The survey was carried out toward the end of 2003.

The responses were grouped on the basis of organizational size and experience. Statistical tests were carried out to: (1) test the significance of the responses on different items, as well as on any differences in perception between the above groupings; and (2) categorize the significant factors (both “facilitators” and “deterrents” separately) into broader “factor” categories that would present “wider targets” for top management attention.

Profile of Respondents

30% of issued questionnaires (60 out of the 200 posted) were completed and returned within 3 weeks, indicating a good response rate in comparison to recent surveys of construction organizations in Hong Kong (Rahman 2003) and in Singapore itself, where a recent survey on construction innovations yielded only 6% responses within one month of issue (Ling 2003). The respondents seem evenly spread across the four grades of contractors as in Table 1, apart from the single response that could not be classified.

24% of the respondents were from top management as identified in the breakdown by top, middle, and professional management in Table 2. The profile of respondents’ experience in different types of construction organization was also analyzed. Although indicating a certain degree of direct exposure to viewing the industry through “other perspectives,” e.g., while working in consultant organizations, most of the respondents had predominantly worked with contractors, e.g., 40 of the 60 had worked only with contractors, whereas 10 had worked with both consultants and contractors (and were now with contractors), and a handful had worked with private and/or public clients as well.

In terms of total years of experience in the construction industry: this ranged from 12 having “1–5 years experience,” to 9 respondents having over 20 years experience, and the largest

Table 2. Managerial Profile of Respondents

Designation of respondents	Number	Percentage
Top management		
General manager	10	20
Director	1	2
Deputy general manager	1	2
Middle management		
Project manager	6	11
Contracts manager	3	6
Professional management		
Quantity surveyor	23	45
Training officer	1	2
Engineer	6	12
Total	51	100

Note: Nine respondents did not provide information.

number (19) having “6–10 years experience.” In terms of experience in RC approaches, this ranged from 38 (63%) having no RC experience, 13 (22%) having “1–3 years experience,” 6 (10%) having “4–6 years experience” and 3 having above 6 years experience. The foregoing profiles confirm that RC approaches are relatively new in the Singaporean construction industry.

Basic Analysis of Facilitators and Deterrents

Factors Facilitating Building a Project-Based Integrated Team

From Table 3, 27 out of 28 factors identified are likely to facilitate building a project based integrated team for more effective relational contracting. However, the factor of an independent full-time facilitator to supplement the project manager in building trust, teamworking and “can do” spirit and enhancing cooperative learning among contracting parties (factor 4.26) has a significance of 0.066. At the 95% confidence interval, there is insufficient evidence to show that it is important for team building because the corresponding significance level is greater than 0.05.

The three most important factors were reputation in the industry (of each party) (4.8), disclosing project information to potential partners at early stages of a project for any optional feedback, as appropriate (4.17), and previous performance records on “soft factors” such as joint decision making, joint problem solving, and compromises on unclear issues (each party) (4.15).

Better reputation is closely associated with greater trust. Dollinger et al. (1997) found in their experimental study that the better a firm’s reputation the more likely it is to be targeted as an alliance partner. A reputation for “fair dealing” becomes a business asset and can substitute for detailed contractual controls (Powell 1990; Klein 1997; Gulati 1998). When contracting parties are confident that their partners are credible and capable, trust building can occur more easily.

It was suggested by Cheng and Li (2002) that joint problem solving was the most critical component in partnering applications; whereas Rahman (2003) similarly identified joint risk management as critical in RC. This underscores the importance of such joint decision making approaches in the team building process, based on joint risk management and joint problem solving.

The three least important factors were more workshops for better interactions to build trust/reliability (4.21), learning about RC approaches before contracting (all parties) through workshop,

Table 3. One-Sample *t*-Test of Factors Facilitating the Building of Project-Based Integrated Teams

Rank	Factor ^a	Test value=3			
		Mean	Standard deviation	<i>t</i>	Significance level (1-tailed)
23	4.1	3.60	1.182	3.933	0.0001
24	4.2	3.47	1.282	2.820	0.0033
21	4.3	3.63	1.089	4.506	0.0000
27	4.4	3.28	1.059	2.072	0.0213
22	4.5	3.62	0.739	6.468	0.0000
20	4.6	3.65	0.936	5.381	0.0000
14	4.7	3.98	0.911	8.359	0.0000
1	4.8	4.60	0.867	14.287	0.0000
4	4.9	4.42	0.869	12.624	0.0000
8	4.10	4.20	0.898	10.349	0.0000
11	4.11	4.13	0.769	11.409	0.0000
12	4.12	4.12	0.940	9.197	0.0000
18	4.13	3.77	0.593	10.018	0.0000
25	4.14	3.43	0.831	4.040	0.0001
3	4.15	4.43	0.810	13.703	0.0000
10	4.16	4.17	0.763	11.847	0.0000
2	4.17	4.57	1.047	11.585	0.0000
13	4.18	4.02	1.112	7.081	0.0000
7	4.19	4.23	0.851	11.225	0.0000
16	4.20	3.93	0.686	10.545	0.0000
26	4.21	3.43	0.789	4.254	0.0000
15	4.22	3.95	0.622	11.824	0.0000
5	4.23	4.27	0.733	13.378	0.0000
9	4.24	4.20	0.632	14.697	0.0000
17	4.25	3.92	0.829	8.561	0.0000
28	4.26	3.18	0.930	1.528	0.0660
19	4.27	3.67	0.752	6.870	0.0000
6	4.28	4.25	0.728	13.304	0.0000

^aSee the Appendix.

seminar or training within the company (4.4), and requirement of an independent full-time facilitator to supplement the project manager in building trust, teamworking and can do spirit and enhancing cooperative learning among contracting parties (4.26). This aligns with the findings of Schultzel and Unruh (1996), who classified workshops as a “hygiene factor” to partnering—so that more workshops do not improve performance, but the absence of workshops can lower performance levels. This also concurs with the findings of Cheng and Li (2001) that workshops are not critical for the building of a project based integrated team.

Factors Deterring the Building of Project-Based Integrated Teams

From Table 4, all the factors in Section 5 of the questionnaire have significance levels which are less than 0.05 except for factors 5.5, 5.6, 5.7, 5.16, and 5.17. Therefore, there is insufficient evidence that respondents generally agree that the following factors inhibit the team building process for relational contracting: bureaucratic client organization (5.5), stringent/incompatible public sector rules and regulations (5.6), public sector accountability concerns (5.7), separated and unrelated risk–reward plans for different parties (5.16), and exclusion of consultants in risk–reward plan (5.17). The results correspond closely with the results of the findings to questions on factors impeding RC, which are reported

Table 4. One-Sample *t*-Test of Factors Deterring the Building of Project-Based Integrated Teams

Rank	Factor ^a	Test value=3			
		Mean	Standard deviation	<i>t</i>	Significance level (1-tailed)
22	5.1	3.50	1.321	2.931	0.0024
9	5.2	3.98	1.049	7.258	0.0000
6	5.3	4.20	0.898	10.349	0.0000
20	5.4	3.58	1.030	4.387	0.0000
29	5.5	2.75	1.373	-1.410	0.9591
31	5.6	2.38	1.379	-3.464	0.9998
30	5.7	2.42	1.406	-3.214	0.9995
10	5.8	3.97	0.901	8.307	0.0000
12	5.9	3.87	0.536	12.531	0.0000
14	5.10	3.80	0.755	8.211	0.0000
1	5.11	5.38	1.106	16.690	0.0000
4	5.12	4.50	0.930	12.497	0.0000
24	5.13	3.42	0.869	3.713	0.0002
16	5.14	3.72	0.640	8.671	0.0000
15	5.15	3.77	0.673	8.822	0.0000
28	5.16	2.85	1.102	-1.054	0.9260
27	5.17	3.03	0.991	0.261	0.3977
23	5.18	3.47	0.873	4.142	0.0001
26	5.19	3.35	0.840	3.227	0.0010
11	5.20	3.97	0.663	11.294	0.0000
18	5.21	3.63	0.802	6.118	0.0000
21	5.22	3.52	0.854	4.689	0.0000
19	5.23	3.62	0.825	5.788	0.0000
25	5.24	3.40	0.827	3.744	0.0002
7	5.25	4.20	0.732	12.701	0.0000
3	5.26	4.60	0.867	14.287	0.0000
17	5.27	3.70	0.926	5.855	0.0000
5	5.28	4.35	1.087	9.624	0.0000
2	5.29	5.13	1.016	16.260	0.0000
13	5.30	3.85	0.840	7.836	0.0000
8	5.31	4.15	0.799	11.151	0.0000

^aSee Appendix.

in the companion paper (Kumaraswamy et al. 2005). This also shows that the respondents were consistent in their answers and increases the credibility of the results.

The three most important factors were lack of trust and reliability among contracting parties (5.11), discontinuation of open and honest communication (5.29), and failure to share information among contracting parties (5.26). Sharing of information is therefore considered critical in building an integrated team.

Further Analysis of Survey Outcomes

Evaluating Differences between Large and Medium Contractors

The 24 respondents in A1 and A2 grades (as classified in Table 1) were taken to be "large contractors." Those in B1 and B2 grades were considered to be "medium contractors." Any differences in perceptions between these "large" and "medium" were assessed by applying the ANOVA test with the help of the SPSS (Chicago, Ill.) statistical package.

Table 5 shows only one significant difference between these groups: In the perceived importance of the role of a facilitator in building trust, teamworking and can do spirit, and enhancing cooperative learning among contracting parties (factor 4.24) in forming integrated teams. The fact that larger contractors are stronger advocates of the role of a facilitator in RC may possibly be linked to the fact that they have been in a better financial position to engage one, and thereby experience such benefits.

Table 6 shows no significant differences between ratings on factors deterring the construction of a project based integrated team. The null hypothesis is retained in this case, suggesting that construction firms, irrespective of their size, generally have similar opinions regarding the importance of barriers to building a project based integrated team for more effective RC.

Evaluating Differences between those "With" and "Without" Relational Contracting Experience

Of the 60 respondents, only 22 had some level of experience in RC approaches, ranging from 13 who had 1–3 years experience, to 3 had more than 6 years experience. Thirty-eight had not been exposed to RC in practice, but were apparently aware of the concepts, whereas such appreciations must have been reinforced by the introductory remarks on RC provided in the covering letter with questionnaire. ANOVA was again applied to assess the differences with and without RC experience. The null hypothesis was supported for all factors in Table 6, since the significance levels were all greater than 0.05. This indicates a general similarity of opinions on the importance of factors facilitating the building of integrated teams, irrespective of the degree of present exposure to RC. This may be possibly linked to disillusionment with non-RC approaches as well.

However, the respondents with practical RC experiences identified four variables as more important, in relation to factors deterring the building of project based integrated teams (see Table 6). The alternative hypothesis is accepted for those factors where the significance level is less than 0.05. From Table 6 these four factors are: absence of any risk-reward plan (5.15), absence of contractual relations between client and major subcontractors (5.21), and lack of any relationships and communications between both clients (5.22) and consultants (5.23) with their major suppliers. It appears that those with RC experience can be expected to have developed more insights into the problems and potential solutions.

Factor Analysis

Given the large number of important factors emerging from the above outcomes, "factor analysis" was used to group the factors into more "manageable" categories or components. Each component is expected to contain a cluster of similar factors that may be "managed" with a common approach. Such factor analysis has been described more broadly by Kim and Mueller (1978) and Norušis (2002). After such grouping, each component would appear to be homogenous, while those in different clusters/components would appear to be quite different.

Factors Facilitating Building a Project-Based Integrated Team

Table 7 summarizes the factor analysis outcomes after analyzing the factors facilitating the building up of a project based inte-

Table 5. Factors Facilitating Integrated Team Building: Different Views Based on Respondents' Financial Grading and Relational Contracting Experience

Number	Contractor mean		F	Significance level	Mean		F	Significance level
	"Large"	"Medium"			No experience	With experience		
4.1	3.33	3.74	1.744	0.192	3.63	3.55	0.073	0.788
4.2	3.13	3.66	2.539	0.117	3.55	3.32	0.462	0.499
4.3	3.58	3.63	0.024	0.876	3.66	3.59	0.052	0.821
4.4	3.29	3.26	0.015	0.904	3.37	3.14	0.665	0.418
4.5	3.67	3.54	0.414	0.522	3.58	3.68	0.267	0.607
4.6	3.58	3.66	0.089	0.767	3.61	3.73	0.234	0.631
4.7	3.88	4.06	0.555	0.459	4.08	3.82	1.144	0.289
4.8	4.67	4.57	0.168	0.684	4.58	4.64	0.060	0.807
4.9	4.29	4.49	0.699	0.407	4.47	4.32	0.442	0.509
4.10	4.21	4.20	0.001	0.973	4.18	4.23	0.031	0.860
4.11	4.08	4.17	0.181	0.672	4.18	4.05	0.449	0.506
4.12	4.04	4.17	0.263	0.610	4.16	4.05	0.196	0.659
4.13	3.79	3.74	0.094	0.761	3.76	3.77	0.004	0.953
4.14	3.29	3.51	1.013	0.318	3.37	3.55	0.629	0.431
4.15	4.29	4.54	1.360	0.248	4.50	4.32	0.698	0.407
4.16	4.08	4.20	0.330	0.568	4.24	4.05	0.875	0.353
4.17	4.25	4.77	3.637	0.062	4.68	4.36	1.312	0.257
4.18	4.21	3.89	1.181	0.282	4.00	4.05	0.023	0.880
4.19	4.04	4.34	1.802	0.185	4.29	4.14	0.447	0.507
4.20	3.83	4.00	0.825	0.368	3.97	3.86	0.355	0.554
4.21	3.38	3.46	0.151	0.699	3.39	3.50	0.245	0.623
4.22	4.04	3.89	0.877	0.353	3.92	4.00	0.221	0.640
4.23	4.29	4.26	0.031	0.862	4.18	4.41	1.317	0.256
4.24	4.42	4.06	4.830	0.032^a	4.16	4.27	0.455	0.503
4.25	3.96	3.89	0.106	0.746	3.95	3.86	0.140	0.710
4.26	3.29	3.09	0.693	0.409	3.34	2.91	3.133	0.082
4.27	3.75	3.60	0.555	0.459	3.76	3.50	1.729	0.194
4.28	4.17	4.29	0.377	0.541	4.32	4.14	0.845	0.362

^aFactors with a significance level lower than 0.05.

grated team. Four components emerged from this analysis, and together they accounted for 60% of the total explained variations. The percentage variations explained by these four components are 23, 15, 14, and 8%. The four components are discussed in the following.

Component 1—Client's competencies and overall learning/training policy: This component consists of 8 factors that focus mainly on client's knowledge of project processes and enhancing cooperative learning among contracting parties. This component is consistent with the Omaha District U.S. Army Corps of Engineers (USACE) (1991) findings that formal and long-term training programs are imperative for successful corporate change. Formal training is an essential step to equipping employees with knowledge and skills needed to work through conflict and adversity to change the industry's culture. The client also plays an important role in facilitating the team building process. A client who is knowledgeable in project processes and appreciates the value of RC is likely to be more enthusiastic in initiating integrated team building.

Component 2—Previous interactions, performance, competencies, and specific inputs and outputs of various partners: This component contains or represents 6 factors that focus mainly on familiarity among the partnering parties and a careful assessment of the competencies and potential special inputs of the contracting parties. This involves knowledge of the resources, technical skills, previous performance and industry reputation of each party. As-

essment may include an appraisal of any prior experience which the parties have in RC approaches.

Component 3—Compatible organizational culture, longer term focus and emphasis on trust building: This component includes six factors which emphasize the "fit" of the organizational culture of involved parties and the ability to build trust and reliability through longer-term interactions. This finding concurs with Crane et al. (1997) that contracting parties should assess their ability to partner based on the company culture and work processes. It has also been shown that developing a closer and possibly longer term working relationship has been held up as a way of overcoming the many perceived barriers to efficiency, and of facilitating team building (CII 1993).

Component 4—Improved selection of project partners and better responsibility delegation: This component contains or represents 7 factors. It is clear from the loadings that this factor emphasizes the aspect of partners' competencies instead of price only consideration. It also includes the disclosure of important project information to potential partners at early stages of project for any optional feedback. Delegation of responsibility is also an important aspect to consider for successful team building.

Factors Deterring Building a Project-Based Integrated Team

Table 8 shows the factor analysis results in terms of the factors deterring the building of project based integrated teams. Five

Table 6. Factors Deterring Integrated Team Building: Different Views Based on Respondents' Financial Grading and Relational Contracting Experience

Number	Contractor mean			Significance level	Mean			Significance level
	"Large"	"Medium"	F		No experience	With experience	F	
5.1	3.29	3.63	0.911	0.344	3.53	3.45	0.040	0.841
5.2	4.13	3.86	0.926	0.340	4.05	3.86	0.448	0.506
5.3	4.38	4.06	1.802	0.185	4.21	4.18	0.014	0.906
5.4	3.46	3.63	0.391	0.534	3.53	3.68	0.314	0.577
5.5	3.00	2.54	1.590	0.213	2.68	2.86	0.235	0.630
5.6	2.67	2.11	2.455	0.123	2.37	2.41	0.012	0.913
5.7	2.71	2.14	2.466	0.122	2.37	2.50	0.120	0.730
5.8	3.92	3.97	0.052	0.820	4.11	3.73	2.513	0.118
5.9	3.92	3.83	0.375	0.543	3.82	3.95	0.934	0.338
5.10	3.75	3.83	0.150	0.700	3.76	3.86	0.244	0.623
5.11	5.29	5.49	0.438	0.511	5.29	5.55	0.743	0.392
5.12	4.58	4.46	0.256	0.615	4.42	4.64	0.744	0.392
5.13	3.46	3.37	0.139	0.711	3.34	3.55	0.759	0.387
5.14	3.75	3.69	0.139	0.710	3.66	3.82	0.871	0.354
5.15	3.88	3.69	1.111	0.296	3.63	4.00	4.416	0.040^a
5.16	2.83	2.83	0.000	0.987	2.74	3.05	1.094	0.300
5.17	3.00	3.03	0.012	0.915	2.95	3.18	0.777	0.382
5.18	3.33	3.54	0.809	0.372	3.32	3.73	3.214	0.078
5.19	3.29	3.37	0.126	0.724	3.21	3.59	2.950	0.091
5.20	4.04	3.89	0.806	0.373	3.87	4.14	2.327	0.133
5.21	3.54	3.66	0.302	0.585	3.47	3.91	4.341	0.042^a
5.22	3.50	3.49	0.004	0.949	3.32	3.86	6.251	0.015^a
5.23	3.67	3.54	0.327	0.570	3.45	3.91	4.630	0.036^a
5.24	3.38	3.37	0.000	0.987	3.29	3.59	1.876	0.176
5.25	4.21	4.17	0.036	0.851	4.21	4.18	0.021	0.885
5.26	4.50	4.66	0.457	0.502	4.63	4.55	0.135	0.714
5.27	3.79	3.60	0.616	0.436	3.63	3.82	0.562	0.457
5.28	4.08	4.54	2.576	0.114	4.29	4.45	0.318	0.575
5.29	4.88	5.31	2.692	0.106	5.16	5.09	0.060	0.808
5.30	3.75	3.89	0.373	0.544	3.84	3.86	0.009	0.925
5.31	4.21	4.09	0.332	0.566	3.97	4.45	5.428	0.023^a

^aFactors with a significance level lower than 0.05.

components emerged from this analysis, and together they account for 64% of the total explained variations. The percentage variations explained by the five components are 14, 13, 13, 13, and 11%. The five factors are discussed in the following.

Component 1—Lack of trust, open communication and uneven commitment: This component contains and represents 5 factors that focus mainly on lack of trust and reliability among contracting parties, failure to share information among contracting parties and discontinuation of open and honest communication. It is associated with uneven commitment of contracting parties and persistence of a "master-slave" concept. These are typical problems found in the traditional win-lose relationship (Edelman et al. 1991; Peters 1991; Warne 1992).

Component 2—Commercial pressures, absent or unfair risk-reward plan, incompatible personalities and organizational cultures: This component contains 9 factors. It is clear from the factor loadings that emphasis is placed on the absence of risk-reward plan and cultural clash at the individual and corporate level. It is essential for expectations to be validated in advance (Slater 1998). This allows the participating parties to resolve their corporate and individual differences which can hinder the team building process. The presence of an equitable risk-reward plan

can act as a safeguard against opportunistic behavior under commercial pressures.

Component 3—Lack of general top management commitment and client's knowledge/initiative: This component consists of 4 factors that focus mainly on the lack of top management commitment and client's knowledge. The commitment of upper management in each organization is fundamental. Senior personnel can nurture and reinforce the partnering process (Edelman et al. 1991), even countering the arguments of detractors (Kubal 1994). The client can more effectively drive the team building process as the project financier.

Component 4—Lack of good relationships among the team players: This component represents 4 factors which deal with the lack of good relationships and communications among the project team which may deter building a project based integrated team for RC. Through personal relationships and communication about each stakeholder's risks and goals, there is better understanding, which leads to trust and, possibly, team synergy (Uher 1994).

Component 5—Exclusion of some team players in risk-reward plan, errors and cultural inertia: This component represents 4 factors which emphasize the exclusion of consultants, major subcontractors and major suppliers in any risk-reward plan. Resis-

Table 7. Factor Analysis of Factors Facilitating a Project-Based Integrated Team

Factor	h^2	Factor loading	Component (eigenvalue/percentage)
4.1	0.779	0.834	Client's competencies and overall learning/training policy (6.307/23%)
4.2	0.754	0.754	
4.3	0.653	0.708	
4.4	0.686	0.769	
4.5	0.664	0.646	
4.6	0.726	0.575	
4.21	0.570	0.611	Previous interactions, performance, competencies, and specific inputs and outputs of various partners (4.168/15%)
4.27	0.657	0.524	
4.7	0.714	0.702	
4.8	0.631	0.462	
4.10	0.688	0.742	
4.11	0.834	0.647	
4.12	0.774	0.773	Compatible organizational culture, longer term focus and emphasis on trust building (3.692/14%)
4.18	0.698	0.552	
4.13	0.746	0.841	
4.14	0.659	0.463	
4.15	0.754	0.832	
4.17	0.744	0.797	
4.20	0.694	0.793	Improved selection of project partners, and better responsibility delegation (2.210/8%)
4.28	0.672	0.459	
4.9	0.614	0.536	
4.16	0.829	0.606	
4.19	0.757	0.576	
4.22	0.766	0.856	
4.23	0.721	0.682	Exclusion of some team players in risk-reward plan, errors and cultural inertia (2.783/11%)
4.24	0.609	0.515	
4.25	0.811	0.788	

tance of contracting parties to an integrated project culture may ensue from such asymmetry and inequities in the risk-reward plan.

Discussion

Facilitating Integrated Teams

Twenty-eight factors that may possibly facilitate the construction of a project based integrated team are tested and 27 factors are found to be significantly important in facilitating the relational contracting process. Specific findings emerged, e.g., that it is not important to have an independent full-time facilitator to supplement the project manager in building trust, teamworking and can do spirit and enhancing cooperative learning among contracting parties. On the other hand, the most important factor is "reputation in the industry (of each party)"; and the second most important factor is "disclosing project information to potential partners at early stages of a project."

The ANOVA test was used to evaluate different perceptions of various groups. On comparing the various groups, it was found that larger contractors are stronger advocates of the role of a facilitator (factor 4.24) in forming integrated teams. On the other hand, construction professionals, whether with or without RC experience, expressed similar opinions regarding the importance of factors facilitating the process of team building.

Table 8. Factor Analysis of Factors Deterring a Project-Based Integrated Team

Label	h^2	Factor loading	Component (and eigenvalue/percentage)
5.11	0.721	0.829	Lack of trust, open communication and uneven commitment (3.717/14%)
5.26	0.777	0.858	
5.27	0.565	0.410	
5.28	0.513	0.624	
5.29	0.861	0.887	
5.8	0.357	0.442	
5.9	0.424	0.605	Commercial pressures, absent or unfair risk-reward plan and incompatible personalities and organizational cultures (3.489/13%)
5.10	0.252	0.356	
5.12	0.372	0.449	
5.13	0.458	0.602	
5.14	0.465	0.656	
5.15	0.709	0.740	
5.20	0.555	0.511	Lack of general top management commitment and client's knowledge/initiative (3.344/13%)
5.31	0.449	0.492	
5.1	0.654	0.674	
5.2	0.842	0.902	
5.3	0.799	0.858	
5.4	0.657	0.600	
5.21	0.737	0.837	Lack of good relationships between the team players (3.254/13%)
5.22	0.842	0.898	
5.23	0.926	0.938	
5.24	0.697	0.577	
5.18	0.839	0.854	
5.19	0.838	0.879	
5.25	0.548	0.589	Exclusion of some team players in risk-reward plan, errors and cultural inertia (2.783/11%)
5.30	0.730	0.526	

Factor analysis was conducted and the following four components were extracted, although the factors within these components accounted for only about 53% of the overall variations:

- Client's competencies and overall learning/training policy;
- Improved selection of project partners and better responsibility delegation;
- Previous interactions, performance, competencies, and specific inputs and outputs and trust building of various partners; and
- Compatible organizational culture and longer term focus.

Barriers to Integration

Thirty-one factors identified as potential deterrents to an integrated team approach to RC were tested and 26 factors were found to be significantly important. Specific findings emerged: for example the factor that least deters building of an integrated team is: "stringent/incompatible public sector rules and regulations." The most important factor deterring integrated team building is "lack of trust/reliability among contracting parties."

Again using the ANOVA tests, it was also found that construction firms, irrespective of company size, do not exhibit any significant differences in their opinions regarding the importance of barriers to building a project based integrated team for more effective relational contracting. On the other hand, respondents with prior experience have rated the absence of any risk-reward plan, absence of contractual relations between client and major subcontractors and lack of any relationships and communications be-

tween both clients and consultants with their major suppliers, as more important than those without experience in RC in the team building process.

Factor analysis was also conducted and five components were extracted, although the factors within these components were not always as consistent or clear cut as in the previous analysis. Still they accounted for 64% of the overall variations:

- Lack of trust, open communication and uneven commitment;
- Commercial pressures, absent or unfair risk–reward plan, incompatible personalities and organizational cultures;
- Lack of general top management commitment and client’s knowledge/initiative;
- Lack of good relationships between the team players; and
- Exclusion of some team players in risk–reward plan, errors and cultural inertia.

Comparisons of Questionnaire Response Analyses

As indicated earlier, the major research on RC comprised two parts: facilitating RC culture and building integrated teams. The detailed findings on RC culture are reported in the companion paper (Kumaraswamy et al. 2005) that focused on factors facilitating and impeding such a relational contracting culture. This paper reports on the second part. It is useful to integrate the findings for both parts in order to gain a holistic overview that will enable mapping of the way forward.

Factor analyses of the factors facilitating and impeding project based integrated teams yielded less components (4 and 5, respectively) than those related to the “relational contracting culture” (6 and 7, respectively), as seen in the companion paper (Kumaraswamy et al. 2005). But the degree of total “explanation” of the variations by these components is also less (53 and 64%, respectively), compared to 70 and 72% in the case of fostering relational contracting culture. This implies that there may be less grouping/clustering and more unrelated factors among those facilitating or impeding the construction of integrated teams, as compared to those facilitating or impeding a relational contracting culture. This could be attributed to the diversity of contributors and barriers to practical short-term team building (as needed in a project time frame); as well as the supersensitivity of emerging project teams to a wide variety of forces and variable factors.

Framework for the Way Forward

The analyses of the responses to the first two questions in the precursor/companion paper yielded useful findings, e.g., that “trust” is the most important factor in the development of an RC culture; whereas “open communication” was ranked second out of 24 important factors identified therein. “Teamworking and can do spirit” was ranked third. Therefore the identified importance of this “teamworking” factor mutually reinforces the value and criticality of the complementary findings in the present paper. The challenge is to guide project participants away from their traditional adversarial attitude to more cooperative and collaborative mindsets. The international literature and previous studies reinforce the present findings, e.g., for overcoming the high costs of mistrust in Canadian contracts that were identified by Zaghoul and Hartman (2003); and the increasing need for relationally integrated supply chains (Palaneeswaran et al. 2003).

Further, interim conceptual models were formulated in the companion paper (Kumaraswamy et al. 2005) to illustrate the benefits of moving from traditional to relational contracts and from cultural inertia and/or clashes to cultural synergies in a re-

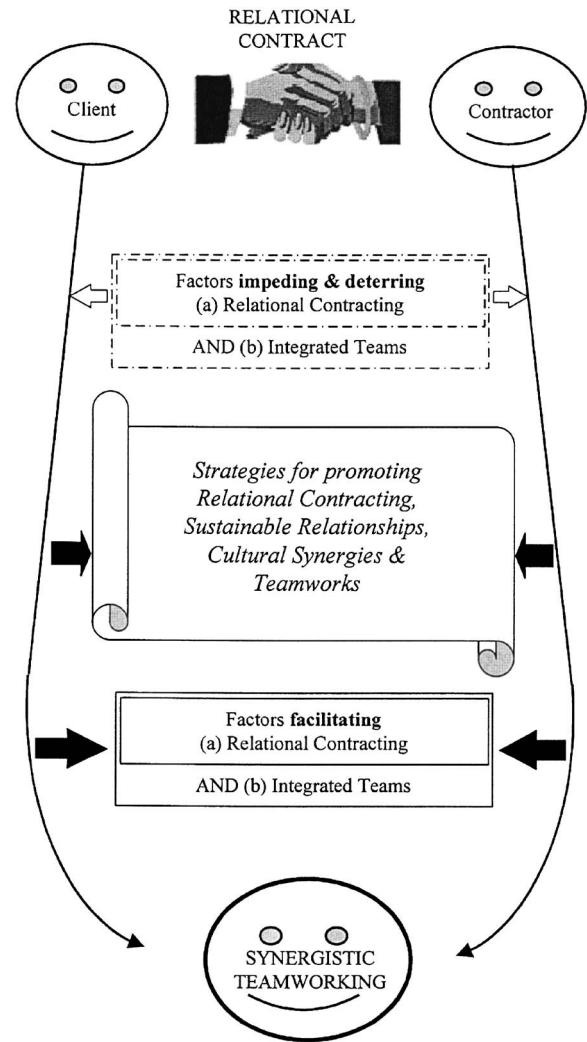


Fig. 1. Potential team integration in relational contracts

lational culture setting. However, it was also noted that a relational culture must be reinforced and sustained through integrated teams. Attention has been drawn to worldwide exhortations to construction industries to activate step changes in performance based on relational approaches and integrated teams. Drawing on the consolidated findings of both parts of the research leads to the formulation of a combined basic model as in Fig. 1, that depicts synergistic teamworking as a logical outcome of a truly relational culture.

Now that the relevant factors and their relative strengths have been identified, it appears necessary to simultaneously (1) mobilize the factors and forces facilitating both relational contracting cultures and integrated teams; and (2) counteract the factors/forces impeding/deterring relational contracting cultures and integrated teams. The reported research, focusing on identifying various facilitating and deterring factors for integrated teams, relies on the perceptions of the survey respondents. A logical focus of future research would be to formulate and test a suitable matrix to evaluate the degree of integration of different project teams.

Conclusions

The move from “classical contracting” and traditional transactions to relational contracting provides a theoretical foundation

for the desired cooperative teamworking and consequential performance improvements. However, the effectiveness of this shift depends on the convictions and motivation of the people who drive it. For example, since trust was found to be the most important factor in constructing a relational culture, a virtual cultural revolution is needed to break down barriers to such mutual trust building. Traditional adversarial attitudes need radical transformation towards more cooperative and collaborative thinking. While this journey has started with partnering, alliancing and other such arrangements, a top to bottom realignment and across-the-board commitment are needed in order to reach the desired destination; and to keep moving further with continuous improvements.

The survey results revealed that the current trust levels in the industry are still low, despite the evidently widespread appreciation of the need for a relational culture and integrated teams. The dangers and high costs of “mistrust” have also been identified in previous studies elsewhere, e.g., in Canada. Strategies and specific mechanisms are evidently needed to develop trust, for example through a series of collaborative projects. The factors and forces identified in this study, as both facilitating and impeding relational contracting and integrated team building can therefore be valuable in this process. These can be linked to guidelines that may be applied when selecting team members (both organizations and individuals) for the project, so that their previous track record and/or capacity for relational teamworking can be assessed. More significantly, the importance assigned to this criterion will be conveyed to all project participants at the outset. They would then appreciate the need to “fit in” in order to be selected. Second, incentives in the form of appropriate risk-reward mechanisms may be incorporated to promote the ongoing team building, while paying attention to forces that have been identified in general, and specific factors that may be extracted in particular contractual regimes.

The results of the survey of Singapore-based contractors interestingly indicate the general appreciation of the need for relational integration, as against mere structural integration that was envisaged, e.g., through integrating the design and construction functions/operations. This aligns well with the previously identified needs for relational cultures and teamworking that have been directly identified in industry reports, as imperative for improved construction industry performance in other countries such as Australia, Hong Kong, and the United Kingdom; and are already being pursued in practice in those countries, as well as in others, including the United States, and Canada. The results also reinforce and suggest ways to move forward with findings in other contractual regimes. The research framework and reported methods may also be conveniently applied in other countries in order to map out region-specific force fields and significant factors.

Acknowledgment

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Appendix: Sections 4 and 5 from Questionnaire

4. Drivers/ Factors facilitating building a project based integrated team for more effective RC: Please rate the following factors by circling the relevant number (if responding on hard copy), or inserting cross (X) mark in the relevant box (if responding on soft copy).

Factors	Lowest importance = 0, Highest importance = 6						
	0	1	2	3	4	5	6
4.1 Enlightened and enthusiastic client	0	1	2	3	4	5	6
4.2 Knowledgeable client (about project processes and RC)	0	1	2	3	4	5	6
4.3 Client's initiative	0	1	2	3	4	5	6
4.4 Learning about RC approaches before contracting (all parties), e.g. at a workshop, seminar, or training within the company	0	1	2	3	4	5	6
4.5 Learning working in flexible contract/ teamworking environment before contracting with others (all parties), e.g. through training	0	1	2	3	4	5	6
4.6 Co-operative learning within project organisation	0	1	2	3	4	5	6
4.7 Familiarity/ previous relationships with/ among other parties	0	1	2	3	4	5	6
4.8 Reputation in the industry (each party)	0	1	2	3	4	5	6
4.9 Willingness/ enthusiasm of involved parties	0	1	2	3	4	5	6
4.10 Previous experience in RC approaches (each party)	0	1	2	3	4	5	6
4.11 Adequate resources and technical skills (each party)	0	1	2	3	4	5	6
4.12 Previous performance records on 'hard factors', e.g. time, quality, safety, etc. (each party)	0	1	2	3	4	5	6
4.13 Compatible organisational culture of involved parties	0	1	2	3	4	5	6
4.14 Inter-personal relations/ cultural harmony (individual level)	0	1	2	3	4	5	6
4.15 Previous performance records on 'soft factors', e.g. joint decision making, joint problem solving, compromises on unclear issues, etc. (each party)	0	1	2	3	4	5	6
4.16 Short-listing 'capable' (as in items 11-12) & 'compatible' (as in items 13-15) potential project partners, instead of 'price only' considerations	0	1	2	3	4	5	6
4.17 Disclosing project information to potential partners (as in item 16) at early stages of project for any optional feedback, as appropriate	0	1	2	3	4	5	6
4.18 Seeking specific inputs on constructibility, construction methods, materials, etc. from among potential partners (of item 16), for better project planning	0	1	2	3	4	5	6
4.19 Selecting the best possible 'capable and compatible' project team from among potential partners (of item 16)	0	1	2	3	4	5	6
4.20 Bringing contractor, major subcontractors and major suppliers into the project team, in appropriate cases, for longer-term interactions to build trust / reliability	0	1	2	3	4	5	6
4.21 More workshops for better interactions to build trust/ reliability	0	1	2	3	4	5	6
4.22 Use of single point responsibility - e.g. only one QS from the contractor representing all contracting parties in the project, instead of different QSs for various contracting parties	0	1	2	3	4	5	6
4.23 Group/ combined responsibility, as against individual responsibility - e.g. responsibility of binding decision making on 'unclear issues' by a pre-selected group comprising one person from each major party	0	1	2	3	4	5	6
4.24 Role of an independent full-time facilitator in building trust, teamworking & 'can do' spirit, and enhancing cooperative learning among contracting parties	0	1	2	3	4	5	6
4.25 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	0	1	2	3	4	5	6
4.26 Requirement for an independent full-time facilitator to supplement PM (Project manager) as per item 24 above	0	1	2	3	4	5	6
4.27 Company training policy to build adaptable individuals for working with diverse partners (each party)	0	1	2	3	4	5	6
4.28 Corporate strategy of building trust with potential partners by doing the 'right' things and meeting time & cost targets	0	1	2	3	4	5	6
Others: Please add more factors (from your experience) and rate							
4.29	0	1	2	3	4	5	6
4.30	0	1	2	3	4	5	6
4.31	0	1	2	3	4	5	6

5. Barriers/ Factors deterring building a project based integrated team for RC: Please rate the following factors by circling the relevant number (if responding on hard copy), or inserting cross (X) mark in the relevant box (if responding on soft copy).

Factors	Lowest importance = 0, Highest importance = 6						
	0	1	2	3	4	5	6
5.1 Lack of client's Knowledge (about project processes and RC)	0	1	2	3	4	5	6
5.2 Lack of commitment from top management: client	0	1	2	3	4	5	6
5.3 Lack of commitment from top management: other parties	0	1	2	3	4	5	6
5.4 Lack of client's initiatives	0	1	2	3	4	5	6
5.5 Bureaucratic client organisation	0	1	2	3	4	5	6
5.6 Stringent/ incompatible public sector rules and regulations	0	1	2	3	4	5	6
5.7 Public sector accountability concerns	0	1	2	3	4	5	6
5.8 'Price' only selection methods	0	1	2	3	4	5	6
5.9 Commercial pressures on contracting parties	0	1	2	3	4	5	6
5.10 Opportunistic behaviour of one or more contracting parties	0	1	2	3	4	5	6
5.11 Lack of trust/ reliability among contracting parties	0	1	2	3	4	5	6
5.12 Unwilling/ unenthusiastic participation of contracting parties	0	1	2	3	4	5	6
5.13 Inter-personal/ cultural clash (individual level)	0	1	2	3	4	5	6
5.14 Incompatible organisational culture (corporate level)	0	1	2	3	4	5	6
5.15 Absence of any risk-reward plan	0	1	2	3	4	5	6
5.16 Separate/ unrelated risk-reward plans for different parties	0	1	2	3	4	5	6
5.17 Exclusion of consultants in risk-reward plan	0	1	2	3	4	5	6
5.18 Exclusion of (major) subcontractors in risk-reward plan	0	1	2	3	4	5	6
5.19 Exclusion of (major) suppliers in risk-reward plan	0	1	2	3	4	5	6
5.20 Unfair risk-reward plan	0	1	2	3	4	5	6
5.21 Lack/ absence of contractual relations between client and major subcontractors, although they carry out major parts of work	0	1	2	3	4	5	6
5.22 Lack of any relationships/ communications between client & major suppliers, although information on & timely supply of some critical materials may improve project planning & works progress	0	1	2	3	4	5	6
5.23 Lack of relationships/ communications between consultants & suppliers, although information on source, price, supply time, etc. of some critical materials may improve design, planning & construction	0	1	2	3	4	5	6
5.24 Lack of relationships/ communications between subcontractors and suppliers	0	1	2	3	4	5	6
5.25 Resistance of contracting parties to integrated project culture	0	1	2	3	4	5	6
5.26 Failure to share information among contracting parties	0	1	2	3	4	5	6
5.27 Persistence of 'master' (e.g. client/ prime consultant) and 'slave' concept	0	1	2	3	4	5	6
5.28 Uneven commitment of contracting parties	0	1	2	3	4	5	6
5.29 Discontinuation of open and honest communication	0	1	2	3	4	5	6
5.30 Improper planning, design errors and omissions	0	1	2	3	4	5	6
5.31 Potential legal liabilities (in resolving non-contractual issues)	0	1	2	3	4	5	6
Others: Please add more factors (from your experience) and rate							
5.32	0	1	2	3	4	5	6
5.33	0	1	2	3	4	5	6
5.34	0	1	2	3	4	5	6

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