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COMPARATIVE STUDY OF RELATIONSHIP MANAGEMENT IN DESIGN-BID-BUILD AND DESIGN-BUILD PROJECT DELIVERY METHODS IN INFRASTRUCTURE PROJECTS

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Abstract: Supply chain management (SCM) concepts suggest that high fragmentation of roles on projects causes significant negative impacts such as lower processes integration and higher transaction volumes. Within the scope of construction SCM, relationship management (RM) is regarded as one of the most important aspects for achieving efficient SCM. The use of RM in construction projects administration worldwide is manifest on alternative procurement methods, drifting away from traditional systems to ones that are relationship-based. Despite the significance of relationships for project delivery, there were no previous studies that investigated the influence of supply chain RM on construction projects utilizing different project delivery methods (PDMs). The aim of this paper is thus, to determine how RM among parties may be influenced by the PDM utilized. This is achieved through conducting case studies to compare RM in multi-prime design-bid-build versus design-build projects. The researchers adopted the core values developed by Meng's 2011 RM maturity model to assess RM on projects utilizing different PDMs. Based on the two case studies, the total project RM score was seen to be lower in DBB projects compared to DB projects suggesting that the PDM employed influences RM on construction projects. Such findings can serve as a preliminary evidence of PDM choice effect on project RM and can help project parties gain a better understanding of PDM association to effective supply chain RM implementation. This study could be further extended to encompass more projects to provide statistical evidence of the influence of PDM on RM.

1 INTRODUCTION

The construction industry is characterized by high fragmentation with significant negative impacts such as perceived low productivity, cost and time overruns, conflicts and disputes, and resulting claims and time-consuming litigation (Cain 2003). The application of Supply Chain Management (SCM) is a means of developing vertical integration in the design and production process and operation to link the process into a chain, focusing on maximizing opportunities to add value while minimizing total cost. As this application requires a significant shift in the mind-set of the participants toward collaboration, teamwork, and mutual benefits, it is surprising that only few sophisticated applications have been reported in the construction industry (Kadefos 2005). Within the scope of construction specific supply chain literature, supplier relationship management (RM) is regarded as one of the most important aspects for achieving efficient SCM (Maqsood & Akintoye, 2002; Bemelmans et al. 2012). Despite the significance of relationships for the delivery of projects, there is a dearth of research in this area (Bemelmans et al. 2012).

Over the past decade, there has been an increasing emphasis on the use of RM in the construction projects administration worldwide. This emphasis is manifest on alternative procurement methods, drifting

away from traditional procurement systems to ones that are relationship-based (Walker & Hampson, 2003). Though the dynamic nature (Teece & Pisano 1994) of the construction industry allowed for the continuous implementation of relationship-based systems through different project delivery methods (PDM), there yet remains a lot of room for improvement and development in this area. *The aim of this paper is thus, to determine how RM among parties within the construction SCM may be influenced by the project delivery method (PDM) utilized in a construction project.*

2 BACKGROUND

Reliance on the traditional project management approach which focused on scientific/mechanistic tools and techniques led to dramatic project failures in addressing cooperative, complex inter-relationships among project parties, especially in mega-projects with high uncertainties. The inadequacy of traditional project management to deal with uncertainty had driven the focus towards relational contracting, partnering, joint ventures, and other collaborative patterns, which target softer skills and show how crucial good relationships are to the successful management of projects. A relationship approach, based on relationship building and management, is emerging as a new construction management paradigm of the future (Pryke & Smyth, 2006). Whilst broader than relational contracting and RM, the relationship approach embraces social capital generally and the role of relationships in core competency development and adding value. It shows how to create and maintain effective relationships between the client and the project team, as well as intra-coalition relationships.

RM does not only play a key role in procurement and transactional relationships (Gadde & Snehota, 2000) but determines the realization of many other facets of business activities (Chen & Paulraj 2004). For example, Monczka et al. (2011) particularly emphasized the aspects where relationships play a key role such as value-driven interaction; communication; trust and commitment; and establishing close partnership relationships with strategic or key suppliers. Rowlinson & Cheung (2006) explored the use and operation of RM as a means for engaging stakeholders through parallel studies in Australia and Hong Kong. They identified stakeholder typologies and adopted a multi-perspective view of project performance in order to link RM, stakeholders and sustainability in a framework which allows exploration of projects and their success. In their research they pointed out that RM is useful for enhancing project performance and client satisfaction (Rowlinson & Cheung 2008). All of these elements have significant importance in the relationship development process but unfortunately, RM has not received adequate attention to reflect its critical role within construction supply chain management (cSCM)

2.1 Relationship Management in Construction Supply Chain

PDMs in construction define the relationships, roles, and responsibilities of parties and the sequence of activities required to provide a facility while RM is a process to establish and manage these relationships between the parties that aims to remove barriers; encourage maximum contribution; and allow all parties to achieve success. Studies suggest that relational approach, such as partnering, alliances, framework agreements and RM, provide positive contributions to social, environmental and economic sustainability and help satisfy client and stakeholder interests (Blau 1963; MacNeil 1978, 1985; Rousseau & Parks 1993). In other words, relational contracts provide the means to achieve sustainable, on-going relationships in long and complex contracts by an adjustment process of a more thoroughly transaction specific, on-going, administrative kind (Kumaraswamy & Matthews 2000). The essence of RM is also found in collaborative procurement. Collaborative procurement aims at engaging parties at all project stages; competitive bidding is no longer the only selection criterion for contractors and design consultants, as well as suppliers (Hughes et al., 2006). Also, some reliance is placed on the deliberate development of long-term working relationships which requires trust building.

Benefits of collaboration and relational approaches in construction projects include time and cost savings, trust, motivation, open communication, and joint risk management (Bennett & Jayes 1998; Bresnen & Marshall 2000a; Kumaraswamy & Matthews 2000; Wood & Ellis 2005; Wood et al. 2002). Successful sustainable relationships in the supply chain rely on relational forms of exchange characterized by high levels of trust and commitment between project stakeholders. Close collaboration with a wide variety of

stakeholders from various backgrounds and professions is essential for business to thrive. To truly benefit from RM, the whole supply chain including the project team, project organizations and stakeholders, must understand the principles of RM and be part of the process.

2.2 Core values in RM

A number of authors have given insights into the core values of RM in cSCM whether focusing generally on the core values of RM (Cheung, 2011, Pinto et al., 2009, Gulch & Raisanen 2009, Kadefos 2005) or specifically on partnering and its relation to RM core values (Marrewijk et al. 2008, Maqsod & Akintoye, 2002). Meng (2010) built upon those studies by integrating the main factors of RM included in previous studies to eight core values: procurement, objectives, trust, collaboration/joint working, communication, problem solving, risk allocation and continuous improvement. The next paragraphs will provide some background on these eight core values and their significance on construction projects.

Procurement and contract is the fundamental of the establishment of a supply chain relationship. The sub criteria of "Procurement" include "Selection criteria," "Procurement route," and "Form of contract (Meng et al 2011). Mutual objectives encompass the change in traditional relationships to a shared culture; based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values (Brensen & Marshall, 2000a). Integrative interactions are characterized by cooperative behavior; hence, parties in a business transaction seek ways to achieve mutual objectives while bargaining (Grover et al 1996). Establishing relational goals may reduce the negative influence of formal contractual rules on people's behavior (Kadefos 2004) and instead align the goals and objectives of different parties (Meng 2010).

As for trust, it is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another (Kadefors 2004). This could imply that trust is a process that begins within an individual and must rely on certain human qualities or characteristics, such as ability, benevolence and integrity (Kadefors 2004). Showing trust communicates to a partner that cooperation is anticipated and tends to be reciprocated with a behavior that validates trust (Kadefors 2004). However, in the construction industry trust has a different meaning for the parties involved in the industry, such as contractors and owners (Pinto et al. 2009). Trust has direct effects on work group process and performance. Successful collaborative relationships rely on relational forms of exchange characterized by high levels of trust.

Communication, on the other side, mainly involves the transfer of information between people in a group or organization (Gluch & Raisanen 2009). One of the major causes of delay in construction projects is communication problems, however, delays can be minimized by discussions that lead to understanding (Assaf & Al-Hejji, 2006). Performance can be improved in the construction industry if the focus was shifted to examining the constraints of organizational cultures (Gluch & Raisanen 2009) such as the lack of the "no-blame" culture, through communication which will encourage individuals within the organization to experiment with new ideas (Dulaimi et al 2002).

According to Meng (2010), joint working is generally reflected by joint decision-making based on clear understanding of mutual objectives, joint effort of problem solving and joint effort for continuous improvement. Bresnen and Marshall (2000a) suggested that project performance, in terms of cost, time, and quality can be dramatically improved if participants adopt more collaborative ways of working, however before collaboration can become a team effort it depends on individual behavior (Bresnen & Marshall 2000a). Although the willingness to share information and knowledge occurs over time (Gale & Luo 2004), construction project teams learn to part and share what they know in a short space of time. Lack of continuity of relationships, due to the short-term nature of most construction projects, undermines attempts to secure full benefits of collaborative working (Bresnen & Marshall 2000a).

As for risks, they cannot be eliminated; however, they can be effectively managed as they are perceived to be the occurrence of unwanted or uncertain events (Zou et al. 2007) that may negatively affect the success of a construction project. A successful project risk management process relies on the risk being thoroughly and properly understood before it is allocated or before the method of allocation is chosen

(Rahman & Kumaraswamy 2002). Risk should be allocated to the party best able to anticipate and control that risk, however the willingness of that party to take on the risk is an important consideration in the allocation of project risk (Ward et al 1991). Conditions of contract are themselves alone not sufficient to allocate risk properly (Rahman & Kumaraswamy 2002); an open and cooperative attitude towards risk by all contractual parties must be maintained for the risk management process to be successful (Schmidt et al 1999). Risks are inherent in all construction projects, none the less due to the temporal and unique nature of construction projects, their precise and natural form is project specific (Rahman & Kumaraswamy 2002). The identification of risks as early as possible in a project's life is important (Ward et al 1991) in ensuring that the primary project performance objectives of time, cost, and quality are achieved.

Continuous improvement implies successfully establishing a culture of development and constant learning within an organization or a project team, and facilitating the learning process of the individuals is regarded as important to the continuity of the continuous improvement activities (Alstrup 2000). The construction industry has seen the introduction of various tools, techniques and methods such as partnering, benchmarking and joint ventures (Bresnen & Marshall 2000a), as measures of continuous improvement in the aim of improving the industry's project performance. Partnering assumes that continuous improvement is a joint effort to eliminate barriers to improvement (Larson, 1997) and that it is a possible solution for reducing the adversarial nature of the construction industry (Love et al 2002). Continuous improvement has been seen as a way of promoting long-term performance improvement (Bresnen & Marshall, 2000a). However, the short term nature of most construction projects is not a suitable one as it means that most project teams and organizations live from project to project and each time focus on the successful completion of these projects, as a result this may inhibit the learning process and thus the continuous improvement of project teams (Gieskes & Broeke 2000).

Lastly, according to Barron (2000), joint problem solving requires collaboration within peers and a willingness and openness to be influenced by others, which will result in joint understanding within the parties involved in a problem solving process. Construction projects frequently encounter unforeseen and unanticipated challenges which require the project team to be highly efficient and effective in responding to resolving such challenges. A focused project team with a range of skills and experiences to cope with such problems (Walker & Hampson 2003) and a right attitude to joint working can positively affect the performance of a project.

3 METHODOLOGY

The aim of this paper is to determine how RM within the construction SCM may be influenced by the PDM utilized in a construction project. To achieve this aim, the following three tasks needed to be completed: (1) identify relationship indicators to measure the relationship among project participants; (2) identify the parties involved in the processes and their interactions in different PDMs based on a construction supply chain perspective; (3) compare RM of key suppliers based on the relationship indicators in projects with different PDMs. The first task was completed through literature review where the researchers decided to use the core values of RM adopted from Meng (2011) maturity model as RM indicators. Meng (2011) maturity model included eight main RM core values (discussed in Section 2.2) each divided further to 3 sub criteria with each sub criteria having four maturity levels. The main criteria represent the main aspects of a supply chain relationship, whereas the sub criteria describe different detailed areas in each main aspect. For example, 'procurement' was broken down to selection criteria, procurement route, and form of contract each having four maturity levels.

The relationships at maturity Level 1 represent an extreme position dominated by self-interest and mistrust, mutual objectives do not exist, and parties only focus on achieving their own objectives and maximizing their own profits, with no regard to the impact of their actions on others. Trust is limited to the formal contract commitment with price competition being common practice. Win-lose business philosophy are prevailing resulting in adversarial relationships. At maturity Level 2, parties are mainly interested in their own objectives and interests. The mutual objectives are not established. However, a win for one party and a partial win for another enables limited degree of cooperation between the parties. Competition

does not focus on price anymore; instead quality competition becomes more common. Although the parties rely on the formal contract, trust is mainly built on the basis of mutual understanding of each other's capabilities to carry out their tasks. At Maturity Level 3, alignment of objectives is achieved in a single project. Everyone's interests are best served by concentrating on the overall project success. Partners work collaboratively as an integrated project team and the win-win attitude becomes the fundamental of the project partnering relationship. Finally, the relationship at maturity Level 4 is characterized by highest degree of trust and alignment of objectives over a series of projects, which focuses on long-term relationship. Fair gain sharing ensures that partners collaborate most closely in the whole supply chain. Continuous improvement is made jointly by learning from performance measures feedback and adopting innovative technology and management approaches. In general, this relationship is reflected as strategic partnering or strategic alliance (Meng 2010).

As for the second and third tasks, they were realized through conducting case studies to gain insights on RM in two projects implemented using different PDMs. The case study included analysis of project documentation and semi-structured interviews with project participants from owner's, designer's, or contractor/subcontractor perspective. Interviewing different parties involved in the project allowed the researchers gain a holistic view of the RM in the two projects studied. Interview questionnaire was divided into two parts. The first part aimed at gaining a deeper understanding of the project background and identifying contractual and relational issues among the project parties (including the project phase in which the different participants were initially involved). The second part was based on the core values adopted from Meng (2011) maturity model described above. It included close-ended questions about the eight main RM core values, each of which has four maturity levels. Respondents were asked to choose the statements/levels that was best suited for their project in each of the sub criterion for each of the different parties they defined in the first part of the questionnaire. Each response was assigned a score number equivalent to the level under which it falls, i.e., responses were assigned score between 1 and 4 which corresponds to the maturity level it lies at. For example, if the respondent in sub criteria 'type of trust' chooses the "contractual trust" - a statement in level 1 – then a score of 1 is assigned. On the other side if "Long-term goodwill trust" - a statement in level 4 – is selected, then a score of 4 is assigned. After obtaining a score for the sub criteria, the core RM score was obtained using the Equation 1:

[Equation 1] $$Core\ Value\ RM\ \ Score = \frac{\sum \text{Total for each subcriteria}}{\text{Number of parties x 4}}$$

and then the project total RM using Equation 2:

[Equation 2] $$Total\ Project\ RM\ score = \frac{\sum \text{Score for each RM core value}}{\text{Number of core values (i.e. 8)}}$$

4 CASE STUDY ANALYSIS

4.1 Case I – DB project

Case I is a project delivered under a Design-Build PDM in which the owner procures both design and construction services in the same contract from a single, legal entity referred to as the design-builder. It is a value based DB project. The project started in 2011 valued at $200.35M. This $200 million project features the construction of 22 bridges (including two fly-over bridges and a one-of-a-kind cap with a cultural wall), 28 retaining walls, two new urban avenues, an additional lane for through traffic, additional lanes on both directions, wider sidewalks and improved lighting on bridges 4,000+ feet of 54" storm sewer micro tunneling, and roadway reconstruction along 29 alignments. There were eight parties that were identified by the respondents, both owner and design-builder, in this project (Figure 1). The project team included the owner, design builder, two owner consultant (one responsible for record keeping and paperwork tracking and the other assisting in quality oversight), subcontractors responsible for specialty work, consultants working for the design builder for quality assurance, design consultant working for the design-builder as well as subcontractors working for the design-builder. All the eight parties were involved in the early design stage of the project. One party was involved in the development of the construction

documents, six parties were involved in the bidding process, all parties were involved in the construction and finally six parties were involved in occupancy. The solid lines in figure 1 shows the contractual relationships while the dotted lines show non contractual relationships.

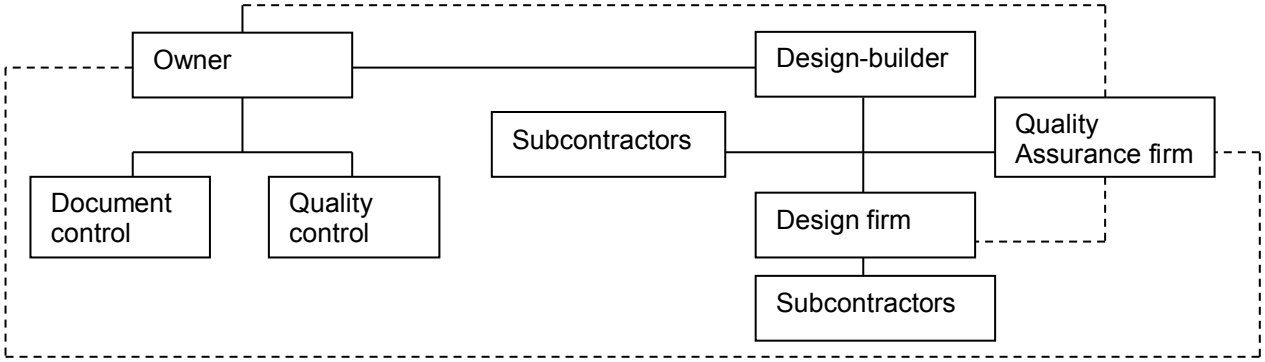

Figure 1: Schematic representation of the organization of all the parties involved in the project

As discussed in the methodology, both the owner and design-builder were asked in the interview to report the eight core values of RM model utilizing the four maturity levels for the eight parties involved in the project. In terms of *core value 1 'procurement'*, the owner reported that the design-builder was selected based on multi-criteria from long-term perspective (level 4) which is the prospective for long-term engagement, while project record keeping and quality oversight parties were selected based on cost and quality (level 2). Subcontractor and sub consultants were selected based on multi-criteria from short-term perspective (level 3). Bidding was done based on two stage tendering (level 2) except for owner project record keeping and owner's assistance for quality oversight parties where they used direct negotiation (level 4). The design-builder had the same responses as the owner but had more information regarding the subcontractors who were selected based on direct negotiation (level 4) that was possible because of previous projects that they had done together.

As for *core value 2 'objectives and goals'*, the parties in this project seem to be differently informed. According to the owner, he intends to work with these parties in the future (level 4) except for the subcontractor for quality assurance that the owner intends to work with in prospect of future work through tendering (level 2). The design-builder intends to work with the subcontractors in future projects while with the design and quality monitoring units, the design-builder will work with them in prospect of future work through tendering (level 2). According to the owner, in terms of *core value 3 'trust'*, there was a contractual trust (level 1) with the contractor and subcontractors while there was competence trust (level 2) with the record keeping and quality oversight parties and long-term goodwill trust (level 4) for final designer and specialty design parties based. As for the design-builder, there was short-term good will trust with some confidence within the parties in this project (level 3). In terms of monitoring, checking was 'somewhat reduced' (level 2).

In terms of *core value 4 'communication'*, according to the owner, most information is exchanged openly (level 4) with the record keeping and quality oversight parties, while some information is exchanged openly with the contractor and subcontractors (level 2). With the other parties including subcontractor for quality assurance, final designer, and specialty designer, much information is exchanged openly (level 3). There is continuous sharing learning and innovation (level 4) except for subcontractor where there is sharing learning and innovation (level 3). Open book costing between two parties (level 3) is listed under the subcontractors, final designer, and specialty designer, whereas there is open book costing throughout the whole chain (level 4) for all the other parties. The design-builder response was that most information was shared among the parties (level 4) except for the consultant responsible for record keeping and paperwork tracking where, there was continuous sharing, learning and innovation throughout the whole chain and in terms of cost information (level 4), there was open book costing throughout the whole chain (level 4). As for *core value 5 'collaboration'*, Owner reported close collaboration with the owner project record keeping and quality oversight parties (level 4). With the subcontractors, the owner has limited cooperation (level 2) and with the rest of the parties including the contractor, the owner has a

collaborative working relationship (level 3). The working relationship between the parties in the project was that of close collaboration (level 4) according to the design-builder. The parties abandoned the blame culture and always supported the weak party (level 3).

As for *core value 6 'risk allocation'*, according to the owner, risk sharing was greatly increased (level 3) with subcontractors reported as having limited risk-sharing culture (level 2). Risk is allocated to the party able to manage it in the project (level 3) for the project teams except for the project record keeping and quality oversight parties where risk is allocated to the party best able to manage it in the long-term (level 4). There are always appropriate rewards for the party taking the risk (level 4). The design-builder's response to this particular core value was that risk-sharing was greatly increased in the project based (level 3) and risk was allocated to the party best able to manage it in the long-term based (level 4). The parties also always appropriated rewards for the party that took the risk (level 4).

As for *core value 7 'continuous improvement'*, continuous effort for better ways of working (level 4) is exhibited in the project according to the owner, with common measures, formal, regular, and continuous feedback. However, for subcontractors, common measures and regular and formal feedback in the project (level 3) was selected. Generally, there are multiple incentives by project parties for improvement (level 4). During the project, there was a joint effort to better ways of working according to the design-builder (level 3). Also, common measures, formal, regular and continuous feedback was given by these parties with multiple incentives (level 4).

As for *core value 8 'problem solving'*, according to the owner, there was early risk warning throughout the whole chain based (level 4) with project record keeping and quality oversight parties having most of their problems timely resolved at the lowest level (level 4). The other parties have many problems timely resolved at the lowest level (level 3). With subcontractors, final designer and specialty design parties, few problems are repeated (level 3) while rare problems are repeated by the other project parties (level 4). The design-builder stated that there was early risk warning throughout the whole chain (level 4). Many problems were timely resolved at the lowest level and rarely were problems repeated (level 4).

The responses in this case shows that the average score of all the eight core values is 3.5 on the designer-builder perspective while the average score is 3.2 based on the owner response. The case average is 3.34 (table 1) meaning that this case lie in level 4 of Meng, 2011 maturity model.

4.2 Case II- Multiprime project

Case II is a multiple prime contract which is a variation of the traditional Design-Bid-Build, in which the owner holds separate contracts with contractors of various work disciplines. In this system, the owner, or its construction manager (CM), manages the overall schedule and budget. Case II is a refinery construction project, a multiprime contract, valued at $2M located in Toledo Ohio. The project started in September 2013 and was completed in October 2014. The owner was represented by the CM who had direct contact with the prime contractors. All prime contractors' communications to the owner was through the CM. The prime contractors also had several other subcontractors (Figure 2). The prime contractor interviewed has other projects going on with the owner because of their previous working relationships. According to the interviewees, there were nine key parties involved in the project, owner, prime contractors, subcontractors, architect/engineer, material suppliers and local authorities. The contractor was involved in the early stages of the project and gave input during preconstruction and design stages of construction. There were four parties involved in the predesign, three in the design and development of construction documents, four during bid process, all parties in the construction, and two in the occupancy stage. There was a contractual relationship between the prime contractors and the owner representative.

In terms of *core 1 'procurement'*, according to the interviewees both from the owner and contractor perspective, single-stage tendering (level 1) was used in selecting contractors except the architect/engineer who had direct negotiation (level 4) with the owner and also the CM was selected through tendering then negotiation (level 4). For *core 2 'objectives'*, according to the respondent from the contractor's perspective, some parties in the project were aware of the mutual objectives of the project

and were working towards achieving these project objectives (level 2). Other units focused on the mutual objectives in the long-term while working towards achieving these project objectives (level 4).

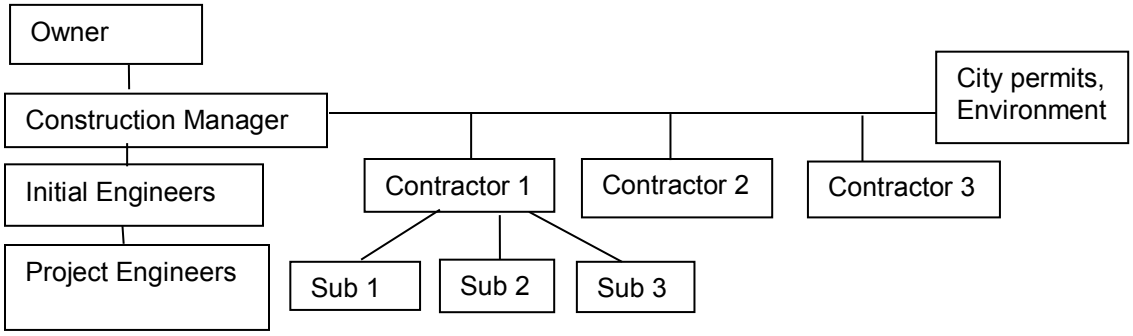

Figure 2: Schematic representation of the organization of all the parties involved in the project

In terms of *core 3 'trust'*, there were mixed reactions between the project participants. According to the owner and contractor, some had long-term goodwill trust (level 4), others had competence trust based (level 2) while others only had the contractual trust (level 1). One of the parties that showed contractual trust (level 1) was a new company and this was their first job while the other ran out of business even before the start of the actual construction. One of the interesting parts in this project is that there was transparency on the side of the CM. One of the interviewees representing the contractor said that towards the closure of the project the CM realized an accounting error of $25,000 owed to the contractor of which they were unaware.

As for *core 4 'communication'*, some information was exchanged openly (level 2) in this project while the construction manager and the owner exchanged much information more openly (level 3). It was interesting to note that there was little sharing and learning information (level 2) in this project while on cost information there was either little cost transparency (level 2) or open book costing (level 4) between two parties. All correspondences and change of scope was done through the CM. The CM held weekly meetings with these other units and was in charge of change orders.

As for *core 5 'collaboration'*, there was close collaboration (level 4) between the owner, CM and the primes. Limited collaboration (level 2) was noticed in the relationship between the primes and the subcontractors, who usually sought self-defence as part of their working culture (level 2). The contractor, owner CM relationship was a problem solving focused culture and always had to support a weaker party (level 4). The designer for this project only supported with the issues related to self-interest (level 2) while subcontractors often had support for a weaker party (level 3).

In terms of *core 6 'risk allocation'*, there was limited risk sharing (level 2) between the parties in the project. Basically the interviewees responded by saying that nobody would wish to share risk because they already have enough. Risk was always allocated to the party best able to manage it in the project (level 3). Some rewards for the party taking up the risk were awarded (level 2). As for *core 7 'continuous improvement'*, there was continuous effort for better ways of working between the owner and the CM (level 4). Limited joint effort (level 2) was noticed between these other units within the project as there was no common measure and no formal feedback (level 4). As for *core 8 'problem solving',* notably missing was the incentives (level 1) for the units except for the owner CM where there were multiple incentives (level 4) for the CM. Few problems (level 3) were repeated throughout the project. Risks were identified and early warning issued throughout the chain (level 4) and most problems were solved timely at the lowest level (level 3).

From the findings, there seems to be a variation in terms of how the RM values are affected in each project. For both cases, subcontractors obtained the lowest level in the RM core values. The consultants or the professionals working for the owner seem to rank highly in the hierarchy in all the indicators of the RM. The average scores for owner and contractor/design-builder responses are summarized in Table 1.

In case I, the DB project, even though all the parties were involved in the early stages of the project especially in the design phase, they don't seem to be aware of the objectives and hence not working towards achieving them. However, all other indicators especially on problem solving, the design-builder's response rank the core values at the highest maturity level. In case II, the contractor reported levels 2 and 3, with risk allocation and trust being the lowest while owner also reported trust being the lowest.

Table 1: Summary of the average levels from the respondents

Variables	*Case I (Design-Build)*		*Case II (Multiple-Prime)*	
	Design-builder	Owner	Prime	Owner
Procurement	3.2	2.8	2.7	3
Objectives	2.9	2.8	3.1	2.5
Trust	3.1	2.8	2.6	2.3
Communication	3.6	3.5	2.7	3
Collaboration/joint working	3.6	3.2	3.0	2.7
Risk allocation	3.7	3.2	2.4	2.6
Continuous improvement	3.8	3.9	2.7	3.1
Problem solving	3.9	3.5	3.6	2.6
Respondent Average	3.5	3.2	2.8	2.7
Case Average	**3.34**		**2.8**	

5 CONCLUSIONS

RM is different from investigating the contractual relationship on a construction project. The aim of RM is to build upon the partnership by going beyond typical partnership 'rules' and draw on co-existing social and cultural norms. RM requires that all parties to the contract agree to align their individual goals, thereby establishing common or aligned goals for the project. The gain share/pain share mechanism is structured so that the parties (client, designer and contractor) will either win or lose together. There can be no blame - success or failure is a joint responsibility. This is a significant departure from traditional project practice. DB PDM is assumed to have better/improved relationships as compared to DBB just by the virtue of early contractor involvement. To investigate that preposition, an assessment to compare between a traditional and an alternative PDM is needed. This paper presents a comparative analysis which compares two project delivery methods. It also goes further to look at the interaction structure of the project parties in the different phases of construction and investigates whether core values of RM are affected by the project delivery used on the project using two case studies. It was established based on the documentation and responses from the owner and prime contractor that in a multiprime design-bid-build project the average total project RM score during the assessment lie in Level 3 where the parties are engaged in partnering relationship while in design-build project, it lies in level 4 where the parties are engaged in strategic partnering/strategic alliance. Therefore, the results of the study can serve as preliminary evidence to that alternative PDMs have better RM compared to traditional project delivery methods. It also shows the benefits of cSCM implementation not only in assessing RM but also a tool that could be inherently used in the construction project operations. The research can be further extended to incorporate more projects to provide a statistical evidence of the influence of PDM on RM and compare RM in different types of construction projects such as commercial, residential and expand it to include other alternative project delivery methods.

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