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Defining relational contracting from the Wittgenstein family-resemblance philosophy

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Abstract

There has been an increasing interest in the concept of relational contracting (RC) in construction starting from the late 1990s. RC embraces and underpins different forms of collaborative approaches, including partnering, alliancing, joint venture and other collaborative working arrangements and better risk sharing mechanisms. By applying Nyström's and Yeung et al.'s similar approaches to define construction partnering and construction alliancing respectively, this paper focuses on RC and family-resemblance. A significant contribution to new knowledge is believed to have been made in providing a concise and comprehensive approach in defining the similar and yet different key components of RC by using a Sunflower Model. The development of this innovative Model is based on the German philosopher, Ludwig Wittgenstein's family-resemblance philosophy. His idea is that a complex concept can be understood as a network of overlapping similarities. Based on the reported literature, it is concluded that there are always five core elements included in construction RC. They are "commitment", "trust", "cooperation and communication", "common goals and objective", and "win-win philosophy". In addition to these core elements, a number of different non-core elements, or called petals, can be added to constitute a specific variant of RC in construction. The contribution can be of paramount importance to both the research community and the construction industry. By using this innovative theoretical framework to define construction RC, industrial practitioners may find the Sunflower Model useful in the procurement of a construction RC project. The Sunflower Model can be applied to explain the underlying concepts and as a common starting point for discussions between a client and a contractor on how to procure a RC project, thus avoiding any misinterpretations of what a RC project is.

Keywords: Relational contracting; Family-resemblance; Ludwig Wittgenstein; Sunflower Model

1. Introduction

Different projects require different procurement systems and processes to get off the ground and RC is one of many forms. In fact, an increasing trend of the adoption of RC in construction has received much attention from academics and industrial practitioners within the construction industry since the 1990s (Rahman and Kumaraswamy, 2002, 2004; Rowlinson and Cheung, 2004). Although more and more academic papers have discussed the characteristics of RC, there is still no consensus on the precise and comprehensive meaning of the concept because various researchers view it differently and the paces of development of RC in different countries are quite different. In fact, RC can be characterised as a complicated concept where it has been difficult to reach an agreement on a standard type of definition. An explanation for the increasing number of RC definitions is that the concept is yet to mature. If this is true, a comprehensive and conclusive definition of RC, which states the necessary and sufficient conditions, will finally arise. Nevertheless, the reality is just the opposite. It seems that the first step to clearly understand the conception of RC in construction is probably to realise that such a definition does not exist for this vague and versatile concept.

However, there is still a need for a common conception of RC because discussions will be cross-purposed and ineffective if there is not any mutual starting point. The aim of this paper is to present the innovative and useful Sunflower Model to define RC in construction, which is developed by using a German philosopher, Ludwig Wittgenstein's family-resemblance concept. The same methodology has been applied to define construction partnering (Nyström, 2005) and construction alliancing (Yeung et al., 2007), which are two major forms of RC in construction, but a holistic definition on the full spectrum of RC is still lacking. The current paper aims to fill up this gap by examining and defining each component of RC in detail. After the introduction, the various forms of RC will be first defined, followed by the introduction of Ludwig Wittgenstein's family-resemblance concept to define RC. Then, the research methodology will be depicted, followed by the detailed descriptions of the essential elements of RC. Following this, the RC will be analysed using Ludwig Wittgenstein's family-resemblance concept and then four various cases will be used to demonstrate the applicability of the RC Sunflower Model. After that, the significance and value of RC Sunflower Model will be highlighted and the conclusions will be drawn.

2. Definitions of relational contracting

There are numerous definitions of RC and this reflects that it is very difficult to give concise and comprehensive explanations of RC. RC was firstly defined by Macaulay (1963) as the working relationship amongst the parties who do not often follow the legal mechanism offered by the written contracts, and the parties themselves govern the transactions within mutually acceptable social guidelines. The foundation of RC is often viewed to be based on recognition of mutual benefits and win-win scenarios through more cooperative working relationship between parties (Alsagoff and McDermott, 1994; Jones, 2000; Kumaraswamy et al., 2005a; Ling et al., 2006; Macneil, 1978; Palaneeswaran et al., 2003; Rahman and Kumaraswamy, 2002, 2004; Rahman et al., 2007; Rowlinson and Cheung, 2004). RC embraces and underpins different approaches, including partnering, alliancing, joint venture and other collaborative working arrangements and better risk sharing mechanisms (Alsagoff and McDermott, 1994; Jones, 2000; Macneil, 1978; Rahman and Kumaraswamy, 2002, 2004; Rowlinson and Cheung, 2004). Kumaraswamy et al. (2005a) advocated that the core of RC is to establish working relationships between the parties through a mutually developed,

formal strategy of commitment and communication aimed at win-win situations for all parties. Sanders and Moore (1992) however considered the aim of RC is to generate an organisational environment of trust, open communication and employee involvement. Palaneeswaran et al. (2003) viewed RC as "win-win" relational contracting approaches, which encompass partnering and alliancing to provide vehicles for clients and contractors to drive towards excellence by achieving quality with greater value. Walker and Chau (1999) stated that RC offers a cost-effective means of encouraging collectively beneficial behaviour when transactions are exposed to opportunism, but a fully contingent contract is too costly to specify. McLennan (2000) described RC as a way to maximise project outcomes for all parties in the new complicated environment by adopting a conscious approach to build up and manage relationships alongside the co-operative application of ever improving project delivery systems and processes.

Different researchers put different emphases on the definition of RC and it should not be difficult to observe that some common threads exist although it is yet to be able to derive a single, concise and comprehensive definition for RC. It should also be noted that RC is a set of principles, or in other words, philosophy of contracting. Macneil (1974) stated that RC argues how contracts should cater for the proposed transaction, especially in the face of uncertainty and complexity, why people cooperate and why some specific measures are to be crafted in contract. It postulates that contracts lie on a continuum, from fully transactional at one extreme to vertical integration at the other extreme. Contracts are chosen to address the characteristics of the proposed transaction and needs of the parties. Therefore, apart from the fully transactional contract, all other contracts are relational, with varying degree of cooperation or relational elements. On the basis of this umbrella like philosophy of RC, the searched literature extracted relevant RC elements using content analysis to suit the purpose of this research study. Therefore, it should be noted that under such umbrella of RC defined, there are various major arrangements of cooperation, ranging from partnering, alliancing to Public-Private Partnership (PPP) and joint venture (JV). It should also be highlighted that relational contracting and relational contract are not the same. The former is a philosophy and the latter is a contract containing elements of RC. Table 1 shows the definitions of various forms of RC, including RC, project partnering, strategic partnering, project alliancing, strategic alliancing, PPP, and JV.

Please insert Table 1 here.

3. Using Ludwig Wittgenstein's family-resemblance concept to define relational contracting

The numerous definitions of RC mentioned above show how hard it is to give a concise and comprehensive explanation of the concept. It is clear that there is no agreement on which specific elements should be included in defining RC and thus the concepts appear vague and difficult to be compared. In fact, the German philosopher, Ludwig Wittgenstein argued that complex concepts are unable to be defined in the traditional way by stating necessary and sufficient conditions because there may not be a single set of characteristics that are common for all variants of a concept (Nyström, 2005; Yeung et al., 2007). Instead he regarded that complicated networks overlap similarities amongst the things that fall under a complex concept (Kenny, 1975). Murphy (1991) stated that a Ludwig Wittgenstein's classical example is the term "game", which is illustrated in such a way that a large number of activities are characterised as games. Nevertheless, he argued that there is not a single and common characteristic for all of them. He further elaborated that ball games such as tennis,

football and basketball have rules to be followed. But there are no rules stated clearly when a person just throws a ball in the air. Some elements of the ball games, encompassing rules, competitiveness, and reward and penalty, remain but some do not. Such ball games are characteristic of only hard physical work and the ball, when the thought goes to board games. Ludwig Wittgenstein suggests that there is a complex network of overlapping characteristics without any common features covering all kinds of games. Such an approach to understand a versatile concept is called "family-resemblance" because it resembles the type of similarity that is able to be found within a family. He further used the following example to illustrate the family-resemblance concept. A daughter in a family could have the "same" nose as her father while the father and his son have the "same" ears, but there is no feature common to all members of the family. Nevertheless, there is still a bond between them (Kenny, 1975). Clearly, the family-resemblance method defining a multifaceted concept is more flexible and structured because it does not restrict the meaning of a concept to a small number of simple characteristics. Therefore, it is suitable to use this innovative method to understand complex concepts, such as RC that is vague and multi-faceted in nature. Nyström (2005) and Yeung et al. (2007) adopted the Wittgenstein's approach to successfully define partnering and alliancing (both are complicated and multi-faceted concepts) respectively.

4. Research methodology

The research method adopted for this paper is to launch a comprehensive review of the related literature over the past two decades. The specific strategy is to look at how often different elements are mentioned in descriptions of different major forms of RC in construction and then apply the family-resemblance approach to the result of this quantitative study by cross-referencing and assessing their importance on RC projects. The literature was selected from the website of Google Scholar at http://www.scholar.google.com. It is appropriate to use Google Scholar because it is one of the best search engines regarding literature search in building and construction. The keywords for "scanning" were relational contracting, relationship contracting, partnering, project partnering, strategic partnering, alliancing, project alliancing, strategic alliancing, public private partnership (PPP), and joint venture (JV). These terms are well-known and are common in papers on RC in construction. Nevertheless, it is felt that too many papers use these terms. In order to maintain the efficiency and effectiveness of the literature searching process (i.e. searching the largest number of papers with the highest quality but with the least time spent on the searching process), these terms were finally searched with a restricted symbol. In details, the searching process is as follows:

- The titles of the articles were scanned with the keywords. In total more than 800 articles were scanned. However, not too many articles that contained one of the keywords in their titles are either "genuine" construction RC papers or closely related papers.
- Important but missed articles were identified from cross referencing of cited studies. Less related articles were excluded. For instance, some papers just included a small section with little significance on RC. These could not be judged to be relevant papers.

Finally, a total of 42 relevant and important research reports, textbooks, and articles from scientific journals and conference proceedings on RC in construction have been identified. They constitute the empirical base of the study. By using the content analysis method in this research, twelve elements of RC in total have been crystallised from the analysed materials (Table 2). Content analysis is often used to determine the main facets of a set of data, by simply counting the number of times an activity occurs, or a topic is mentioned (Fellows and

Liu, 2008). To conduct the content analysis, the initial step is to identify the materials to be analysed. The next step is to determine the form of content analysis to be employed, including qualitative, or quantitative; the choice is dependent on the nature of the research project. The choice of categories will also depend upon the issues to be addressed in the research if they are known. In qualitative content analysis, emphasis is on determining the meaning of the data (grouping data into categories) while quantitative content analysis extends the approach of the qualitative form to yield numerical values of the categorised data (frequencies, ratings, ranking, etc) which may be subjected to statistical analyses. Comparisons can be made and hierarchies of categories can be examined (Fellows and Liu, 2008). The process in conducting the content analysis in this research study was that all the key points and main ideas of each literature were first marked down. Then, similar main points and ideas were assembled and different main themes were finally crystallised from the analysed literature. After the analysis, a total of twelve main themes/essential elements of RC were categorised and they were described in the following section.

5. Essential elements of relational contracting

Based on the reviewed literature, "commitment", "trust", "cooperation and communication", "common goals and objective" and "win-win philosophy" are the most important elements in RC because they are cited with the highest frequencies by the authors (Table 2). The following sections briefly present the elements that constitute the whole "RC family" as they are described in the literature. After that, the application of family-resemblance approach to the RC concept is illustrated.

Please insert Table 2 here.

5.1 Commitment

A lot of researchers viewed commitment as a core element of RC (Asian Development Bank, 2007; Construction Industry Institute Australia, 1996; Kumaraswamy et al., 2005a, 2005b; Li et al., 2000; Manley and Hampson, 2000; Rahman and Kumaraswamy, 2002; Thorpe and Dugdale, 2004; Walker et al., 2000b, 2002). When this element is developed, other elements are likely to be developed (Bennett and Jayes, 1998). Manley and Hampson (2000) stated that partnering can be regarded as a commitment between a client and a contractor to actively cooperate to meet separate but complementary objectives. Li et al. (2000) opined that strategic partnering requires a long-term commitment and trust by the parties involved to extend their relationships beyond the successful completion of a single project to the formation of an alliance. McGeorge and Palmer (2002) stated that apart from a need for high-level commitment for implementing partnering; there is a need for "internal partnering" to promote the partnering spirit. Peters et al. (2001) suggested that partnering relies solely on the commitment of individuals since the partnering charter is not legally binding. The Construction Industry Institute Australia (1996) reckoned that an agreed partnering charter forms the basis of a working agreement that is intended to shape a non-adversarial culture and to promote win-win working relationships between partners. This is achieved through fostering cooperative and mutually beneficial relationships amongst project stakeholders and developing an explicit strategy of commitment and communication. Bennett and Jayes (1998) opined that the strategies need to be supported by all the organisations involved in the partnering arrangement, and the commitment gradually builds up through the successful collaborative working experience. Hampson and Kwok (1997) proposed that commitment is

one of the key characteristics of successful strategic alliances as well as successful business relationships.

Walker et al. (2000b) emphasised that trust and commitment underpins the three essential elements of partnering and alliancing, including (1) mutual objectives; (2) problem resolution; and (3) continuous improvement. Walker et al. (2002a) stated that the delivery management plan of the National Museum of Australia Project was established on the basis of an alliance concept. The core principle of alliancing was to achieve a positive outcome for all alliance members through shared commitment to a common goal of project realisation delivering best value to the client and acceptable reward outcomes to alliance members. Thorpe and Dugdale (2004) agreed that successful alliance contracting requires commitment by both parties to achieving common goals. Alchimie and Phillips (2003) stated that project alliances are characterised by uncompromising commitments to trust, collaboration, innovation and mutual support so as to achieve outstanding results. To make alliances successful, Lendrum (2000) regarded that all parties have to agree on the objectives and share the principles' process and general information to gain a partner's initial and ongoing support and commitment.

Asian Development Bank (2007) opined that the application of PPP and its successful implementation is based on the strong commitment of the central government and local governments. Senior leaders and municipal mayors have to support the concept of PPP and take a leadership role in PPP projects. In fact, a well-informed leader can help minimise misconceptions about the principles and merits of PPP. Tomlinson (1970) viewed a joint venture as an arrangement where there is commitment of funds, facilities and services by two or more legally separated interests, to an enterprise for their mutual benefit for more than a short period of time. A number of researchers stated that the core of RC is to establish the working relationship amongst different parties through a formal strategy of commitment and communication targeted at win-win situations for all parties (Kumaraswamy et al., 2005a, 2005b; Rahman and Kumaraswamy, 2002, 2004). Provan and Gassenheimer (1994) examined the relationship between dependence and power in vertical inter-organizational relations. They found that the exercised power of primary suppliers over dealer decisions was found to be related to dealer dependence on its primary supplier in ways that could be readily explained by social exchange of power. In contrast, the relationship between exercised power and dependence was significantly different when the primary supplier-dependent buyer tie was characterized by the high supplier commitment of a relational contract.

5.2 Trust

Many researchers (Construction Industry Institute Australia, 1996; Green, 1999; Kumaraswamy et al., 2005a; Lazar, 2000; Li et al., 2000; Manley and Hampson, 2000; Rahman et al., 2007; Sanders and Moore, 1992) viewed trust as a core element of RC. When this element is developed, it is likely to achieve other sub-elements and the benefits to all parties are easier to be maximised (Bennett and Jayes, 1998; Construction Industry Institute, 1991). Sanders and Moore (1992) viewed that the aim of partnering is to generate an organisational environment of trust, open communication and employee involvement. Crowley and Karim (1995) mentioned that partnering is typically defined in one of the two ways, including: (1) by its attributes such as trust, shared vision, and long-term commitment; and (2) by the process where partnering is seen as a verb, as opposed to a noun and refers to such as developing a mission statement, agreeing on goals, and organising/conducting partnering workshops. Walker et al. (2000b, 2002) stated that partnering and alliancing are

based upon a need for mutual trust to generate commitment and constructive dialogue, and trust is part of an outcome from negotiation. In fact, trust is bound up with past experience both directly with the persons concerned and indirectly, through projected or anticipated experiences, thus trust is an intensely emotional and human phenomenon. Walker et al. (2002) pointed out that the partnering and alliance team's formation of a management group as a true joint management group with democratic membership ensures that trust and commitment is truly encouraged and manipulation discouraged by the system of alliancing was a vital feature. Hampson and Kwok (1997) proposed trust as an important element of successful strategic alliances as well as successful business relationships. Howarth et al. (1995) believed that no successful strategic alliances can be developed without trust. Trust in a strategic alliance also includes the concept of reciprocity, which implies a long-term focus, the acceptance that obligations are mutual, and room for adjustment if one partner is suddenly placed in a compromising position. Hauck et al. (2004) agreed that trust and integrity are essential for true collaboration while Alchimie and Phillips (2003) viewed project alliancing as an integrated high performance team selected on a best person for the job basis; sharing all project risks with incentives to achieve game-breaking performance in pre-aligned project objectives; within a framework of no fault, no blame and no dispute; characterised by uncompromising commitments to trust, collaboration, innovation and mutual support; all in order to achieve outstanding results. Kumaraswamy et al. (2005a) and Rahman et al. (2007) perceived that trust should be at the core of RC approaches to construction procurement. Rahman and Kumaraswamy (2005) conducted a study and confirmed that trust and business ethics related factors and strategies are more helpful for collaborative working arrangements than some others. Jeffries and Reed (2000) explored the effects of interaction between two types of trust on negotiators' motivation to solve problems of adaptation in relational contracting. They concluded that excessive trust was as bad as too little.

5.3 Cooperation and communication

A number of researchers stated that RC is based on recognition of mutual benefits and win-win philosophy through more efficient cooperation and communication between the parties (Alsagoff and McDermott, 1994; Jones, 2000; Kumaraswamy et al., 2005b; Macneil, 1978; Rahman and Kumaraswamy, 2002, 2004; Rowlinson and Cheung, 2004). Rahman and Kumaraswamy (2004) stated that win-win working relationships between partners is achieved by fostering cooperative and mutually beneficial relationships amongst project stakeholders and developing an explicit strategy of commitment and communication. Walker et al. (2000b) stated that partnering and alliancing are founded upon team spirit and the honesty associated with notions of trust, commitment, and the application of power and influence. Excellent and effective communication is essential for successful relationship building. Construction Industry Institute (1991) also viewed effective communication and cooperation as a vital partnering element. Hampson and Kwok (1997) stressed repeatedly that cooperation and communication is a key element of successful alliances. Abrahams and Cullen (1998) opined that working cooperatively between entities is an important element for alliancing parties to succeed. Both Hauck et al. (2004) and Walker et al. (2002) pointed out that the intense integration of alliance partners through the whole collaborative process requires excellence in communication at a personal level, at a business level, and at operational level. This generally requires a quantum leap in the use of shared information technology (IT) systems and information processing integration. Alchimie and Phillips (2003) also agreed that cooperation and collaboration are vital elements for successful alliances. Walker and Johannes (2003) observed that large scale construction infrastructure projects in Hong Kong are always delivered using joint venture of global and local construction organisations. They

viewed that supporting reasons for companies to do so include bridging knowledge and expertise gaps, sharing risk and exploring opportunities to add value to the JV organisations through collaboration and cooperation.

5.4 Common goals and objectives

Walker and Chau (1999) reckoned that RC approaches appear useful in achieving common goals and objective, which are to reduce the sum of production and transaction costs. As mentioned previously, recognition of mutual benefits and win-win scenarios are the two bases of RC and they are achieved by more cooperative relationships between parties. This implies that they often have common agenda to achieve them. Construction Industry Institute (1991) viewed shared vision (common goals and objectives) as a vital partnering element in which each of the partnering organisations must understand the need for a shared vision and common mission for the partnering relationship. Bennett and Jayes (1998) proposed that one of the three key elements of partnering is to agree common goals to take into account the interests of all the firms involved. Crowly and Karim (1995) agreed that a typical partnering definition is based on its attributes, including: (1) trust; (2) shared vision (common goals and objectives); and (3) long-term commitment. Partnering is about people within partnered organisations making commitment and building trust to work together towards their common project goals and objectives (Walker et al., 2000b, 2002). In a PPP project, it is often mutually agreed to deliver the project on-time, with enhanced asset quality and cost reductions through the equitable allocation of risks (Asian Development Bank, 2007). Shaughnessy (1995) viewed that the most vital prerequisite for success in an international joint venture is that the parties should share the same objectives. Rowlinson and Cheung (2004) pointed out that partnering is defined as a structured management approach to facilitate team working across contractual boundaries. Its fundamental elements include: (1) mutual objectives; (2) agreed problem resolution methods; and (3) an active search for continuous measurable improvements. Project alliancing is described as a cooperative arrangement between two or more organisations that forms part of their overall strategy, and contributes to achieving their major common goals and objectives for a specific project (Kwok and Hampson, 1996). Walker et al. (2000b, 2002) explained that the core principle of alliancing was to achieve a positive outcome for all alliance members through shared commitment to common goals and objectives of a project realisation delivering best value to the client and acceptable reward outcomes to alliance members. Thorpe and Dugdale (2004) viewed that alliance contracts are best suited to contracts that require innovation and commitment to achieving common goals. Hauck et al. (2004) also agreed that common goals and objectives are key elements for successful alliance contracts.

5.5 Win-win philosophy

Similar to common goals and objectives, win-win philosophy is a key element for RC as recognition of mutual benefits and win-win scenarios are often viewed as a base of the foundation of RC and they are achieved through more cooperative relationship between parties (Alsagoff and McDermott, 1994; Jones, 2000; Kumaraswamy et al., 2005a, 2005b; Macniel, 1978; Rowlinson and Cheung, 2004). Crowley and Karim (1995) viewed win-win philosophy as an important element for partnering, and they defined it as "neither party wins due to the other's losses". Lazar (2000) mentioned that partnering is able to guide people on and off the project site into the types of interactions and relationship, and produces a win-win outcome. Lendrum (2000) mentioned that in order for alliances to be successful, all parties have to agree on the objectives and share the principles, processes and general information to

gain their partner's initial and ongoing support and commitment. The contractor must be involved to ensure a win-win long-term relationship. Geringer (1988) stated that joint ventures involve two or more legally distinct organisations, and each of them shares in the decision-making activities of the jointly owned entity in order to achieve a win-win situation. Walker and Johannes (2003) observed that large-scale construction infrastructure projects in Hong Kong have a tendency to use joint venture so as to achieve win-win outcomes, including bridging knowledge and expertise gaps, sharing risk and exploring opportunities to add value to the JV organisations. Walker et al. (2002) defined an element of alliances was that joint budget and cost/time committed targets established through an alliance board represented by key senior project champions from each alliance member and the owner/client. Whilst Abrahams and Cullen (1998) defined alliancing as "an agreement between entities which undertake to work cooperatively, on the basis of a sharing of project risk and reward, for the purpose of achieving agreed outcomes……" implies a win-win philosophy. Asian Development Bank (2007) and Li et al. (2005) perceived that PPP can achieve win-win results for all parties concerned because a core principle of PPP arrangement is the allocation of risk to the party best able to manage or control it. In general, the private sector is more efficient in asset procurement and service delivery because of its market-driven orientation. It is, therefore, to the government advantage to share the associated risks with the private sector participants.

5.6 Agreed problem resolution methods

Agreed problem resolution method is considered as an important element for RC, especially for both partnering and alliancing. As suggested by Bennett and Jayes (1998), one of the three key elements of partnering is to make decisions openly and to resolve problems in a way that was jointly agreed at the start of a project. Walker et al. (2002) stated that agreed problem resolution is essential when establishing trust and commitment between parties. The Construction Industry Institute task force considered that a successful partnering relationship element included conflict resolution through agreed problem solving (Crowley and Karim, 1995). Rowlinson and Cheung (2004) agreed that a fundamental element for partnering is agreed problem resolution methods. Walker et al. (2000b) stressed that the three essential elements of partnering and alliancing, encompassing: (1) mutual objectives; (2) agreed problem resolution; and (3) continuous improvement, are underpinned by trust and commitment. Problem and dispute resolution procedures adopted in alliancing provide for the types of problem to be defined and reasonable timeframes for resolution stipulated. The reason for escalating a dispute may be hardening of diverse positions or may simply be a result of the party not being authorised to commit required resources to resolve the dispute. In cases where a dispute is escalated unnecessarily, the person escalating the dispute may not be appreciated by his peer groups. This provides a self-regulating mechanism for ensuring that problems are indeed resolved at the lowest possible level. Hampson and Kwok (1997) also proposed that joint problem solving method is a key element of the successful alliances.

5.7 Continuous improvements

A key element for RC, particularly partnering and alliancing, (Bennett and Jayes, 1998; Construction Industry Institute, 1991; Walker et al., 2000b) is continuous improvement, meaning that long-term targets are set and achieved by all the stakeholders. Rowlinson and Cheung (2004) agreed that a fundamental element for successful partnering encompassed an active search for continuous measurable improvements. Cheng and Li (2004) also consented that continuous improvement is a vital element for successful strategic partnering to create a

good learning culture. He illustrated that continuous improvement involves continuous learning (Garvin, 1993) devoted to gradual process improvement (TQM), radical process improvement (BPR) and learning process improvement (a learning organisation) (Kilmann, 1995). Walker et al. (2000b, 2002) observed that an essential element of partnering and alliancing was continuous improvement in that performance is measured and analysed to provide knowledge about how improvement can be achieved continuously. There must be a commitment to learn from experience and to apply this knowledge to improve performance. Thorpe and Dugdale (2004) addressed a vital element of alliance was continuous improvement, so as to achieve results on time and to full specification requirements, while innovation will always be required to improve the current process. Under Private Finance Initiative (PFI), a major type of PPP, the public sector only states the requirements of the service outcomes but not prescriptive facilities. This allows the private sector to innovate in the ways it provides for those outcomes. The management skills and innovations of the private sector can lead to reduced project costs, increased efficiencies and continuous improvements (The International Project Finance Association, 2001). Bolton et al. (1994) stated that in Japan, inter-firm relations are more likely to involve relational contracting, characterized by stable bonding mechanisms and a dense historical network of economic ties between the parties to the exchange. This also relied on continuous improvement process.

5.8 Facilitated workshops

Facilitated workshops are also key elements for partnering and alliancing but with relatively less importance. Green (1999) considered that partnering workshops need to be continuous and not one-off at the project start. Walker et al. (2000b, 2002) pointed out that the interviewing process to derive a shortlist of potential alliance members requires sophistication and judgment of a client as does the facilitated workshops. This means that alliancing workshops are a useful tool to help select capable construction alliance partners.

5.9 Equity

Equity is another foundation for successful partnering and alliancing implementation. All the interests of stakeholders should be considered in creating mutual goals and there should be commitment to satisfying each stakeholder's requirement based on equity (Crowley and Karim, 1995; Lazar, 2000; Li et al., 2000; Walker et al., 2002). It reflects a sense of proportionality and balance transcending simple fairness (Construction Industry Institute Australia, 1996). Bennett and Jayes (1998) opined equity as one of the seven pillars for the second generation partnering, and it can be defined to ensure that each contracting party is rewarded for his work based on fair prices and fair profits. Manley and Hampson (2000) studied that one of the alliancing features is an equitable risk-reward balance that aligns the commercial interests of the parties. Hauck et al. (2004) agreed that the foundation of the collaborative process for project alliancing is equity between parties.

5.10 Joint declaration statement of achieving common objectives

Many researchers stated that there are generally some important statements highlighting a joint declaration between parties to achieve shared objectives in different forms of RC. For instance, there are always some key statements mentioning common objectives in a partnering charter built up by different project stakeholders for adopting structured partnering approach (Construction Industry Institute, 1991; Construction Industry Institute Australia, 1996; Manley and Hampson, 2000). For alliancing, there are also some joint declaration

statements highlighting some common objectives in an alliance contract (Walker et al., 2000b, 2002). For PPP, it often generally includes statements containing common objectives to achieve value for money and reduce project risks by transferring them to parties best able to manage them (Asian Development Bank, 2007; Li et al., 2005). For joint venture, there is usually a joint declaration to achieve common objectives, i.e. technology transfer (Carrillo, 1996).

5.11 Real gain-share/pain-share

Walker et al. (2000b, 2002) analysed that with alliancing, there is a "joint" rather than "shared" commitment. Parties agree their contribution and required profit levels beforehand and then place these levels at risk. If one party in the alliance under-performs, then all other alliance partners are at risk of losing their rewards (profit and incentives) and could even share losses according to the agreed project gain-sharing/pain-sharing model. Abrahams and Cullen (1998) defined project alliances as an agreement between entities which undertake to work cooperatively, based on a mechanism of project risk and reward sharing in order to achieve agreed outcomes. This approach is based on principles of good faith and trust as well as an open-book accounting approach towards costs. Hauck et al. (2004) mentioned that as an alliance of talented professionals pooling resources to achieve the project goal, they develop the project price target through design development with agreed risk and reward sharing arrangements like guaranteed maximum price (GMP) and target cost contracting (TCC) procurement strategies. Agreement on a risk and reward formula where an open-book accounting approach is undertaken to determine cost reimbursement together with agreed and verified site management costs to establish a base target cost. The firm's corporate profit (usually determined from audited figures over an agreed period) is placed as an "at risk" element to ensure that the agreed project costs are met. A bonus reward mechanism to be shared by all parties is jointly established to encourage further innovation and excellence. Therefore, the agreed project cost can only be determined when the alliance partners have been selected. McGeorge and Palmer (2002) emphasised that alliancing differs radically from partnering with regard to risk and reward sharing. In partnering the client still ultimately purchases a product (usually a building) which is produced, albeit in a spirit of mutual co-operation, with the design and construction team. In alliancing, the virtual corporation produces the product with each member of the corporation sharing risks and rewards. The characteristics of successful strategic alliances proposed by Hampson and Kwok (1997) are trust, commitment, interdependence, cooperation, communication, and joint problem solving. The interdependence here implies sharing risks and rewards.

5.12 Formal contract

McGeorge and Palmer (2002) viewed that alliancing is somewhat akin to the slogan of the three musketeers "All for one and one for all" in that alliancing could be described as partnering underpinned with economic rationalism given that alliance partners coalesce into a virtual corporation in which agreed profit and loss outcomes are contractually binding on all parties (Walker et al., 2000b, 2002). Rowlinson and Cheung (2004) pointed out that a project alliancing agreement is legally enforceable while Hauck et al. (2004) also stated that the project alliancing "agreement" is a legally binding contract and, therefore, legally enforceable.

6. Analyzing relational contracting by using Ludwig Wittgenstein's family-resemblance concept

Twelve common elements were identified from the literature in the study of RC (Table 2). "Commitment", "Trust", "Cooperation and Communication", "Common Goals and Objective", and "Win-win Philosophy" appear to be the most vital elements for RC because they have been more frequently cited than other RC elements when defining the RC concepts. In addition, these five relationship-based elements are by far cited most frequently by researchers investigating RC principles. Therefore, they can be interpreted as core elements for RC. The family-resemblance philosophy proposed by the German Philosopher, Ludwig Wittgenstein was adopted to define RC in construction by firstly identifying core elements for RC in construction (acting together as a core of a sunflower) and a number of non-core elements (acting as petals of the sunflower). Different combinations of core elements and non-core elements constitute different variants of RC Sunflower Model in construction.

The resulting analysis of the RC concept can be described as a "sunflower" because there is a centre containing the five common core elements to all RC designs, combined with the other non-core important elements as mentioned in Figure 1. The non-core elements can be seen as petals of the sunflower. A contracting practice can be defined as a type of RC if it firstly contains the five core elements and secondly, some of the petals. It should be noted that there is no specific petal or a set of petals that the RC Sunflower has to contain. Therefore, adding different sets lead to different variants of RC. The sunflower as an entity can be seen as the base for portraying the whole "family" of all RC variants (Figure 1). It should be highlighted that RC Sunflower Model is both a conceptualisation and a hypothesis. This means that it can be tested to see whether a project can be classified as a RC project or not based on the identification of the core and non-core RC elements in a particular project. The following four case studies are used for demonstration purposes.

Please insert Figure 1 here.

7. Application of the Ludwig Wittgenstein's family-resemblance concept to RC contracts

The above-mentioned structure facilitates a practical application of the somewhat vague and multi-faceted concept of family-resemblance. Various designs of RC projects can be captured within the same structure, which is indicated by the following four cases:

Please insert Figure 2 here.

Case 1: Chater House (a partnering project in Hong Kong)

The first case is taken from Chan et al. (2004a, 2004b, 2004c, 2005, 2006), where they described the Chater House, a prestigious office development project in Hong Kong. The project was procured by a Negotiated Guaranteed Maximum Price (GMP) contract together with adopting a partnering approach. The mechanism of the Guaranteed Maximum Price (GMP) contract requires that the client, consultants, and the main contractor work as a team in determining construction method, programme, pricing, detailed breakdown of direct works, and consenting to preliminaries and conditions of contract. This entailed the main contractor to release all his back up data in an open manner to team members. The exchange of this information required a high level of trust amongst the team, especially the main contractor. It

was reported (Chan et al., 2004a, 2005) that support from senior management and commitment from all participants were two of the most critical success factors (CSFs) for achieving partnering success in this project. In addition, the interviewees perceived that the level of trust was high and they agreed that partnering enabled them to develop good working relationships. The good communication and cooperation was partly due to the fact that there were clear common goals and objectives mentioned in the partnering charter and parties tried hard to achieve win-win philosophy between them.

In addition to these five core elements, namely, "commitment", "trust", "cooperation and communication", "common goals and objective" and "win-win philosophy", this RC project also acknowledged the importance of other elements: (1) partnering charter; (2) agreed problem resolution methods; and (3) facilitated workshops. The variant of RC is shown by the set of elements within the thin solid line boundary in Figure 2.

Case 2: Australian National Museum Project (an alliancing project in Australia)

The second case is found from Walker et al. (2000b, 2002) and Hauck et al. (2004) where the Australian National Museum Project was described. This was a large-scaled public sector project. The client was National Museum, the main contractor was Bovis Lend Lease, and a main consultant was Peck Von Hartel (architect). It was found from Hauck et al (2004) that support from senior management and commitment to alliancing from project participants were two of the most critical success factors (CSFs) for achieving alliance success in this project. A collaborative process included integrity and trust which were essential for true collaboration in this alliance project. In fact, the trust level was high and there were good collaborative teams in this project. The working relationship between the client and the project team was very good because when problems arose, parties were willing to follow the alliance contract. The communication between parties was good and they worked jointly toward a common goal. Collaborative Process Institute (CPI) (1997) concluded that collaborative communication had to be based on key principles, which encompasses equality, openness, problem-orientation, positive intent, empathy, and extensive use of technology. Apart from the five core elements, this RC project also included: (1) formal contract; (2) real gain-share/pain-share; (3) continuous improvements; and (4) facilitated workshops. The variant of RC is delineated by the set of elements within the thin dotted line boundary in Figure 2.

Case 3: Project 2002 – Enhancing the Quality of Education in Glasgow City Schools (a PPP project in the UK)

The third case is found from the website of Hong Kong Efficiency Unit (2008) (http://www.eu.gov.hk/emglish/case/case.html) where Project 2002 – Enhancing the Quality of Education in Glasgow City Schools was mentioned. There were a total of 39 secondary schools in Glasgow City, UK in 1996. A majority of them were poorly conditioned, and they needed substantial refurbishment with accumulative maintenance costs estimated to be more than £100m. Although the schools could accommodate more than 50,000 pupils, there were only about 29,000 pupils in the city. It was expected that this figure will rise slightly in the coming future. The sponsor for the project was Glasgow City Council, Scotland. The consortium was 3Ed (Miller Group Limited, Amey Ventures Ltd and Halifax Projects Investments Ltd). The capital cost was £225m, with the contract length of 30 years and Information Communications Technology (ICT) of 12 years.

It was observed from the Hong Kong Efficiency Unit (http://www.eu.gov.hk/emglish/case/case.html) that commitment from the consortium was a CSF for achieving construction success in this project. In addition, it was perceived that the level of trust was quite high and project team members worked collaboratively and harmoniously in this project. It was partly because they had clear common goals and objectives, i.e. achieving value for money, innovative financing, risk transfer, and change management. Besides, different parties tried their best to achieve win-win outcomes for themselves. The lessons learned from this project encompass: (1) testing of value of money; (2) achieving affordability; and (3) consultation. The lessons learned were related to the five core elements identified, namely (1) commitment; (2) trust; (3) cooperation and communication; (4) common goals and objectives; and (5) win-win philosophy. Apart from the five core elements, this RC project also included: (1) formal contract; (2) real gain-share/pain-share; and (3) equity. Like other PPP projects, this PPP project was procured with a formal contract, with real gain-share and pain-share arrangements between public and private sectors. To implement so, there exerted equity principle behind the mechanism. The variant of RC is delineated by the set of elements within the thick dotted line boundary in Figure 2.

Case 4: Tsing Ma Bridge (a joint venture project in Hong Kong)

The fourth case is found from the website of http://en.wikipedia.org/wiki/Tsing_Ma_Bridge and http://www.cse.polyu.edu.hk/~ctbridge/case/tsingma.htm) where the Tsing Ma Bridge was depicted. Tsing Ma Bridge is a suspension bridge in Hong Kong, China. The client was Highways Department of the Hong Kong government; the main contractor was Anglo Japanese Construction JV; and the engineer and designer was Mott MacDonald Hong Kong Limited. Tsing Ma Bridge is the seventh-longest span suspension bridge all over the world. It was named by combining the names of two of the islands in Hong Kong, namely Tsing Yi and Ma Wan. It has two decks and carries both road and rail traffic. It is the world's largest suspension bridge of this type. The main span of the bridge is 1,377 metres (4,518 ft) long and 206 metres (676 ft) high. The span is the largest of all bridges in the world that carry rail traffic. The 41 metres (135 ft) wide bridge deck carries six lanes of automobile traffic, with three lanes in each direction. There are two rail tracks in the lower level. In addition, there are two sheltered carriageways on the lower deck for both maintenance access and as backup for traffic in case typhoons strike Hong Kong. Although road traffic would need to be closed in that case, trains could still get through in either direction.

It is found that apart from the five core elements, this RC project also included: (1) formal contract; and (2) real gain-share/pain-share. Like other JV projects, this JV project was implemented with a formal contract, with real gain-share and pain-share arrangements between contracting parties. The variant of RC is delineated by the set of elements within the thick solid line boundary in Figure 2.

8. Significance, value and limitation of RC Sunflower Model

An increasing number of client organisations have been observed to adopt RC to manage their building and construction works over the past decade (Chan et al., 2002; Walker et al. 2000a). With the time going by, the development of RC becomes complicated, and it is quite difficult to define what a construction RC project is. In fact, industrial practitioners and academics are always vague with the concepts and definitions of RC. By the adoption of the German philosopher Ludwig Wittgenstein's idea of family-resemblance, a RC Sunflower

Model has been proposed. It should be highlighted that although the research methodologies adopted in this research study are the same as previous research works to define construction partnering (Nyström, 2005) and construction alliancing (Yeung et al., 2007), their research foci and research findings are totally different. Nyström (2005) only focused on defining construction partnering and based on his research findings (based on 13 pieces of literature only), there are two core components in partnering, trust and mutual understanding, with seven elements as petals, including: (1) economic incentive contracts; (2) relationship building activities; (3) continuous and structured meetings; (4) facilitator; (5) choosing working partners; (6) predetermined dispute resolution method; and (7) openness. Later, Yeung et al. (2007) focused on defining alliance in construction and their research findings (based on 14 pieces of literature only) reported that there are two core hard (contractual) elements: formal contract and real gain-share/pain-share arrangement, and three essential soft (relationship-based) elements: trust, long-term commitment, and cooperation and communication. In addition to these core elements, there are nine elements identified as petals, encompassing: (1) win-win philosophy; (2) equity; (3) agreed problem resolution methods; (4) common goals and objectives; (5) continuous improvements; (6) alliancing workshops; (7) early selection of contractors; (8) for a single project only; and (9) for at least two projects.

Unlike these two research works which are narrow in research focus, i.e. each of them covers merely one type of relational contracting, this research study has made a significant contribution to define different forms of relational contracting in the whole spectrum. In addition, the research findings (based on a total of 42 pieces of literature) are significantly different from the two studies in that there are five relationship-based core elements identified, including: (1) commitment; (2) trust; (3) cooperation and communication; (4) common goals and objective; and (5) win-win philosophy. Apart from the five core elements, there are seven petals, including: (1) continuous improvements; (2) agreed problem resolution methods; (3) formal contract; (4) real gain-share/pain-share; (5) a joint declaration; (6) equity; and (7) facilitated workshops.

The model provides an innovative and useful framework to define the vague and versatile concept of RC in construction in a more flexible and structured way. Industrial practitioners may find the RC sunflower model useful in the procurement phase of a construction project, particularly if needed, both as a description of the concept and as a common starting point for discussions between the client and the contractor on how to procure a RC project. It deserves to highlight that the RC sunflower model developed is universal in nature because the identification of a combination of core and non-core elements as shown in Table 2 are sourced from different countries and regions. This is dissimilar to the research work conducted by Rowlinson and Cheung (2008), in which the relational contracting concepts defined by them are by and large region/country specific.

A limitation of this research is that due to time and resource limitation, the inter-relationships within core elements, within non-core elements, and between core and non-core elements have not yet been investigated. Further research work may be pursued in this direction to make the application of the RC Sunflower Model more robust.

9. Conclusions

Based on an in-depth analysis of reported literature, this paper has clearly defined RC in construction by using the innovative Sunflower Model. This model was developed from the German philosopher Ludwig Wittgenstein. Wittgenstein's ideas are that complicated concepts can be understood as a network of overlapping similarities. This is dissimilar to the traditional definition whereby a concept is given necessary and sufficient conditions. The RC literature was examined according to the Wittgenstein's philosophy and it was found that five core elements were always included in descriptions, "commitment", "trust", "cooperation and communication", "common goals and objective", and "win-win philosophy". Besides these core elements, there was an overlapping network of the other non-core elements. The model provides a concise and innovative framework to define the complicated concept of RC in a more structured manner. The contribution can be of paramount importance to both the research community and the construction industry. Having obtained a clearer definition for the various forms of RC in construction, researchers may now proceed to identify situational variables which will make a particular form of RC most suitable. Industrial practitioners may find the RC sunflower model useful in the procurement phase of a construction project, particularly if needed, both as a description of the concept and as a common starting point for discussions between the client and the contractor on how to procure a RC project.

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Table 1. Comparisons of the definitions of various forms of RC (including RC, project partnering, strategic partnering, project alliancing, strategic alliancing, PPP, and JV)

Definitions of various forms of RC	Definition
Relational contracting (RC)	Based on recognition of mutual benefits and win-win scenarios through more cooperative relationship between parties. RC embraces and underpins different approaches, encompassing partnering, alliancing, joint venture and other collaborative working arrangements and better risk sharing mechanisms. (Macniel 1978; Alsagoff and McDermott 1994; Jones 2000; Rowlinson and Cheung, 2004; Rahman and Kumaraswamy 2002, 2004; Palaneeswaran et al. 2003; Kumaraswamy et al. 2005a; Ling et al. 2006; Rahman et al. 2007).
Project partnering (PP)	A long-term commitment between two or more organisations for the purpose of achieving specific business objectives by maximizing the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisational boundaries. The relationship is based on trust, dedication to common goals, and an understanding of each other's individual expectations and values (Construction Industry Institute, 1991).
Strategic partnering (SP)	The major difference between project partnering (relationships established for a single project) and strategic partnering (a long-term commitment beyond a discrete project) is that the former is for a single project (Construction Industry Institute, 1991) but the latter involves at least two projects (Bennett and Jayes, 1998).
Project Alliancing (PA)	A cooperative arrangement between two or more organisations that forms part of their overall strategy, and contributions to achieving their major goals and objectives for a particular project (Kwok and Hampson, 1996). With alliancing, there is a "joint" rather than "shared" commitment. Parties agree on their contribution levels and required profit beforehand and then place these at risk. If one party in the alliance under-performs, then all other alliance partners are at risk of losing their rewards (profit and incentives) and could even share losses according to the agreed project pain-sharing/gain-sharing model (Walker et al., 2000b & 2002).
Strategic alliancing (SA)	The major difference between project alliancing and strategic alliancing is that project alliancing has a defined end, which is most commonly the practical completion date of a project (Peters et al., 2001). However, a strategic alliance usually exists between two companies that extend beyond a specific project (Walker et al., 2000b).
Public private partnerships (PPP)	The collaborations where the public and private sectors both bring their complementary skills to a project, with different levels of involvement and responsibility, for the sake of providing public services (Hong Kong Efficiency Unit, 2003).
Joint venture (JV)	Joint Ventures involve two or more legally distinct organisations (the parents), each of which shares in the decision-making activities of the jointly owned entity (Geringer, 1988).

Table 2. Key elements of relational contracting (including project partnering, strategic partnering, project alliancing, strategic alliancing, PPP, and JV)

Papers / elements	1	2	3	4	5	6	7	8	9	10	11	12
	Commitment	Trust	Cooperation and communication	Common goals and objectives	Win-win philosophy	Agreed problem resolution methods	Continuous improvements	A joint declaration statement	Facilitated workshops	Equity	Real gain-share/pain-share	Formal contract
Relational contracting												
Rahman and Kumaraswamy (2002)	√		√		√							
Palaneeswaran et al (2003)			√		√							
Rahman and Kumaraswamy (2004)	√		√	√	√							
Rahman and Kumaraswamy (2005)	√	√		√								
Kumaraswamy et al (2005a)	√	√	√		√							
Kumaraswamy et al (2005b)	√	√	√	√	√							
Ling et al (2006)			√		√							
Rahman et al (2007)		√		√								
Project partnering												
Bennett and Jayes (1991)	√	√		√		√	√	√	√			
Construction Industry Institute (1991)		√	√	√			√	√				
Sanders and Moore (1992)		√	√									
Crowley and Karim (1995)	√	√		√	√	√			√	√		
CIIA (1996)	√	√	√	√	√	√		√		√		
Lenard et al (1996)	√		√					√	√			
Green (1999)	√	√							√			
Lazar (2000)		√			√					√		
Li et al (2000)	√	√		√								
Walker et al (2000b)	√	√	√	√		√	√	√				
Manley and Hampson (2000)	√	√				√		√				
McGeorge and Palmer (2002)	√							√	√			
Walker et al (2002)	√	√				√				√		
Rowlinson and Cheung (2004)				√		√	√					
Strategic partnering												
Bennett and Jayes (1991)	√		√	√		√	√	√	√			
Bennett and Jayes (1998)	√	√		√		√	√	√	√	√		
Walker et al (2000b)	√	√	√	√		√	√	√				
Li et al (2000)	√	√								√		
Cheng and Li (2004)							√					

Project alliancing												
Kwok and Hampson (1996)			√	√								
Hampson and Kwok (1997)	√	√	√			√					√	
Abrahams and Cullen (1998)		√	√		√						√	
Walker et al (2000b)	√	√	√	√		√	√		√	√	√	√
Manley and Hampson (2000)	√		√							√		√
McGeorge and Palmer (2002)											√	√
Walker et al (2002)	√	√	√	√	√		√		√		√	√
Rowlinson and Cheung (2004)					√							√
Hauck et al (2004)		√	√	√						√	√	√
Alchimie and Phillips (2003)	√	√	√								√	
Thorpe and Dugdale (2004)	√	√		√			√					
Strategic alliancing												
Howarth et al (1995)		√										
Hampson and Kwok (1997)	√	√	√			√					√	
Lendrum (2000)	√			√	√							
Walker et al (2000b)	√	√	√			√	√					√
Peters et al (2001)	√											
Rowlinson and Cheung (2004)	√											
Hauck et al (2004)				√								
PPP												
The International Project Finance Association (2001)							√					
Li et al (2005)					√			√				
Zhang (2005)					√							
Asian Development Bank (2007)	√			√	√			√				
JV												
Tomlinson (1970)	√											
Geringer (1988)					√							
Shaughnessy (1995)				√								
Carrillo (1996)								√				
Walker and Johannes (2003)			√		√							
Total	**32**	**28**	**24**	**23**	**18**	**14**	**13**	**13**	**9**	**9**	**8**	**7**

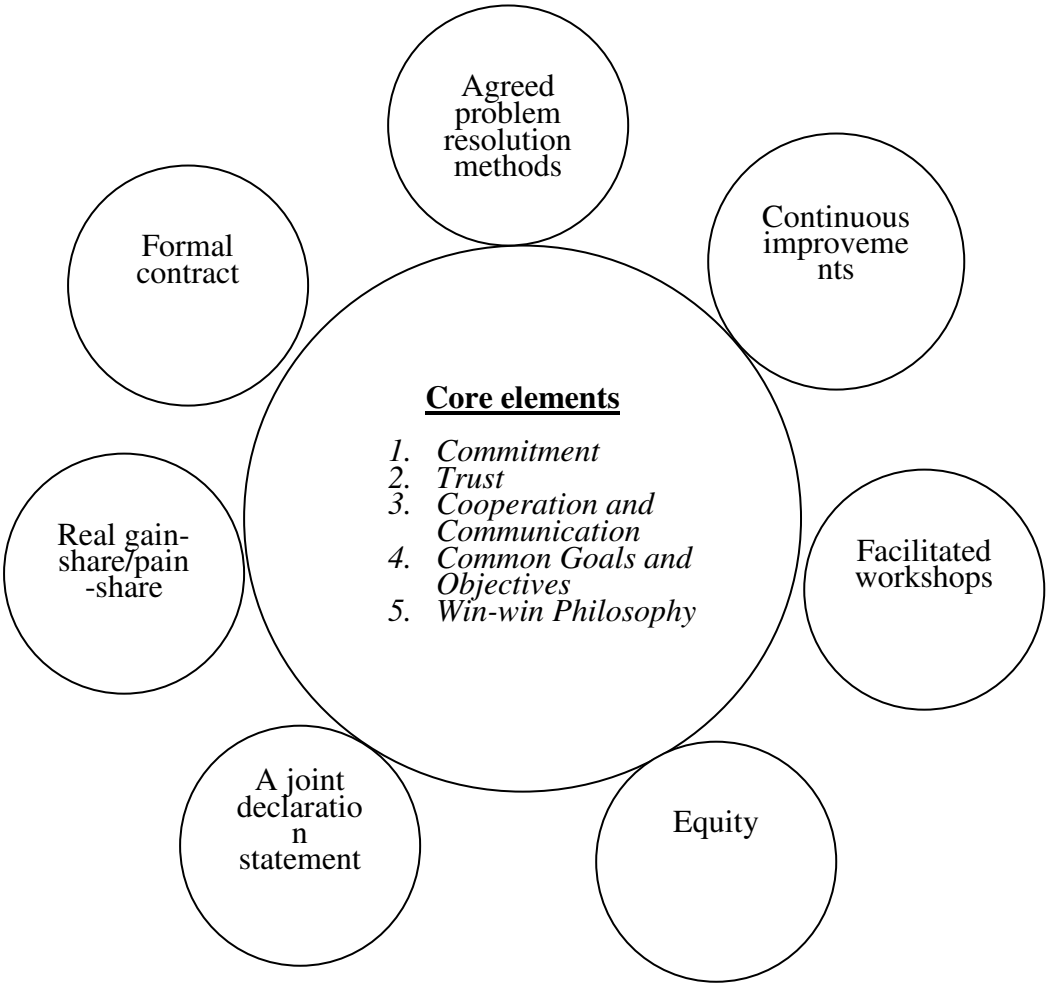

Figure 1. RC Sunflower Model containing the key elements of RC (adapted from Nyström, 2005; Yeung et al., 2007).

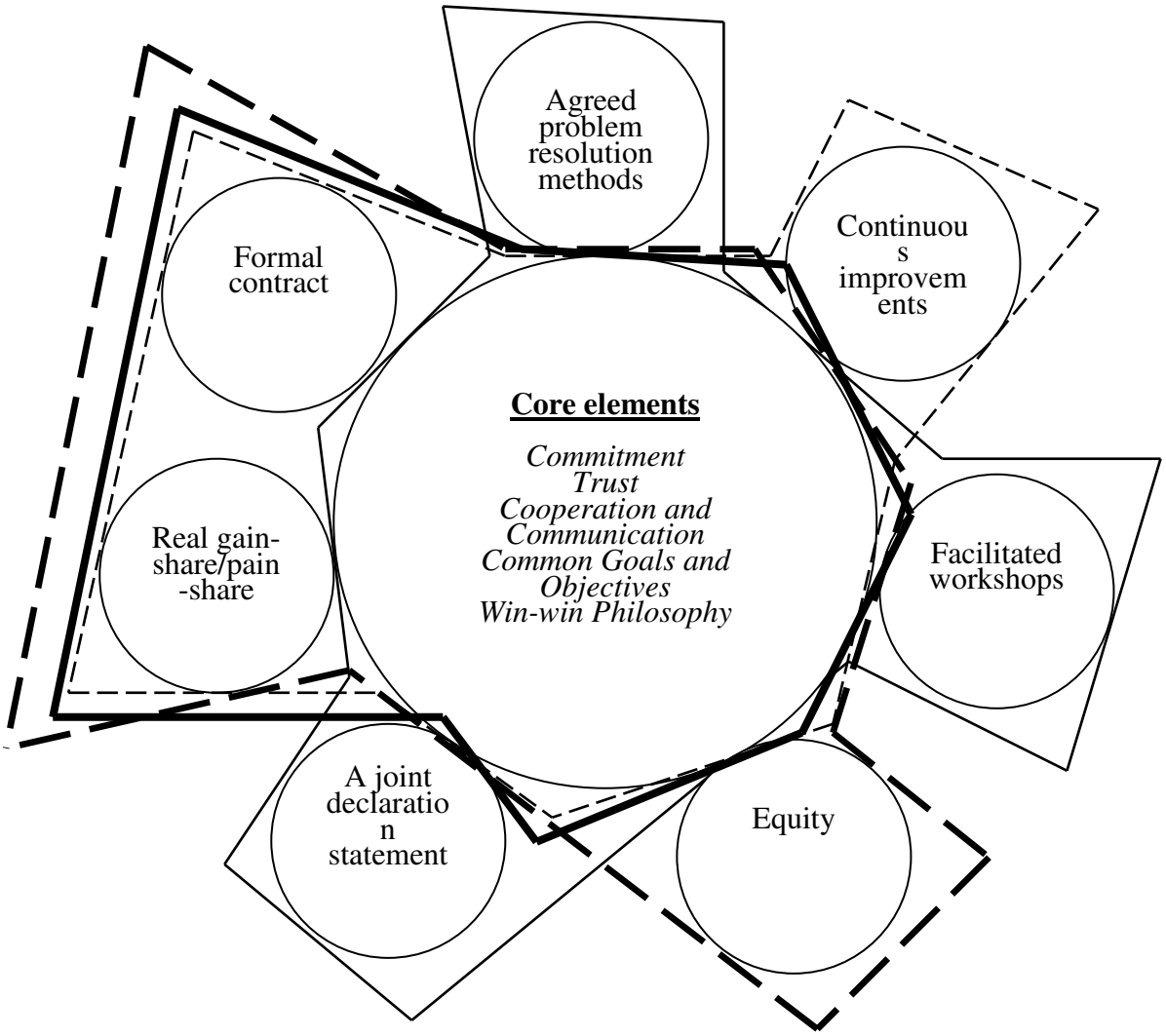

Figure 2. The applied RC Sunflower Model.

Legend:

- Thin solid lines for "Chater House" Project
- Thin dotted lines for "Australian National Museum" Project
- Thick solid lines for "Tsing Ma Bridge" Project
- Thick dotted lines for "Project 2002 – Enhancing the Quality of Education in Glasgow City Schools"