

INNOVATIVE INITIATIVES IN INTEGRATING CONSTRUCTION SUPPLY CHAINS

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ABSTRACT

Recent research into innovative procurement systems in general and ‘relational contracting’ in particular, lead to a proposed model for relationally integrated construction supply chains. Formidable barriers, such as those arising from ingrained adversarial industry cultures, have hitherto hampered the integration of segregated and fragmented functions, and hindered the elimination of supply chain inefficiencies and operational deficiencies. This paper draws on: (a) the growing body of ‘lessons learned’ from recent bold initiatives towards more relationship-based procurement arrangements in many countries; and (b) related perceptions on the potential for the joint management of many construction risks. The responses to two recent questionnaire surveys are found to strongly reinforce the value and viability of this present conceptualisation, and proposed operationalization, of relationally integrated supply chains - in releasing latent energies and enabling substantial synergies in construction teams. These energies and synergies are in turn expected to contribute to considerably enhanced performance levels.

KEYWORDS

Enhanced performance, Joint Risk management, Procurement, Relational Contracting, Supply Chain.

1. INTRODUCTION

This paper is based on interim findings from three parallel ongoing research projects investigating: (1) innovative procurement systems, (2) Relational Contracting (RC) and Joint Risk Management (JRM) and (3) contractor selection methodologies. The emerging evidence from the interviews and questionnaire surveys in these projects has contributed to a growing consensus among the researchers, of the value of the ‘relational integration’ of hitherto fragmented construction supply chains. Formidable barriers, such as those springing from a particularly adversarial industry culture, have impeded the integration of segregated teams. Powerful centripetal forces are needed to counteract the centrifugal forces that flung apart the various functions and team members in the first place. These centrifugal forces were justified at that time by the perceived greater efficiencies of specialization; but did not account for the progressive debilitation triggered by the increasingly adversarial cultures, which in turn arose from

the fragmented functions of design, construction, supply and management, which were further segregated e.g. into different specialist designs, sub-contracts etc. Such fragmentation and related adversarial attitudes have now clearly stifled supply chain efficiencies and significantly contributed to performance shortfalls.

Recent initiatives, for example in the UK and by some clients and contractors in Hong Kong indicate bold moves towards more relationship-based procurement arrangements. The potential for the joint management of many construction risks was investigated in two related questionnaire surveys and a series of interviews in Hong Kong. The observations from these investigations lead to a relationally integrated supply chain model - that is presented in this paper as a viable and valuable vehicle via which to move towards the desired JRM, and also towards the enhanced performance levels that are demanded from construction industries worldwide.

While necessarily drawing attention to the extensive construction supply chain i.e. involving many players, this paper focuses on the client-contractor part of this supply chain, in order to illustrate the potential approaches, relationships and benefits that may be developed. Being the most visible and arguably critical link in the supply chain, it was felt useful to analyze and demonstrate the potential benefits at this interface in the first instance. This does not detract from the importance of other links, for example to sub-contractors and suppliers. However, limitations of time and space added further justification for this focused (and step-wise) approach in the present exercise. Still it may be recommended that the implementation of the recommended relational strategies should be applied simultaneously across the whole supply chain in order to maximize their impacts and benefits, and in turn enhance their acceptability and further development.

2. INDUSTRY RESPONSES TO INCREASING DEMANDS

A rising tide of discontent with construction industry performance levels and self-defeating conflict scenarios led to a series of recent high-powered self-examinations that resulted in reports calling for dramatic reforms in the UK (CTF, 1998), Singapore (C21C, 1999), Australia (ISR, 1999) and Hong Kong (CIRC, 2001). In terms of outputs, productivity gains of up to 30% over three years were anticipated from implementing the recommendations e.g. as envisaged in the UK. In terms of inputs, in Hong Kong for example, the Construction Industry Review Committee (echoing exhortations in the UK and Australian reports), calls for radical improvements e.g. in the way risks are managed and the way industry participants interact.

However, a shift from long entrenched adversarial approaches towards co-operation and collaboration will take time. It is important for the key industry players, particularly the major clients, to initiate this approach to change. For example, such leadership is already reaping good results in the UK with the M4I (Movement for Innovation) (<http://www.m4i.org.uk/>) and the Construction Best Practice Programme (www.cbpp.org.uk) initiatives in general, and more specific thrusts such as the 'preferred contractors' initiative of the National Health Service, 'framework agreements' of the British Airports Authority' Wolstenholme (2001) and other major clients, and 'prime contracting' by the Ministry of Defence. Benefits have also been reaped from the proactive alliancing arrangements on the Australian National Museum project (Eggleton, 2001); and the partnering approaches initiated by the Mass Transit Railway Corporation in Hong Kong on its recent Tsung Kwan O project (Bayliss, 2000). Proactive major contractors can also take the initiative, resulting in demonstrable savings to both client and contractor (Ho, 2000). Other contractors could then be pushed/ motivated towards desirable change by such examples, as well as by a revamped selection process that is weighted towards awarding contracts to those who adapt faster to the 'new culture'.

The major cultural shift – indeed the 'cultural revolution' – that is evidently needed, must be triggered by such powerful change agents as indicated above. For example, it has been found possible to catalyse such changes by eliciting a commitment to such collaborative working arrangements at the selection stage itself. This is when prospective project participants (e.g. consultants, contractors and sub-contractors) are most receptive to client initiatives and/or pressures. Thus a move away from purely price-based selection of supply chain members, towards performance-based criteria, should also include measures of the potential to integrate into harmonious and efficient teams (Rahman et al., 2001). That such approaches yield monetary savings, apart from the indirect and intangible benefits was demonstrated in reported studies: (1) by Kumaraswamy and Matthews (2000) that focussed on sub-contractor selection, and (2) by Lawton et al. (1997) on 'taking partnering down the supply chain'.

The industry has evidently appreciated the needs for such approaches throughout the entire supply chain. For example, the Construction Industry Council in the UK has established an 'Integrated Supply Chain sub-group'

within its 'Strategic Forum for Construction'. This sub-group is presently charged with developing an 'integrated supply chain tool kit' that will address their conceptualization of an integrated supply chain – by enabling 'everyone involved in asset development, designing, manufacturing, assembling & constructing, proving and operating & maintaining' to 'add maximum value by being integrated around common processes, culture/ values and rewards'.

A *caveat* (cautionary note) is however needed to guard against a pendulum swing from a totally adversarial to an uncomfortably close relationship that may be abused e.g. to replace competition with collusion. An appropriate balance must thus be struck, a safe/ comfortable 'distance' maintained and appropriate process 'checks' must be incorporated, in order that no operatives are tempted to stray from collaboration to collusion or even corruption. In this context, it is useful to draw on the theoretical concepts of Relational Contracting (RC) to underpin the approaches to the envisaged culture of Joint Risk Management (JRM) and other collaborative modalities.

3. RELATIONAL CONTRACTING (RC) AND JOINT RISK MANAGEMENT (JRM)

3.1 Relational Contracting (RC)

Relational Contracting (RC) concepts may be tracked back to Macaulay (1963) who referred to a scenario where legal mechanisms offered by specific contracts are superseded by transactions within mutually accepted social guidelines and relationships. While found in many commercial relationships, RC therefore covers a wide range of flexible approaches to managing contractual relationships, based on an appreciation of win-win scenarios through cooperative relationships between the parties. Being based on a fundamentally 'collaborative culture', RC principles can be now seen to underpin approaches, such as partnering, alliancing and joint venturing, that in turn contribute to the desired collaborative culture.

RC is based on a dynamic relations scenario, all segments of which - past, present and future - are interrelated (Macneil 1974) rather than compartmentalized as discrete transactions. Macneil (1980) described 'contract' broadly as 'the relationship among parties, to the process of projecting exchange into the future'. Because not all events can be 'presentiated' (perceived or realised or quantified at present), and as all necessary information cannot be 'presentiated' at the time of contracting, mutual future planning is required (Campbell 1997). This leads parties to negotiation, because negotiation costs are less than the extra mark-ups that contractors may otherwise add and it is also more economical than terminating contracts. Mutual future planning gives more choices to the parties against the relatively limited options at the time of contracting (Macneil, 1974).

Present manifestations - if not reincarnations - of RC include partnering and alliancing, e.g. with partners working as a team on the basis of a 'charter' that is not legally binding and therefore having recourse to the original contract in case of any clearly 'non-partnerable' issues. The RC route should in essence assist in 'bottom line' imperatives to reduce the sum of production and transaction costs, e.g. by reducing transactional friction and by simplifying hitherto complex procedures.

3.2 Joint Risk Management (JRM)

JRM would constitute an important practical manifestation of Relational Contracting (RC). A recent Hong Kong based survey sampled: (a) the degree of concurrence/ diversity in the interpretation of contractual risk allocation (and thereby estimated the degree of potential conflict) in terms of both present and preferred risk allocation, and (b) the attitude towards JRM under a team-working based co-operative environment. Respondents to a pilot-tested questionnaire stated a percentage (say X, from 0% to 100%) of a particular risk that each of them perceived to presently lie with the contractor; thereby also implying that (100-X)% of that risk presently lies with the employer.

Respondents next stated the percentages of a particular risk that should, in their opinion, be borne (a) by the employer, (b) by the contractor and (c) earmarked for joint management (JRM) at post-contract stage (totalling 100%). Relevant observations from the survey outcomes are summarised below to illustrate particular perceptions on the need for JRM.

A marked divergence is observed in both interpretations of present risk allocation, as well as of preferred allocation, both between and within the different project participant groups (employers, contractors and consultants). This aligns with previous observations, for example in Canada (Hartman et al 1997). But many instances of extreme

divergence (e.g. from 0% to 100%) are also observed in the present study. Such divergence is a source of potential conflict between project participants.

The 41 risk types in the questionnaire were based on the literature and interviews with experienced industry personnel and academics in the initial study phase. However, the respondents were invited to add 'other' risk types. Over 250 questionnaires were distributed in Hong Kong and 35 in Mainland China. 47 usable responses were received from a wide cross-section as shown in Table 1. The respondents had an average of over 21 years total experience and an average of just under 7 years of experience in their present position. Table 1 also presents a relevant analysis of the responses on the perceived need for 'joint management of risks at post-contract stage'. Table 1 indicates that considerable percentages of most of the 41 risks cited in the survey questionnaire are generally perceived to need joint management. Out of the 41 risks listed for the survey, 11 to 50 percent of 29 (i.e. 14 + 9 + 6) risks are generally perceived (i.e. by the total sample) to need joint management (JRM).

Table 1: Average Perceptions on Joint Risk Management (JRM) based on groupings of 'working organisation' and 'nature of present job'

Percentage of risk that should be jointly managed	Number of risks (out of 41, used in the survey) in each category						
	Total (47)	Working organisation			Nature of present job		
		CSL (14)	CTR (8)	OWN (15)	ACAD (10)	ENGG (18)	MGRL (19)
0	0	0	7	1	0	0	1
1 - 10	12	15	6	13	4	18	10
11 - 20	14	13	17	8	20	12	12
21 - 30	9	9	5	8	13	6	8
31 - 40	6	3	4	6	3	5	7
41 - 50		1	1	3	1		1
51 - 60			1	1			2
More than 60				1			
Total No.:	41	41	41	41	41	41	41

Notes: CSL - Consultants CTR - Contractors OWN - Owners ACAD - Academics
 ENGG - Engineering MGRL - Managerial
 Figures in parentheses () indicate the numbers of respondents in each group

A cluster of particular trends were also noted, e.g., that the contractors group in this sample think that 11 to 60 percent of 28 risks should be jointly managed, whereas, the employers group recommended 26 risks for joint management of more than 10 percent. But the range of percentages that they considered suitable for JRM, exceeds 50% for two of these items. This may signal a cultural change in comparison to previous observations that owners are risk evasive (Ahmed et al 1999). Moreover, in the percentage range slots of 31-40 and 41-50, owners recommended a greater number of risks for JRM than consultants and academics. Furthermore, in each of the percentage range slots of 21-30, 31-40 and 41-50, owners recommended a greater number of risks for JRM than contractors. This may also indicate that owners are now even more ready than other groups to approach JRM. Such a trend could herald the desired cultural transformations e.g. towards RC, as owners are well positioned to initiate change, given their over-riding control over the governance structures, contractual forms, consultant and contractor selection strategies, contract content and the overall project modalities.

3.3 Survey on Implementing RC and JRM

Since the first survey confirmed a general cultural shift towards RC and JRM as above, a second survey was launched to evaluate the potential for actually implementing RC and JRM. Table 2 conveys the collective perceptions on one aspect explored in this survey: the 'importance of specific factors for developing successful RC'. The table is sequenced in descending order of the combined (average) ratings, along with respective standard deviations for different factors. The outcomes thus show the required transformations towards more flexible scenarios involving trust, open communication and understanding i.e. away from traditional hierarchical contractual relationships.

The 87 respondents were from 17 countries and comprised of 43 from contractors, 19 from owners, 13 academics and 12 from consultants. The low standard deviations of the collective responses from such a wide sample, reflect an interesting consistency in the perceived strategies and tools for developing RC approaches worldwide. It appears to indicate a growing consensus that could well propel the required paradigm shift towards relationally integrated supply chains.

Although space precludes more details on other aspects of this survey, it is shown elsewhere (Rahman and Kumaraswamy, 2002) how most respondents also recommend the earlier (than usual) mobilization of the supply chain participants; i.e. including consultants, contractors, sub-contractors and major suppliers. In this context, the ways in which innovative and performance oriented selection strategies can enhance supply chain efficiencies has also been compared by Palaneeswaran et al. (2001).

Table 2: Importance Of Factors For Developing A Successful Relational Contract For Implementing JRM (Measured On A Scale Of 1 To 10)

Items/ Factors	Average	Standard Deviation
1. Mutual trust	9.1	1.3
2. Open communication among the parties	8.9	1.3
3. Understanding each-other's objectives	8.8	1.3
4. Equitable and clear allocation of foreseeable and quantifiable risks	8.7	1.6
5. Attitude of the project participants	8.6	1.5
6. Readiness to compromise on unclear issues	8.3	1.3
7. Awareness of risks and rewards	8.2	1.4
8. Effective coordination	7.9	1.5
9. Collective responsibility, instead of personal responsibility	7.9	1.7
10. Alignment of objectives	7.8	1.9
11. Professional ethics	7.8	1.8
12. Agreed process for dispute resolution	7.7	1.7
13. Frequent formal and informal meetings	7.6	1.6
14. Developing a partnering culture, first, within the organisation	7.3	1.9
15. Agreed mechanism for performance appraisal	7.2	1.8
16. Compatible organisational cultures	6.9	1.9
17. Pioneering role of the owner/ client	6.9	2.1
18. Possibility of future work	6.9	2.0
19. Partnering workshop	6.8	1.9
20. Partnering experience	6.8	1.9
21. Role of partnering facilitator	6.5	2.0
22. Legal implications	6.3	2.0
23. Cost of implementing partnering	5.7	2.3
24. Jointly organised social/ cultural activities (e.g. karaoke, sports)	5.2	2.3
25. Traditional owner, contractor, subcontractor hierarchy	4.1	2.2

4. RELATIONALLY INTEGRATED SUPPLY CHAINS

A relationally reinforced supply chain integration model is proposed and presented in this section, to supplement the basic transactional contractual links and facilitate the envisaged JRM as discussed above. This can also harness untapped energies and trigger dormant synergies in the supply chain. These could in turn help to achieve the spectacular improvements in performance levels that are being targeted to restore the sagging construction industry (CTF, 1998).

Drawing on: (a) research findings from the parallel studies referred to in the Introduction of this paper, and (b) the needs for more innovative approaches to assembling construction supply chains (Palaneeswaran et al., 2001): a basic model was conceptualized as shown in Figure 1 - to demonstrate an 'equilibrium' scenario at the core of a typical construction supply chain. The emphasis is on how to strengthen client-contractor links, when typical local 'pull' forces (that usually pull together the principal participants) are strengthened by legally 'binding' transactional forces, as well as by informal relational forces ('bonding'). These would help counteract the typical 'push' forces that tend to throw them apart. In this context, 'push' forces are those that tend to push one participant 'away' from another participant's main agenda, while 'pull' forces are those that help to bridge gaps between their objectives and thereby themselves. As shown in Figure 1, some client side 'push' forces originate from probity, stringency of rules/regulations, cultural inertia, and resource constraints, while client's may be 'pulled' back by over-riding needs (e.g. for timely product delivery and fitness for purpose). Contractor-side 'push' forces may originate from competition and profit margin demands, whereas 'pull' forces that may draw them closer to the client could include the desirability to enhance performance track records, goodwill, future opportunities, and business survival.

Apart from the above push and pull forces, further 'integrative' forces in the supply chain could be classified as 'hard' and 'soft' forces, i.e. (1) 'hard' forces which are binding/ 'transactional' in nature and (2) 'soft' bonding forces which are more 'relational' in nature. For example: (1) 'transactional' forces include [a] legally binding imperatives to meet/ achieve contractual agreements, [b] drivers towards short-term benefits (e.g. monetary gains through pre-agreed contractual incentives), while (2) 'relational' supply chain bonding forces could develop from Joint Risk Management (JRM), better communications, mutual respect, and over-riding long-term visions of sustained mutually beneficial relationships. 'Cultural' force fields could also be mobilized to assist in this respect – by orienting/ developing project cultures appropriately. While this is not easy either, approaches to identify and re-orient dominant sub-cultures and their components in desired directions have been mapped out by Kumaraswamy et al. (2001).

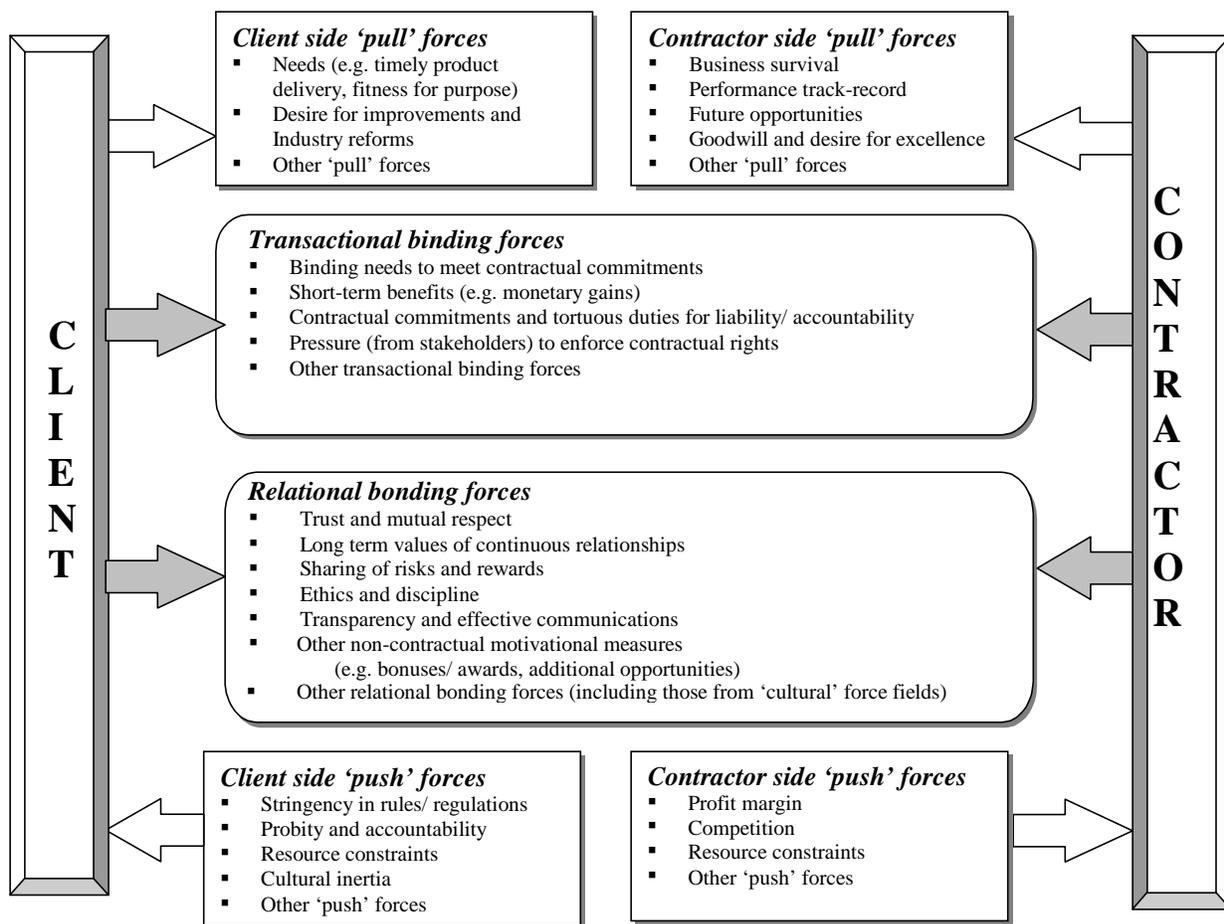


Figure 1 Conceptualising potential Client-Contractor linkages in Construction Supply Chains

In this model, the net effect of the push, pull, binding and bonding forces will determine the ultimate 'relational distance' between each pair of important parties in the supply chain. The overall cohesion and effectiveness of the supply chain can then be taken to depend on the collective net effect of the 'relational distances' between different supply chain members. It would be worthwhile to identify (and rectify) the critical and/or unusually long relational distances by reinforcing the relationally binding forces and thereby strengthening the weak links in the supply chain.

5. CONCLUDING OBSERVATIONS

Benefits from relational contracting (RC) arise for example through Joint Risk Management (JRM) in particular and in producing transactional efficiencies in general. Precise gains will of course not be easy to quantify. However, the general gains expected from RC and JRM are evident from the interviews, questionnaire responses and recent experiences with demonstrable benefits, as for example in the UK and to a small extent (so far) in Hong Kong.

The removal/ lowering of barriers and reduction of friction between supply chain members, should minimize wastage, rationalize resource usage and enhance value considerably. These should in turn revive the much maligned construction industries that continue to under-perform in many countries. The need to integrate is very clear but the ways in which appropriate integration may be successfully achieved have proved difficult to identify in the past.

Effective strategies and practical tools are needed to mobilize the perceived benefits of such relationally integrated supply chains through RC and JRM. In this context it is noted that proactive selection strategies can effectively re-orient mind-sets towards such collaboration. This is achievable by incorporating explicit selection criteria that place a premium on those with proven track records and/or demonstrable potential to contribute to the relational integration of a specific project supply chain. Integrating supply chains functionally has been tried in recent years. Functional integration is necessary but not sufficient. Relational integration is also needed in order to attain the synergistic success levels that are now demanded from the construction industry.

Specific research exercises are needed: (a) to analyze other supply chain linkages e.g. to sub-contractors, suppliers and design teams; and (b) operationalize the envisaged workings of the proposed model for relationally integrated supply chains. These must be followed by pilot testing on some demonstration projects, since the proposed changes are expected to be irreversible and therefore should not be undertaken lightly. The potential dangers of a pendulum swing towards collusion or corruption also need to be guarded against, when repositioning the industry to deliver the desired value to construction clients.

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