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Understanding Relationship Quality in Construction Projects: A study of the New Zealand Construction Industry

Mostafa Babaeian Jelodar

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Civil Engineering

Field of Construction Engineering and Management

Supervised by:

Dr Tak Wing Yiu
and
Professor Suzanne Wilkinson

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New Zealand

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In construction projects relationships are of strategic significance, especially in achieving project goals. Although different methodologies of contracting has been proposed and investigated to structure and formulise relationships between contracting parties, the underlying attributes which contribute to relationship quality have not received much attention. This lack of understanding and consideration may lead to harmful and misguided practices which can be detrimental to the outcome of projects and strategic bonds planned by the contracting parties. On the other hand relationship quality has been successfully conceptualised and applied as an informal tool of evaluating relationships for different human interaction. The concept has been especially useful in marketing to create effective strategic bonds in the buyer-supplier dyad. Because of its significance this study attempts to address a series of interrelated issues around relationship quality in construction procurement. Initially through previous literature and a round of expert interviews Trust, performance satisfaction, commitment and teamwork are identified as attributes of relationship quality. In addition a framework of practical strategies and actions is recommended for enhancing relationship quality and its attributes.

A conjoint full profile questionnaire technique is used to gather data and assess how contracting parties trade-off and value relationship quality attributes against each other. Cluster analysis reveals that three diverse judgment trends exist with different attribute values. Judgment trends of each industry group were investigated and mapped through correspondence analysis; hence two separate undelaying dimensions of effort for achievement and tangibility were identified. It is identified that judgment of relationship
quality is not unanimous within industry professionals and different parties have diverse preferences of attributes and underlying factors. For instance clients require both maximum effort and also tangible results as the basis of good relationships while contractors require more effort compared to tangibility.

Furthermore the effect of construction project conflicts on relationship quality is investigated. Initially causes of conflict are identified through construction litigation cases and expert interviews. A survey accompanied with different statistical techniques is carried out. It is observed that while most causes have negative effects, some had positive effects on relationship quality. Three sources of “technical performance”, “constraints and ambiguities” and “team behaviour” were identified for conflict. Furthermore two distinct types of functional and dysfunctional conflict were classified. It is confirmed that relationship quality is more influenced by conflict type in comparison to sources or causes of conflict. While team behaviour was the only significant source of dysfunctional conflict, all identified sources were significant to functional conflict.

Based on the findings of the study a systematic framework of relationship quality was presented and recommended for future investigation; resulting in tangible relationship quality application in construction procurement.
To:

my darling Sanaz, for I need not to reach since she was always there,

my sweetest Baran for all the joy she brought to mommy and daddy

and to Nikaan our star of hope
This achievement would not have been possible without the help and support of many individuals, friends and organizations that I have met and worked with during the course of this research.

I would like to express my deepest and sincere gratitude to Dr Tak-Wing Yiu for his support as supervisor and academic mentor during this extraordinary journey. His enlightened guidance and careful consideration has been instrumental in completion of this thesis. Above all he has always been a great friend during my study at the University of Auckland. I would like to extend my appreciation and gratitude to Professor Suzanne Wilkinson for her advice and inspiration as my co-supervisor. Her invaluable experienced insights and immense care has been extremely reassuring and an anchor of encouragement.

I would like to thank Dr Jim Bently for his support for the data collection process which has considerably contributed to the quality of this research. Special recognition is given to New Zealand Council for Infrastructure Development (NZCID) and its members for partaking in this study. Special thanks are given to Ting Chang Chen, Cong Ding, Marat Khassenov, and Michael Fisher for their assistance in the data collection process. My respect and appreciation is extended to those who have participated in various stages of this study including the expert interviews and the surveys.

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I am especially grateful to my parents Nadali Babaeeian Jelodar and Houra Askarinejad Amiri for giving me the guidance and opportunity to follow my dreams and the love to make them a reality as my first teachers in life. In addition I would like to thank my brother and sister; Ahmad and Marzieh for their love and companionship throughout my life. I was incredibly fortunate to have such a family of intellect and honour, who taught me values such as hard work, honesty and kindness. In addition I would like to thank my loving grandmothers; Khanjoon and Seyed-Naneh (RIP) who have always prayed for my success and wellbeing.

I have appreciated the blessed presence and incomparable joy of my adorable daughter and angel Baran, who has gracefully offered her love and kindness to daddy during this stressful quest. I cannot imagine how I could have accomplished this work without her wonderful and loving spirit; her smile always filled my heart with assurance and happiness.

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<tr>
<td>ACR</td>
<td>Arms-length Contractual Relations</td>
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<tr>
<td>ADR</td>
<td>Alternative Dispute Resolution</td>
</tr>
<tr>
<td>AMINZ</td>
<td>Arbitrators and Mediators Institute of New Zealand</td>
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<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
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<tr>
<td>AUBEA</td>
<td>Australasian Universities Building Educators Association</td>
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<td>BERL</td>
<td>Building and Economics Research Limited</td>
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<td>BRANZ</td>
<td>Building Research Association of New Zealand</td>
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<tr>
<td>CBA</td>
<td>Cost Benefit Analysis</td>
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<td>CBC</td>
<td>Choice Based Conjoint</td>
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<td>CF</td>
<td>Consent Form</td>
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<td>CIarb</td>
<td>Chartered Institute of Arbitrators</td>
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<td>CII</td>
<td>Construction Industry Institute</td>
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<td>CIRC</td>
<td>Construction Industry Review Committee</td>
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<td>CVA</td>
<td>Conjoint Value Analysis</td>
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<tr>
<td>DBH</td>
<td>Department of Building and Housing</td>
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<tr>
<td>DSS</td>
<td>Decision Support Systems</td>
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<tr>
<td>FIDIC</td>
<td>Fédération Internationale Des Ingénieurs-Conseils</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GFCF</td>
<td>Gross Fixed Capital Formation</td>
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<tr>
<td>ICE</td>
<td>Institution of Civil Engineers</td>
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<td>IJPM</td>
<td>International Journal of Project Management</td>
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<tr>
<td>IoD</td>
<td>Institute of Directors in New Zealand</td>
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<td>IPENZ</td>
<td>Institution of Professional Engineers New Zealand</td>
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<tr>
<td>JCEM</td>
<td>Journal of Construction Engineering and Management</td>
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<tr>
<td>KMO</td>
<td>Kaiser-Mayer-Olkin</td>
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<tr>
<td>LPC</td>
<td>Lowest Price Conforming</td>
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<td>MAUT</td>
<td>Multi Attribute Utility Theory</td>
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<td>MRA</td>
<td>Multiple Regression Analysis</td>
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<td>NEC</td>
<td>New Engineering Contract</td>
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<td>NZCCG</td>
<td>New Zealand Construction Client Group</td>
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<td>Abbreviation</td>
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<td>NZCID</td>
<td>New Zealand Council of Infrastructure Development</td>
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<td>OCR</td>
<td>Obligational Contractual Relations</td>
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<tr>
<td>PCFA</td>
<td>Principle Component Factor Analysis</td>
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<tr>
<td>PIS</td>
<td>Participant Information Sheet</td>
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<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
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<tr>
<td>PWC</td>
<td>Price Waterhouse Cooper</td>
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<tr>
<td>RMS</td>
<td>Root Mean Square</td>
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<tr>
<td>VIF</td>
<td>Variance Inflation Factor</td>
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Chapter 8 includes partial reproduction from the manuscript titled “Systematic Representation of Relationship Quality in Conflict and Dispute: for Construction Projects”. Construction Economics and Building, 15(1), 15. doi: 10.5130/ajceb.v15i1.4281

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Chapter 1
Introduction

1.1 The Construction Industry: An Overview

Construction is always regarded as an infrastructure providing industry accountable for growth and development of countries attaining a good deal of attention and resources. Not only it has a vital role in providing private, social, and economic infrastructure it also employs a large sum of people which will affect the local, national and worldwide economy. The sector has a significant contribution to the Gross Domestic Product (GDP), in fact the construction industry contributes around 7% to 10% in highly developed economies and 3% to 6% in underdeveloped economies to the total GDP. Other economic measures such as Gross Fixed Capital Formation (GFCF) and the availability of capital are also affected by the construction industry in most developing countries. The industry can provide governments with the necessary capabilities to manage the local and national economy by influencing decision making processes (Ganesan, 2000). It also has to be mentioned that the construction industry has considerable interactions with other industrial and economic sectors, making them interrelated prospectively or retrospectively (Bon, 2000; Ganesan, 2000). The industry is highly valued; hence constantly enjoys the intemperance support provided by governments, which has led to inefficiency and underdevelopment in comparison to other well established industries. Wolstenholme (2009) advocated that the construction industry has been protected in a healthy economy leading to prosperity without the need of innovation however the recent economic crisis has changed the scenery, compelling the industry participants to think again.
It is understood that the construction sector is filled with shortcomings which are hindering the realization of its full potential, making it a bulky, inefficient and dispute prone; over-consuming vital and precious resources of nations. Major industry reports and researchers have pointed out different shortcomings and issues surrounding the industry (CIRC. 2001; Egan, 1998; Latham, 1994; Wolstenholme, 2009).

Fragmentation leading to adversarial environment and behaviour is regarded as one of the major issues within the construction industry. A report by the Construction Industry Review Committee of Hong Kong (CIRC, 2001) stated; construction costs are high and the industry is very fragmented and beset with adversarial culture; setting the scene for confrontation instead of collaboration. Despite efforts to reduce this fragmentation Wolstenholme (2009) described the industry as a fragmented still which could lead to a poor quality product, adversarial relationships within project teams. This is why construction research has an on-going practical and theoretical initiative on collaboration, communication and performance based selection of project participants; which are in general relational approaches in procurement strategies. These are regarded as solutions to problems arising from the adversarial and project-based nature of the construction sector (Meng, 2012; Yeung et al., 2012).

Accordingly the concept of relational contracting, specific contractual strategies and working agreements such as partnering, alliancing and joint ventures have been promoted in the recent decades. In this overview relationships are often treated as a competency or essential skill required for managing project networks. These are the catalyst to develop collaboration and provide better opportunities for future business as an intangible asset to construction organizations (Eriksson et al., 2009; Pauget and Wald, 2013; Voss and Kock, 2013; Zou et al., 2014). Therefore the study of relationships and relational approaches become an on-going necessity within the construction culture. In business and marketing
relationships; customers are of extreme value, which is reflected in their associated research and literature; accordingly a lot of emphasis is put on customer retention instead of identifying new customer groups. Similarly the construction sector has realized the need for good quality relationships which could overcome fragmentation and facilitate collaboration. This can be regarded as a strategic effort for improving performance. It is believed that relationship status between parties has direct impact on project success and performance (Meng, 2012). Therefore relationships are not the goal, but are a path to achieving strategic goals (Jelodar et al., 2013b).

The selection process of contracting parties is normally based on factors which value short-term gains. There is a tendency to award contracts to the lowest bidders and delivery programmes are often unrealistically compressed (CIRC, 2001). Clients still have a deep rooted cost driven agenda; they expect to reduce costs or pass costs and risks down the supply chain thereby do not genuinely adopt a win-win attitude (Ng et al., 2002; Taylor, 1999). This will provoke adversarial behaviour by the contractor and also forces the contractor to undermine and compromise quality for cost. Greenwood (2001) also concludes that typical contractor/subcontractor relationships are still traditional cost-driven and potentially adversarial too. More recently Wolstenholme (2009) also addressed the fact that most client business models are focused on short-term gains and do not reward suppliers who can deliver long-term sustainable solutions.

It is time for the industry to seek better relationships and perhaps to adopt a more business-oriented approach to construction projects where relationship quality is of strategic value. However the translation of this approach to construction projects is still rudimentary and encrypted with heavy and bulky contracting procedures and obligations. A general attention toward relationship quality outside the context of contractual arrangements is beneficial.
1.2 Background and Significance of Research

The construction industry is constantly pledging for change in procurement and delivery practices, and this has been constantly reflected through many reports and studies over the recent decades (Building and Construction Sector Productivity Task Force, 2008; CIRC, 2001; Egan, 1998; Latham, 1994; Wolstenholme, 2009). Although some impressive works have been done the general feeling for change is still as strong if not stronger then the time of these reports. Sir John Egan in 2008 stated "We could have had a revolution and what we've achieved is a bit of improvement" “I would give the industry 4 out of 10", and also Sir Michael Latham in 2009 quoted that "What has been achieved is more than I expected but less than I hoped" both pressing for more significant changes (Wolstenholme, 2009).

Akintoye and Main (2007) have reported that the UK contractors want to engage more into collaborative relationships for risk sharing, access to innovation and technology, response to market, resource efficiency and client requirements drivers. Kumaraswamy et al.(2005a) acknowledges the move from “classical contracting” and traditional transactions for the much desired cooperative team-working and consequential performance improvements. They add that clashes of organizational, operational, national, and/or professional cultures point to the need for “relational integration” as a prerequisite for synergistic team-working; with the focus being trust and teambuilding. Harper and Bernold (2005) advocate the replacement of the old “lowest bid” attitude towards procurement with partnership relationships; in addition they demonstrated that lack of trust and resilience to change are barriers to creating alliances and partnerships.

In standard forms of construction contract and traditional procurement methods the tendency is to look for liabilities instead of collaboration in problem solving; therefore the focus of changes in general has been on different contracting methodologies to perhaps overcome fragmentation and the existing blame culture. Accordingly construction practices
have borrowed from the notion of relational contracting which has been previously advocated through the works of MacNeil (1974; 1987) within organisational context. Cheung et al. (2006a) suggested that inadequacies of classical and neoclassical contract law are responsible for the emergence of relational contracting in construction. The relational contracting approach is believed to be a better route for improving cooperative relationships among project participants in the face of uncertainties and complexities of different construction activities (Rahman and Kumaraswamy, 2002). Partnering, alliancing and joint ventures have dominated a level of industry interactions where more risky and complex projects are concerned and the need for cooperation and collaboration is necessary (Chan et al., 2004; Lazar, 2000). MacNeil (1974) presents the idea of mutual planning and relationship development, and emphasis that contracts follow a continuum to serve a purpose from fully transactional at one extreme to vertical integration at the other extreme; therefore all contracts except the fully transactional carry a relational element.

Generally it can be observed that project relationships are largely influenced and governed by contract type in construction. Contracts are used as a tool to formulate and mandate relationships between the contracting parties. However there is a perception that relationships should develop organically and not be forced or formalised. Good and productive working relationships will arise from mutual acceptance and long-term collaboration. This leads to distinguish two different perceptions towards relationships in construction projects. One focuses on relational approaches as informal alignment of goals and agreements outside the contractual setting whereas the other view believes in building and formalising relationships by formal and structured approaches, within construction contract clauses (NZCID, 2013). The relational approach regardless of its formal and informal paradigm is supposed to incur a certain level or magnitude of relationship between the project participants which may be fit for the purpose of the project.
In the buyer-supplier context contractual relationships are presented in a continuum between the 'Arms-length Contractual Relations' (ACR) and 'Obligational Contractual Relations' (OCR) (Sako, 1992). ACR arrangements are highly transactional, one-off; with no commitment between the parties in the absence of goodwill trust. Conversely OCR arrangements are highly interdependent with high collaboration, goodwill trust and reciprocity. According to Cox and Thompson (1997) a similar continuum also exists in construction contracts, with contracts such as the Fédération Internationale Des Ingénieurs-Conseils (FIDIC) being more relational and standard forms of contracts being more transactional and ACR. Furthermore New Engineering Contract (NEC) and eastern contractual cultures are more relational (OCR) as well. It seems that the problem of relational approaches has been occupying the industry for a long period of time and is realized that the core value of relational contracting is the quality of relationships which they can foster.

In marketing and business relationships customer retention is the mainstream strategy vital for success, thus the concept of relationship quality was developed to evaluate and maintain fit for purpose relationships with the ultimate goal of customer retention (Crosby et al., 1990; Dorsch et al., 1998; Roberts et al., 2003). Relationship quality also provides an evaluation of the relationship status, therefore a measure of bond between different parties (Crosby et al., 1990). Keeping track of relationship quality can be valuable for future salesperson-customer interactions because as Roberts, et al.(2003) stated time and money is spent to keep some relationships proactive in a prosperous order for longer terms. Hennig-Thurau and Klee (1997) defined relationship quality as “the degree of appropriateness of a relationship to fulfil the end needs of a customer”. Others have tried to conceptualize it and provide attributional definitions; for instance Roberts, et al.(2003) adopted Bagozzi’s (1984) framework of construct definition to propose a conceptual meanings of constructs explained by several attributes. Relationship quality has been a major focus of research and practice in
relationship marketing lending to great benefits and perception changes in dealing with customers. Relationship marketing is a respected and well established strategy which focusses on building strong relationships with individual customers. This has contributed significantly to the advancement of different business strategies and increased overall performance (Pheng, 1999). Relationship marketing is a move form transactional market places to customer retaining markets were salesperson and customers develop a bonding relationship to the benefit of both parties. This change is very similar to the required and pursued change in construction where the emphasis is on developing long-term relationships and integration (Pauget and Wald, 2013; Voss and Kock, 2013). Consequently based on the evolution of relationship quality as an evaluation mechanism in marketing and business context, it is realised that similar evaluations of contract appropriateness for relational needs in certain construction projects can also be constructed (Jelodar and Yiu, 2012b; Roberts et al., 2003).

Another issue in practice of relational approaches in construction is that, despite high admiration and praise for formal methodologies such as partnering and alliancing it is not possible to apply them to all circumstances especially on projects with limited funds or different legal settings (Ke et al., 2011; Yeung et al., 2012). However the need for relational approaches is felt for a variety of projects with different size and circumstances. Subsequently it is necessary to explore the nature of relationships with the aim to provide bonds and working environments which are fit for the purpose of projects. The concept of relationship quality developed in marketing and business provides a basis of relationship identification through creating awareness. Therefore the identification of its composition and attributes becomes very important. The attributes of the concept although not unanimously but are largely agreed upon; in addition some studies have tried to understand different trends and ways of thinking towards all the various identified attributes of relationship quality
(Ashnai et al., 2009; Naudé and Buttle, 2000). However in construction research and practice the structure of relationship development and such frameworks is still rudimentary (Yeung et al., 2012); and Zou et al., (2014) expressed that the nature of construction relationships outside the framework of contractual provisions is rather unexplored, although there is much appreciation for collaboration and relational approaches.

In typical construction projects regardless of their types and size many events may happen which could incur undesirable outcomes. Incident such as conflict and dispute if not controlled may impact the outcomes and performance of projects. Conflict exists in any human transaction, social structure or projects; and incompatibility of goals and values makes conflict inevitable among construction practitioners (Leung et al., 2013). An important implication of conflict is its negative effect on relationship quality in many project environments. The construction sector is paying a huge price for out of control and relationship defecting conflicts which are very common and have the tendency to develop into full scale disputes. This is why many studies have attempted to understand the nature of this phenomenon (Kumaraswamy, 1997b; Yiu and Cheung, 2007). Although there are general and established research work about implications of conflict on relationships in construction projects (Cheung et al., 2006b; Harmon, 2003a); there is still lack of empirical evidence. Fenn et al. (1997), believed that there has been limited empirically structured evidence to justify the theories presented. Love et al. (2010) have stated even more than a decade later; Fenn et al.’s (1997) observation is still pertinent, advising that a lot of the underlying causal nature of events such as conflicts and disputes are unstructured in association with relational elements of projects.

The causes of conflict and associated events will have a burden on relationship quality; nevertheless the mechanism of conflict influence on relationship quality in construction does not have much empirical backing among contracting parties. If these
mechanisms are identified it may result in more practical and feasible advancements in conflict management. Therefore a more compatible problem solving and conflict handling strategy with the relational agenda of the industry can be acquired in future. Research in the field of conflict management has generally considered the impact of good relations on the effectiveness of problem solving, whether it is conflict management styles or dispute resolution strategies (Mitropoulos and Howell, 2001), however studies which identify the impact of causes or triggers of conflict on the relationship quality of contracting parties are scarce. The industry is moving towards retainable and sustainable relationships, as a result understanding how conflict and dispute influences contractual and working relationships becomes essential. In fact the preservation of existing relationships if performed appropriately will produce value in terms of quality, time and even cost implications of projects (Ling et al., 2014).

It is observed that the construction industry is effortlessly trying to formulise relational approaches through different contracting strategies. Hence after observing the benefits of relationship quality research and practice in other disciplines, and how this rather informal method of structuring bonds and evaluating relationships is successful, the application and practice of a similar informal concept for construction sector is contemplated. This study is inspired and motivated to identify relationship quality attributes and structure through the available knowledge of different procurement strategies and relational contracting methodologies. These methodologies have been accustomed with many shortcomings and are not applicable to all circumstances; hence an informal development of relationship quality could be of great importance in overcoming the shortcomings. Studying and developing such concepts will provide more awareness as to how relational attributes are valued from different parties’ perspective aiding the construction practitioners to more well informed decisions and project outcomes. If parities are aware of each other’s relational
expectation then, preservation and maintenance of their relationships can become much easier. This can be extremely helpful for both short-term purposes with by focusing on more gains and improved performance, and also to the long-term and strategic view with a more business oriented perspective in construction working arrangement. And according to Jelodar and Yiu (2012a, 2012b) this ultimately could equip project managers with an invaluable relationship monitoring system and mechanism similar to the relationship quality measure in marketing and business.

1.3 Problem Statement

Although the tendency to move towards relational approaches in procurement and delivery of construction projects exists among professionals and researchers, the focus is occupied with different forms of contracting and procurement strategies. Therefore understanding the actual nature of relationships and how they vary during and after projects are often undermined and neglected. In order to address these issues this study intends to investigate the measure of relationship quality which can provide reflections on relationship status and a measure of evaluation. The concept has been defined in many forms especially in business and marketing context. Some believe it’s a “high order construct” (Crosby et al., 1990); this implies that the concept is explained by more than one layer of latent variables (Hair, 2010). However Roberts, et al.(2003) advocated an attributional definition.

In order to operationalize the concept in construction, it is imperative to identify its main attributes in construction projects. Bygballe et al., (2010) have identified duration, partners and evolution as non-structural or non-conceptual attributes for relationship dimensions based on the Construction Industry Institute’s definition of partnering [CII](1991). However, there is a lack of research in relationship nature and development especially informal relational approaches (Bygballe et al., 2010). Examination of some recent works (Ling et al., 2014; Meng, 2010) revealed that contracting parties often neglect a
systematic evaluation of their working relationships because their relationships are often considered as ‘one-off’, i.e. ending with project completion. There is a need to change to a long-term relational focus; however the effectiveness of this shift depends on the convictions and motivation of the people who drive it (Kumaraswamy et al., 2005a). In this regard one has to understand different perceptions and how relational concepts in this case relationship quality attributes are evaluated and formed via different industry groups.

Another issue mentioned in the previous section is lack of indications on how relationship develops and evolves during the course of projects. Accordingly there are many events which may affect relationships; however the interactions of these events, their causes and sources with measures and features of the relationship remain uncharted. Specifically inevitable events such as conflicts, disputes and their management approaches may influence the quality of relationships in construction projects and need to be investigated. This study aims to focus on these two broad issues surrounding relationship quality. The following two research questions are therefore developed:

1. How is relationship quality valued or perceived among contracting parties?
2. How could inevitable conflicts in project processes affect relationship quality?

Relationship quality is explored and conceptualised based on the most closely associated relational attributes identified in previous construction literature.

1.4 Research Objectives

This study aims to investigate relationship quality among contracting parties in construction projects. Objectives are presented according to the aforementioned problem statements. Based on the first research question, this study aims to:

1) identify and conceptualize the possible attributes associated with relationship quality in construction projects,
2) evaluate how relationship quality is perceived and judged among construction practitioners based on the identified attributes, and
3) identify and compare patterns of relationship quality judgment within industry professional groups.

Based on the second research question, this study aims to:

4) identify the general causes of conflict and their implications on relationship quality in construction contractual setting
5) evaluate how relationship quality and its associated attributes are affected by the causes of conflict
6) determine the consequent effect of conflict sources and conflict type on relationship quality of the contracting parties, and
7) derive recommendations for future research.

1.5 Research Scope

This study concentrates on the determination of relationship quality for construction project procurement activities in New Zealand. The New Zealand building and construction industry contributes 5% to GDP, employing 8% of the workforce (sixth largest employing industry), and nearly 50% of all gross fixed capital formation; making it a facility provider and growth driver of the economy (PWC, 2011). The construction industry has the third highest number of enterprises in New Zealand economy (Statistics New Zealand, 2009).

However according to industry reports, construction productivity is alarmingly low in comparison with other comparable sectors of New Zealand economy (PWC, 2011). New Zealand Council of Infrastructure Development (NZCID) believes that there is a general underperformance for labour productivity compared to other similar economies and countries (NZCID, 2005). On the other hand a 10% increase in construction productivity can
add around $2 billion to the New Zealand GDP (BERL, 2003). Building Research Association of New Zealand (BRANZ) in a separate study identify that the industry’s operating setup and the existence of poorly understood and complex supply chain relationships are contributing to the decline in productivity. The study suggests lifting the focus from lowest price and adopting a way forward which embraces shared learning, more accurate forward visibility on customers, value-added contractual approach orders and greater collaborative work (Allan, 2008).

In a taskforce commissioned by the Department of Building and Housing (DBH) for sector productivity there is a push for a new perspective with more collaborative and relational methodologies in construction procurement. According to the task force procurement may have a vicious or virtuous cycle; in which elements such as collaborative strategic planning, integrated design and construction, sophisticated cost modelling for whole life sustainability, and knowledge capture and sharing were described among other factors as determinants of the virtuous cycle (Constructing Excellence in New Zealand, 2009).

Furthermore the New Zealand Construction Client Group (NZCCG) believes that Lowest Price Conforming (LPC) competitive tendering; method may have low potential for good quality relationships and may set the scene for more hostility. With this LPC method, construction contractors in New Zealand may not be able to exercise appropriate relationship building practices and might fall in the trap of claim and blame culture which is destructive to working relationships (Constructing Excellence in New Zealand, 2009).

The New Zealand Council of Infrastructure Development (NZCID) also recommends that performance and productivity can be affected by procurement methodology. The chief executive of NZCID emphasises that in order to lift the performance of the construction sector the future work programme must be project specific, well sequenced and should utilise
the best in class procurement capability (NZCID, 2013). The New Zealand Construction Industry Vision 2025 identifies the need for change in New Zealand construction industry by consent of industry leaders. It also suggests that the focus should be on productivity related issues and is pro industry wide leadership changes perhaps via education (Constructing Excellence in New Zealand, 2008). This desire to change to more relational approaches and procurement strategies makes New Zealand construction a perfect base for the current study. All industry professional groups can take part since it seeks to investigate the relationship quality within construction projects from the viewpoint of different contractual parties. This implies that all construction types (industrial, commercial, civil, and residential ...etc.) can be included in this research; in addition research participants can range from middle management to top management levels, from contracting, subcontracting, engineering, client or even consulting positions.

1.6 Research Methodology

This doctoral thesis is structured based on a number of submitted or accepted journal articles developed for the purpose of this research endeavour. A detailed methodology section is included in each of the articles incorporated as chapters of the theses. However in order to make the research approach more tangible and coherent a brief overview of research methodology is presented in this section.

This study aims to address the seven previously discussed objectives, therefore a mix of qualitative and quantitative methods has been used to provide measures of analysis and validation for this study (Fellows and Liu, 2009; Knight and Ruddock, 2009). As such this study has been carried out through five different but interconnected stages including: (1) literature review; (2) expert interviews (see Appendix 2); (3) survey one; the conjoint analysis questionnaire (see Appendix 5); (4) litigation and conflict case reviews; and (5) survey two; conflict and relationship quality questionnaire (see Appendix 6). These stages
support the findings of each other and subsequently provide a foundation to move forward and develop the next stage of research. Figure 1.1 is a graphic illustration of the research methodology.

1.6.1 Conceptual and Research Framework

The five main stages of research contribute to the formation of seven separate chapters of this doctoral thesis. The conceptual framework in Figure 1.1 demonstrates the theoretical links of concepts and variables to be investigated in this study. The framework presents a holistic view of the study and enables better understanding of different research stages. In addition the achievement of each research objective within each chapter is illustrated through different stages of a research framework in Figure 1.2.

This conceptual framework (see Figure 1.1) shows a chain of events which can influence relationships in construction projects. The primary objectives are to understand attributes and the nature of relationship quality and its attributes. Since the focus of the study is on conflict as an inevitable event in construction projects the relevant concepts surrounding this phenomenon are investigated as variables affecting relationships. The study aims to investigate relationship quality pre-dispute and formal methods of resolution since these events are extremely devastating to any working relationship. Therefore causes of conflict are classified by their sources and the development of different conflict types is investigated. The study will investigate the association of “causes of conflict”, “conflict sources”, “conflict type” and also other moderating factors which can influence conflict and relationship quality in construction projects.
The first stage of the study aims to identify the attributes of relationship quality as a beneficial factor to construction projects performance and business initiatives (see Figure 1.1). This is initially done through a comprehensive literature review (see Figure 1.2); the first studies to be examined are the marketing and business discipline which relationship quality has already been investigated and expanded. The review also includes the relevant work in construction literature which focuses on different relational approaches in procurement. Studies with the scope of different relational contracting methodologies such as partnering, alliancing, joint ventures, and supply chain relationships in construction have also been included. This stage allows for the identification of attributes with potential influence on relationship quality. This leads to better understanding and evaluation of relationship quality as illustrated in the research framework of Figure 1.1 (Chapter 2 includes more details).

The expert interviews are performed post literature review stage (see Figure 1.2). These interviews first investigate the nature of relationship quality in construction from various points of view. They also provide a mean of comparison for the outcome of the literature review and therefore can serve as a potential measure of validity. Furthermore the outcomes from other stages could also be compared and validated using the information.
provided by the experts. Possible attributes associated with relationship quality in construction projects are identifies and verified in New Zealand construction context, hence as a result of stage one and two, Objective 1 of the researches is accomplished (see Chapter 2).

In stage three, a survey is designed and developed (see Figure 1.2). The survey was designed for the purpose of performing conjoint analysis which is a relevant technique for assessing different judgment models. The survey aims to capture the actual decisions and trade-offs undertaken by industry professionals towards relationship quality. The previously identified relationship quality attributes in stage one and two of the research are used for this trade-off. Accordingly different perceptions and judgment trends of relationship quality was identified lending to the accomplishment of Objective 2 (see Chapter 3). Furthermore different classifications and patterns of judgment within the construction industry professional groups are identified demarking the achievement of Objective 3 (see Chapter 4).

To achieve Objective 4, a comprehensive review of construction conflict and dispute cases have been performed through examining different construction litigation cases in stage 4 of the research (see Figure 1.2). This is done to identify causes of conflict and further classify them into sources as illustrated in the conceptual framework (see Figure 1.1). These cases are publically available at the New Zealand construction dispute tribunal. As a result the common causes of conflict and dispute are identified (see Chapter 5).

At stage five a second questionnaire survey has been designed and developed (see Figure 1.2) to assess the interactions of conflict events of the research framework (see Figure 1.1) on relationship quality. The survey is based on real case conflict incidents in construction projects. Initially the effect of causes associated to conflict on relationship quality and its attributes is evaluated. This has been carried out by multiple regression analysis and the
stepwise backward elimination technique. Consequently Objective 5 of the study is achieved (see Chapter 6). By using factor analysis, the underlying factors associated with conflict causes are identified and renamed as conflict sources. In addition conflict type is also identified through the application of factor analysis on a scale designed for evaluating conflict. This allows for the examination of the consequent effect of conflict sources and type on relationship quality, lending to the achievement of Objective 6 (see Chapter 7). The elements used for development of this survey were all defined from the previous stages. Causes of conflict used in this stage have been previously identified in stage four; the relationship quality attributes used in this stage have been identified and verified through stage one and two of the study.

From information gathered in the previous stages, certain recommendations are also derived for future research and practice to fulfil Objective 7 (see Figure 1.2). These recommendations are accordingly reflected in Chapter 8 of the study. In Chapter 8 a systematic approach to relationship quality deterioration is suggested, therefore the use of Fault Tree Analysis (FTA) as a system reliability analysis measure is promoted. It is also suggested that any other method as part of the greater general systems theory can be used to evaluate systematic influence of events such as conflict, dispute and etc. on relationship quality. Table 1.1 briefly summarises the methodology of the research according to each chapter and research objective. It also demonstrates the various analytical methods used to achieve these objectives. In addition the table indicates how the different manuscripts and research papers are used in the compilation of this thesis. The outcome of each article is acknowledged as key deliverables, which will feed into the following research article; hence defining the coherent flow of the study.
1.6.2 Ethics

All ethical aspects of the study have been considered, two separate applications have been submitted to the University of Auckland’s Human Participants Ethics Committee for the direct expert interviews and also the anonymous surveys of the study. The committee approved the application for the interviews on 25\textsuperscript{th} of January 2013, for the duration of three years with the reference number of 8461. The approval required a Participant Information Sheet (PIS) and a Consent Form (CF) designed for the individuals taking part in the interview. The approvals for the surveys were obtained on 15\textsuperscript{th} of July 2013 which similarly had a three-year period. However since this survey was anonymous the CF was not necessary and only a PIS was developed. All the relevant ethics documents have been included in the Appendix 1 of this doctoral thesis.

1.6.3 Data Collection

This study uses different bulks of data for analysis at each stage. After the initial literature review stage; in stage two a total of 21 interviews with a variety of industry professionals are conducted. The experts are general contractors, consultants, clients, project managers, mediators, arbitrators, and dispute resolution experts who have had at least 15 years’ experience in construction project management. At stage three of the investigation a survey based on conjoint analysis is carried out (see Appendix 5), in total 91 responses were received achieving a response rate 23\% for this survey. In stage four of the study a total of 123 construction dispute cases was reviewed. The documents were publically available information and court decisions accessible at the Building Dispute Tribunal and also the online database for Dispute Tribunal of the Ministry of Justice. Finally in stage five of the research a second survey is conducted and a total of 124 respondents took part in the research producing a response rate of around 23\% (see Appendix 6).
Stage one: literature review

A study of relationship quality in marketing and business (generally a buyer customer perspective)

A comprehensive study of relational approaches through previous literature in construction
  - Alliancing
  - Partnering
  - Supply chain relations
  - Team integration
  - Collaboration

A study of relational contracting general application in other disciplines especially

Stage two: Expert interviews

Outcome: Objective 1

Chapter 2: The Conceptualization of Relationship Quality

Outcome: Objective 2

Chapter 3: Relationship Quality Judgment Model: A Conjoint Measurement

Outcome: Objective 3

Chapter 4: Relationship Quality among Construction Professionals

Outcome: Objective 4

Chapter 5: Common Causes of Conflict and Dispute in Construction Relationships

Outcome: Objective 5

Chapter 6: Causes of Conflict in Association with Relationships Quality

Outcome: Objective 6

Chapter 7: Effect of Conflict Sources and Type on Relationship Quality

Outcome: Objective 7

Stage three: survey one (conjoint analysis)

Outcome: Objective 8

Stage four: litigation and conflict case reviews

Outcome: Objective 9

Stage five: Survey two

Figure 1.2: Research Framework
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Aim and Objectives</th>
<th>Method of Analysis</th>
<th>Key Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>Justification and definition of the research process</td>
<td></td>
<td>Research objectives/Research framework/ Dissertation outline</td>
</tr>
<tr>
<td>2</td>
<td>The Conceptualization of Relationship Quality</td>
<td>Identify and conceptualize the possible attributes associated with relationship quality in construction projects</td>
<td>Content Analysis</td>
<td>Relationship quality attributes/ Practical strategies and actions for enhance relationship quality attributes</td>
</tr>
<tr>
<td>3</td>
<td>Relationship Quality Judgment Model: A Conjoint Measurement</td>
<td>Evaluate how relationship quality is perceived and judged among construction practitioners based on the identified attributes.</td>
<td>Conjoint analysis/ Cluster Analysis</td>
<td>Judgment models for relationship quality in construction/ Practical managerial suggestions</td>
</tr>
<tr>
<td>4</td>
<td>Relationship Quality among Construction Professionals</td>
<td>Identify and compare patterns of judgment within industry professional groups.</td>
<td>Conjoint analysis/ Correspondence analysis</td>
<td>The judgment trend of different subgroups within industry professional groups/ Identifying new dimension for assessing relationship quality</td>
</tr>
<tr>
<td>5</td>
<td>Common Causes of Conflict and Dispute in Construction Relationships</td>
<td>Identify the general causes of conflict</td>
<td>Case reviews/ Content analysis</td>
<td>List of common causes for conflict and dispute/ The qualitative effects of these causes on relationship quality is obtained</td>
</tr>
<tr>
<td>6</td>
<td>Causes of Conflict in Association with Relationships Quality</td>
<td>Evaluate how relationship quality and its associated attributes are affected by conflict causes.</td>
<td>Stepwise multiple regression analysis (backward elimination technique)</td>
<td>Causes of conflict which influence each of the four identified relationship quality attributes/ How the causes of conflict influence relationship quality in general</td>
</tr>
<tr>
<td>7</td>
<td>Effect of Conflict Sources and Type on Relationship Quality</td>
<td>Determine the consequent effect of conflict sources and conflict type on relationship quality of the contracting parties.</td>
<td>Factor analysis/ Multiple regression analysis</td>
<td>A classification of conflict sources/ A classification of conflict type/ How conflict sources will effect conflict type/ How conflict sources and type will effect relationship quality in construction projects</td>
</tr>
<tr>
<td>8</td>
<td>Systematic Representation of Relationship Quality</td>
<td>Recommendations for potential future research are presented.</td>
<td>Content analysis/ Case studies</td>
<td>Study will suggests and demonstrate a systematic framework representing the interactions of conflict and dispute associated events with the relationship quality</td>
</tr>
<tr>
<td>9</td>
<td>Conclusion and Recommendations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.1: Dissertation methodology according to each chapter
As illustrated the core of the study is supported by variety of data which can provide different perspectives and furthermore serve as measures of validity for the consequent stages of the study. More detail will be provided on the data collection process in the associated chapters.

1.7 Thesis Organization

This document is a PhD thesis with publication. The University of Auckland guidelines requires a core of the thesis comprised of a series of published or unpublished research papers of which the PhD candidate is the lead or sole author. An introduction and conclusion chapter apart from the core of the thesis is also required. Accordingly, this thesis consists of an introduction chapter, 8 core chapters and a concluding chapter. The core chapters of the thesis have been developed to address all the research objectives sufficiently. The chapter and corresponding articles and manuscripts are listed as follows:

- **Chapter 2: The Conceptualization of Relationship Quality;** deals with identifying and verifying attributes which are mostly associated with construction relationship quality.


- **Chapter 3: Relationship Quality Judgment Model: A Conjoint Measurement;** deals with how relationship quality is perceived and judged among construction practitioners based on the identified attributes of Chapter 1.

• **Chapter 4: Relationship Quality among Construction Professionals;** deals with identification and comparison of patterns for relationship quality judgment within industry professional groups.


• **Chapter 5: Common Causes of Conflict and Dispute in Construction Relationships;** deals with identifying the causes of conflict in construction projects. The assessment is performed based on New Zealand litigation cases.


• **Chapter 6: Causes of Conflict in Association with Relationships Quality;** deals with identifying how relationship quality and its associated attributes are affected by conflict causes.


• **Chapter 7: Effect of Conflict Sources and Type on Relationship Quality:** deals with determining the consequent effect of conflict sources and conflict type on relationship quality of the contracting parties.


• **Chapter 8: Systematic Representation of Relationship Quality;** this chapter suggests a potential perspective which could be pursued further in extensive studies.
A systematic view of events which could influence relationship quality is presented. The focus is on conflict and dispute as obvious and inevitable events, however the systematic view could be applicable to other events.


The following list of manuscripts which are also the work of the PhD candidate were used in the discussion and compiling of this dissertation but are not included as separate and individual chapters:

Conference of the Australasian Universities Building Educators Association (AUBEA), The University of New South Wales, Australia.
Chapter 2
The Conceptualization of Relationship Quality

The current chapter is based on the following article:


2.1 Introduction

Project management has a practical and theoretical initiative to focus on collaboration, communication and performance based selection of project participants. This is regarded as a solution to problems arising from the project based and adversarial nature of the construction sector (Meng, 2012; Yeung et al., 2012). In theory relationships are often treated as a competency or essential asset required for managing project networks. These are the catalyst to develop collaboration and provide better opportunities for future business as an intangible asset to construction organizations (Eriksson et al., 2009; Pauget and Wald, 2013; Voss and Kock, 2013; Zou et al., 2014). Nevertheless, from project management and business perspectives, the ultimate goal is to achieve better overall performance and better profit margins. In addition, good relationships with business partners may overcome fragmentation and facilitate collaboration. This can be regarded as a strategic effort for improving performance. Therefore relationships are not the goal, but are the means for achieving strategic goals (Jelodar et al., 2013b).
Although any working relationship in construction starts with acquaintance and commencement of projects, it is largely articulated and governed by contracts. Traditionally contracts were formulated to assign responsibilities, accountabilities and liabilities to parties involved in different projects. MacNeil (1974) introduced the notion of relational contracting; the idea was to apply mutual planning and relationship development. It is believed that contracts follow a continuum to serve a purpose from fully transactional at one extreme to vertical integration at the other; therefore all contracts except the fully transactional carry a relational element (MacNeil, 1974; Sako, 1992). However as mentioned in Chapter 1 standard forms of contract are not usually good hosts for good working relationships since their initial goals are to place the blame where there is liability. As a solution to this contracts with greater capacity for collaboration were structure and popularized in order to stimulating better quality of relationships; thus they are known as relational contracting methods.

Ever since these initial research endeavours on relational contracting have emerged; connections and bridges have been made to the construction industry. What is obvious is that in the course of the past few decades’ attempts have been made to procure for better relationships in construction projects and working arrangements. Hence managing project is being pushed towards more relational approaches. However as described in the introduction chapter the problem of collaboration and better relationship in construction is still persistent to this day and research and practice of such approaches is still rudimentary (Wolstenholme, 2009; Yeung et al., 2012; Zou et al., 2014). The dominant perception is that relationships should be determined by legal boundaries and arrangements such as partnering and alliancing. To this day various research work have focused on relational contracting approaches such as partnering and alliancing (Alderman and Ivory, 2007; Bygballe et al., 2010; Eriksson et al., 2009). Therefore the working relationships in general are formally orchestrated through contracts; nonetheless arrangements such as partnering recognize that
difference and even divergent goals of parties need to be met and aligned in order to achieve
desired strategic outcomes such as maximizing profit (CII, 1991). In addition relational
approaches may include informal alignment of goals and agreements outside the contractual
setting as well as the more formal structure of relational contracting. The relational approach
regardless of its formal (relational contracting) and informal construct carries a certain level
of relationship quality which could be a measure of assessment for the relationships between
the project participants.

Apart from the mentioned approaches in studying relationships individual research
has also been performed to identify certain factors or elements which may affect relations and
bonds between the parties in construction. Attributes such as trust and mutual goals can also
effect collaboration and relationships (Meng, 2010). Harper and Bernold (2005) also mention
lack of trust as impediments to partnership relationships. Accordingly because of the formal
and structure focus to relationships in construction practices; contracting strategies such as
the Commitment to Fair Construction Contracts Charter (CRT/CIPS, 1995) based on
“gentleman's agreement” notion, and the Engineering and Construction Contract (ICE, 1995)
based on a spirit of mutual trust and co-operation’ have been developed to fulfil the relational
prerequisite (Cox and Thompson, 1997). Some of these contracting techniques try to build in
trust into a relationship by formal approaches however there are contradicting views that trust
cannot be orchestrated and is in need of time and effort to be developed.

Other sectors have tried and formulated relational approaches especially through the
concept of relationship quality long before the construction industry. Consequently they have
obtained a level of maturity and also professionalism in both research and application of
collaborative and relational approaches. Since the early 1990s relationship quality is used in
marketing as a mean of implementing relationship marketing which focuses on customer
retention (Crosby et al., 1990; Da Silva et al., 2002; Hennig-Thurau, 2000; Storbacka et al.,
1994; Wray et al., 1994). In business context relationship quality allows for the evaluation of buyer-seller relationships (Da Silva et al., 2002). Many different factors such as trust, ethical conduct, behaviour, satisfaction and commitment have been attributed to relationship quality (Bejou et al., 1996; Lagace et al., 1991).

Historically there has been a general movement towards better collaboration and relationship development with the aim stronger more constructive bonds for better problem solving and troubleshooting. The ultimate goal is improving performance and project outcomes in a more business oriented environment which has a clear long-term focus. However such movements have not been unified and tools such as relationship quality have not been explored in construction projects. The other problem emphasised in the problem statement of the thesis is the formal orchestration of relationships in construction which may reduce flexibility and make relationships more superficial and unrealistic. The relational contracting and the whole relationship development agenda in construction are similar in concept to the relationship marketing movement therefor a notion such as relationship quality could be used in evaluating construction relationships. The purpose of this chapter is to address Objective 1 of the thesis and identify and conceptualize the possible attributes associated with relationship quality in construction projects (see Chapter 1).

2.2 Relationship Quality: Definition and Theory

Initially the concept of relationship quality was suggested as an indication of how appropriate a relationship is for particular purposes; therefore it was soon applied in relationship marketing. Many definition and conceptualisations have emerged, and accordingly there are disagreements and consensus over different dimensions of relationship quality. Hennig-Thurau and Klee (1997) defined relationship quality as the “the degree of appropriateness of a relationship to fulfil the end needs of a customer”, however such definitions do not depict the theoretical implication of the concept. Other researchers have
tried to identify factors, attributes, and a construct which can explain the concept realistically which is applicable in theory and practice. However there has been disagreements as to what should these factors or attributes be since relationships are human driven ventures and have significant complexities. From very early stages it was generally agreed on that relationship quality is “high order construct” (Crosby et al., 1990); implying that it is explained by more than one layer of latent variables or attributes (Hair, 2010). Based on popular literature and mainstream research of marketing and business, Roberts, et al.(2003) advocated an attributional definition, and propose that conceptual meanings of constructs are anchored by the properties and/or attributes they possess. Consequently it is widely believed that relationship quality is attributed as a high order construct made of several distinct though related dimensions or attributes, which can deliver an evaluation tool for working relationship status (Ashnai et al., 2009; Bahar et al., 2009; Jelodar et al., 2015c; Lages et al., 2005). Attributes such as ethical behaviour, satisfaction, commitment, opportunism, and trust have been considered as relationship quality attributes or dimensions (Roberts et al., 2003).

However, there is a lack of research in nature and development of relationships in construction, especially informal relational approaches (Bygballe et al., 2010). Examination of previous studies revealed that contracting parties often neglect a systematic evaluation of their working relationships because their relationships are often considered as ‘one-off’, i.e. ending after project completion (Ling et al., 2014; Meng, 2010). Others suggest that systems, procedures, and methods flow and thrive in suitable essential relationships (Miles, 1996). Therefore, proactive management of relationships is of tactical and strategic value. A shift from relational contracting to proactive relationship management principles should be promoted in project management (Smyth and Edkins, 2007). Hence theoretically relationship quality can assess the status of relationships which is much needed for monitoring and controlling construction projects. Jelodar and Yiu (2012a, 2012b) recently reconfigured the
The Conceptualization of Relationship Quality

concept of relationship quality with the aim to realize the value of such monitoring systems in construction projects. This is due to the fact that relationship status between parties may have a direct impact on project success and performance (Jelodar et al., 2015a; Meng, 2012).

2.3 Methodology

To achieve the objectives of this study, an innovative two-stage methodology has been designed and implemented. In stage 1 the “Theoretical Review”, a comprehensive review of relevant literature form well-respected sources has been carried out to identify different characteristics of relational approaches in construction ‘Theoretical Review”. For stage 2 known as the “Practical Exhaustive Investigation” expert interviews have been performed to explore the practical implication of different relationship quality attributes and make connections with the underlying theories identified in the previous stage. The two stages are described as follows:

Theoretical Review (Stage 1): Different publications and research work in construction have been identified by using a combination of keywords such as relationships in project management, relational contracting, partnering, alliancing, supply chain relationships and etc. For this purpose sources such International Journal of Project Management (IJPM), Journal of Construction Engineering and Management (JCEM), Construction Management and Economics, Journal of Management in Engineering, and Journal of Engineering Construction and Architectural Management were chosen. These journals generally cover the mainstream knowledge areas of construction project management (Tang et al., 2010; Wing, 1997). A total of 81 articles have been identified; after an initial examination 38 of them are shortlisted because of their relevance to this study and are chosen for full review. By using the process of reduction, relationship attributes are extracted and classified (Jones, 2007). In this process, certain units of text are detached from the selected articles in the process of “de-contextualization” which is followed by concluding
a separate meaning in a process of “re-contextualization” (Richards, 2002). This method is depicted by Jones (2007) as a qualitative coding approach, and is the basis for Nvivo coding without a priori knowledge method (Glaser and Strauss, 2009).

A creative approach is used to classify and drive the underlying constructs within the literature by introducing measures of criticality, citing and significance in literature. Previous studies have adopted similar approaches and classified relationship attributes based on their popularity in different studies (Meng, 2010; Roberts et al., 2003; Yeung et al., 2012). However more can be explained by a detailed analysis of the content of statements made in association to these attributes. Therefore in this study a criticality index is created to evaluate the importance of the attributes cited in each publication. This is according to the express language and emphasis that different authors use for describing the association of each classified attribute with relationship development. This method is described by Richards (1999) as using the data as their own descriptors. The measure of criticality is obtained by examining the broken-down statements regarding each relationship attribute in construction projects, and is performed by Nvivo 10. The criticality ranges from 1 (being uncritical) to 5 (being extremely critical) depending on the express language used. Appendix 4 demonstrates the criticality index and the de-contextualization of statements used to describe the association of attributes to relationship quality. Citing measure relates to the number of times that these attributes have been distinctly mentioned in different selected articles. Finally significance in literature is calculated through Equation 2.1. The above mentioned measures are used to create a bubble chart and analyse relationship quality attributes.

\[
\text{Significance in literature} = \frac{\text{Citing}}{\text{Total number of Articles}} \quad \text{(Equation 2.1)}
\]

**Practical Exhaustive Investigation (stage 2):** Expert interviews are carried out in this stage to study the practical relational trends and attributes applied in construction culture.
Semi-structured open ended interview schedule is developed since they allow for a strategic data collection approach with a great degree of freedom and flexibility (Kvale, 2008). This kind of qualitative research can provide key expert insight which is closer to practice and also identify different styles of managing problems (Flick, 2009). Moreover interviews can provide a basis for interpretation and validation of other findings from parallel studies (Gubrium and Holstein, 2002). Based on Glaser and Strauss (2009) suggestion theoretical findings and sampling are integrated to the point where theoretical saturation is achieved and no new fact or theory can be derived. This sampling technique is appropriate for interviews and has been applied by different researchers (Auerbach, 2003; Glaser and Strauss, 2009; Martin and Gynnild, 2011). Experts are chosen in a process of theoretical sampling via purposive sampling considering different competencies and authority fields in construction activities (Patton, 2002). Although in the previous stage a classification of attributes is obtained, the experts are unaware of this classification to avoid any potential bias. These interviews are designed in an exhaustive manner with the aim of exploring construction relationships from both negative and positive perspectives. The expert interviews are structured with principle questions followed by complementary questions for maximum tangibility and comprehension of responses (Chen and Partington, 2004). If the experts are asked “what do you think determines relationship quality in construction activities?” then a certain definitions for the term relationship quality is also required; but such definitions are not widely agreed upon which makes data collection difficult and to some extent unreliable. Thus, with the developed principle questions, answers could be based on direct previous work experience in managing projects. They can also provide examples of different factors, situations, contractual circumstances, behavioural issues, and even organizational and work cultures effecting relationship quality among parties. The interviews lasted around 1 to 1.5
hours, and are audio recorded, transcribed and imported to Nvivo 10 for data classification purposes. A sample of the interview schedule and questions are included in Appendix 2.

The pool and classification of relationship quality attributes obtained from both stages are collated and discussed thus the most appropriate attributes could be identified. Apart from general knowledge and information, comparative case based questions are used to acquire practical information, themes and patterns emerging from these cases. The interviews were asked to provide examples and if possible illustrative cases to justify their claims. The case based questions had an engineered outlined for data consistency purpose, and consequently the findings can be easier applicable elsewhere by adjustments according to the situation (Eisenhardt and Graebner, 2007). Three of the cases were chosen and used in discussion to demonstrate how practitioner’s implemented relational processes in construction and ultimately classify the levels of relationship quality they achieved as part of a conceptual model.

2.4 Findings

From analysing the chosen research work segments of text associating different attributes to relationships are classified, and grouped in Table 2.1 based on measures of criticality, citing and significance in literature described in the methodology section. Figure 2.1 is a bubble chart visualisation of these predominant classifications using the measures in Table 2.1. In this figure cluster of concepts such as trust, general commitment, commitment at senior level, collaboration, cooperation, communication, teamwork and many different strategies and actions have been attributed and associated to relationship quality. After analysing and re-contextualizing the attributes and theories uncovered from literature broader attribute clusters corresponding to relationship quality were classified four general groups of trust, commitment, collaboration and teamwork, and strategies and actions and illustrated in Figure 2.2.
For the practical exhaustive investigation stage of the methodology a total 21 interviews are conducted in the current study until theoretical saturation was achieved. The experts were chosen from clients, contractors, consultants, project managers, directors, general and commercial managers to create a practical knowledge platform through the actual construction projects participants. In addition construction dispute resolution experts and consultants such as lawyers, adjudicator, mediators and negotiators were also included in the study. This is because these professionals serve as consultant to different parties in construction projects and are often involved in relationship management or activities which directly affect relationships. All interviewees are currently involved in New Zealand construction industry and highly experienced; the most experienced of whom with more than 40 years, and the least one for more than 10 years. Interviewee details are included in Table 2.2. Although there are slight differences between the classification of the concepts in the two separate stages of methodology but in general a similar construct is apparent. The experts confirm the association of attributes such as trust, commitment, and teamwork to relationships quality. In an independent concept determined as performance satisfaction is also attributed to relationship quality (see Table 2.3). The construction experts also endorse that attributes should be incorporated and enforced in project relationship, through the preparation and application of certain strategies and actions.

Through the examination of literature and the analysis of interviews acquired form both stages of the methodology; four major attributes of trust, commitment, teamwork, and performance satisfaction are identified and associated with relationship quality. Furthermore categories of strategies and actions facilitating these attributes are identified.
Table 2.1 De-contextualization and re-contextualization of the literature review

<table>
<thead>
<tr>
<th>Relationship Attributes</th>
<th>Criticality</th>
<th>Citing</th>
<th>Significance in literature</th>
<th>Average Criticality</th>
<th>Total Citing</th>
<th>Significance in literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust, Inter organizational trust, Trust build on personal relationships, Trust and</td>
<td>4.20</td>
<td>30</td>
<td>78.95</td>
<td>4.2</td>
<td>30</td>
<td>78.95</td>
</tr>
<tr>
<td>opportunism, Mutual trust, Self-interest and distrust, Distrust, Previous interactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>and Trust building of partners, Trust building and Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment, Understanding each other’s commitment, Long-term commitment, Uneven</td>
<td>3.50</td>
<td>12</td>
<td>31.58</td>
<td>3.27</td>
<td>16</td>
<td>42.11</td>
</tr>
<tr>
<td>commitment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior management commitment, The commitment of top management, Top management support,</td>
<td>3.00</td>
<td>10</td>
<td>26.32</td>
<td>3.39</td>
<td>25</td>
<td>65.79</td>
</tr>
<tr>
<td>leadership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborative team culture, Formulated team building, Teamwork, scope for</td>
<td>3.20</td>
<td>10</td>
<td>26.32</td>
<td>3.27</td>
<td>16</td>
<td>42.11</td>
</tr>
<tr>
<td>teambuilding</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Communication, Open communication, Transparency and effective communication,</td>
<td>3.70</td>
<td>16</td>
<td>42.11</td>
<td>3.39</td>
<td>25</td>
<td>65.79</td>
</tr>
<tr>
<td>Communication via the feedback link</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Cooperation, Cooperation and communication</td>
<td>2.90</td>
<td>6</td>
<td>15.79</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Consistent objectives, Acting consistent with objectives, Mutually agreed goals, Joint</td>
<td>4.00</td>
<td>23</td>
<td>60.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>goal formulation, Common objectives, mutual basis for stakeholder interests</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Joint evaluation</td>
<td>2.00</td>
<td>1</td>
<td>2.63</td>
<td></td>
<td></td>
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<tr>
<td>Problem solving, Dispute resolution system, Conflict management</td>
<td>2.50</td>
<td>13</td>
<td>34.21</td>
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<td></td>
</tr>
<tr>
<td>Continuous improvement &amp; benchmarking process</td>
<td>2.70</td>
<td>10</td>
<td>26.32</td>
<td></td>
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</tr>
<tr>
<td>Incentives, Performance incentives linked with common goals, Incentives and shared</td>
<td>2.60</td>
<td>5</td>
<td>13.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>culture</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Power, Fairness, Equity and empowerment</td>
<td>3.80</td>
<td>6</td>
<td>15.79</td>
<td></td>
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<tr>
<td>Risk allocation and sharing, Unfair risk and reward plan, Joint responsibilities</td>
<td>2.70</td>
<td>8</td>
<td>21.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource sharing, Shared culture</td>
<td>2.00</td>
<td>5</td>
<td>13.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Win-win approach, Win-los attitude</td>
<td>4.00</td>
<td>4</td>
<td>10.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible Attitude, Flexibility in contract</td>
<td>3.00</td>
<td>2</td>
<td>5.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procurement strategy, (competitive tendering), Clear contracts</td>
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<td>3</td>
<td>7.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long term quality focus</td>
<td>1.00</td>
<td>2</td>
<td>5.26</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cultural issues, Compatible Organizational culture, cultural inertia</td>
<td>2.00</td>
<td>4</td>
<td>10.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education and learning, Training, Client competencies and learning</td>
<td>2.30</td>
<td>3</td>
<td>7.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience in relational contracting</td>
<td>1.00</td>
<td>2</td>
<td>5.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective coordination</td>
<td>4.00</td>
<td>1</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear understanding of roles and responsibilities</td>
<td>4.00</td>
<td>3</td>
<td>7.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respect</td>
<td>2.00</td>
<td>1</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel change</td>
<td>1.00</td>
<td>1</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrity</td>
<td>2.00</td>
<td>1</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 2.1: Clusters of de-contextualized attributes of relationship quality in literature

Figure 2.2: Clusters of re-contextualized attributes of relationship quality
### Table 2.2: Expert Interviewee details

<table>
<thead>
<tr>
<th>Expert</th>
<th>Current position</th>
<th>Experience (years)</th>
<th>Professional Institute Associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Relationship Manager</td>
<td>30+</td>
<td>ICE</td>
</tr>
<tr>
<td></td>
<td>Client, Consultancy and Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>Project Director</td>
<td>30+</td>
<td>ICE</td>
</tr>
<tr>
<td></td>
<td>Client, Consultancy and Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>Projects Manager</td>
<td>15+</td>
<td>IPENZ</td>
</tr>
<tr>
<td></td>
<td>Client, Consultancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>Project Director, Consultancy</td>
<td>35+</td>
<td>IPENZ</td>
</tr>
<tr>
<td></td>
<td>Consultancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>Technical Director</td>
<td>20+</td>
<td>IPENZ</td>
</tr>
<tr>
<td></td>
<td>Consultancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R6</td>
<td>Project Director</td>
<td>40+</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R7</td>
<td>Chief Estimator</td>
<td>35+</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R8</td>
<td>Contract Manager</td>
<td>30+</td>
<td>IPENZ, ICE</td>
</tr>
<tr>
<td></td>
<td>Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R9</td>
<td>Project Manager</td>
<td>20+</td>
<td>IPENZ</td>
</tr>
<tr>
<td></td>
<td>Consultancy and Contractor</td>
<td>20+</td>
<td>IPENZ</td>
</tr>
<tr>
<td>R10</td>
<td>Project Manager</td>
<td>10+</td>
<td>IPENZ, ICE</td>
</tr>
<tr>
<td></td>
<td>Client, Consultancy and Contractor</td>
<td>10+</td>
<td>IPENZ</td>
</tr>
<tr>
<td>R11</td>
<td>Mediation, During and post construction</td>
<td>40+</td>
<td>AMINZ, EQC</td>
</tr>
<tr>
<td>R12</td>
<td>Construction law expert, Adjudicator, arbitrator, mediator</td>
<td>40+</td>
<td>AMINZ, CIArb, IoD</td>
</tr>
<tr>
<td>R13</td>
<td>Lawyer/ litigation and mediation</td>
<td>25+</td>
<td>AMINZ</td>
</tr>
<tr>
<td>R14</td>
<td>General commercial and business manager in construction and operations</td>
<td>20+</td>
<td>FIPENZ</td>
</tr>
<tr>
<td>R15</td>
<td>Adjudicator, arbitrator and mediator, quantity surveyor</td>
<td>35+</td>
<td>AMINZ, RICS</td>
</tr>
<tr>
<td>R16</td>
<td>Construction law expert, consultant</td>
<td>20+</td>
<td>AMINZ</td>
</tr>
<tr>
<td>R17</td>
<td>Adjudicator, arbitrator and mediator</td>
<td>15+</td>
<td>AMINZ</td>
</tr>
<tr>
<td>R18</td>
<td>Litigation and mediation expert</td>
<td>10+</td>
<td>---</td>
</tr>
<tr>
<td>R19</td>
<td>Adjudicator, arbitrator and mediator</td>
<td>30+</td>
<td>AMINZ</td>
</tr>
<tr>
<td>R20</td>
<td>Dispute resolution expert and consultant</td>
<td>25+</td>
<td>AMINZ</td>
</tr>
<tr>
<td>R21</td>
<td>Negotiator and mediator</td>
<td>25+</td>
<td>AMINZ</td>
</tr>
</tbody>
</table>

ICE: Institution of Civil Engineers  
IPENZ: Institution of Professional Engineers New Zealand  
FIPENZ: Fellow of the Institution of Professional Engineers New Zealand  
EQC: Earthquake Commission  
CIArb: Chartered Institute of Arbitrators  
IoD: Institute of Directors in New Zealand  
AMINZ: Arbitrators and Mediators Institute of New Zealand
### Table 2.3: Relationship conceptualization through exhaustive interviews

<table>
<thead>
<tr>
<th>Positive Attributes of relationship quality</th>
<th>Negative attributes of relationship quality</th>
<th>Theme of the relational determinant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honesty, Trust (can’t exist without honesty and clear communication)</td>
<td>Not being able to address the issue quickly, honestly and openly</td>
<td>Trust and opportunism</td>
</tr>
<tr>
<td>Trust is essential in all on-going relationship</td>
<td>Hiding issues with the hope that they will go away</td>
<td></td>
</tr>
<tr>
<td>Trust is important to all relationships</td>
<td>Opportunism and self-interest</td>
<td></td>
</tr>
<tr>
<td>Trust is good</td>
<td>Indecent behaviour fraud opportunism</td>
<td></td>
</tr>
<tr>
<td>Direct but honest claiming obviously tied with responses and decision making,</td>
<td>Not being honest and transparent</td>
<td></td>
</tr>
<tr>
<td>Earned Trust which cannot be mandated</td>
<td>Opportunism</td>
<td></td>
</tr>
<tr>
<td>Clear communication</td>
<td>Communication issues</td>
<td></td>
</tr>
<tr>
<td>Communication (as a facilitators)</td>
<td>Lack of collaboration</td>
<td>Teamwork (communication and collaboration)</td>
</tr>
<tr>
<td>Listening and communication skill, collaborative approach and team perspective,</td>
<td>People refuse to listen, A confrontational and dogmatic environmental settings and culture</td>
<td></td>
</tr>
<tr>
<td>Transparency of information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective communication,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team efforts to resolve problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sophisticated experience of the parties, attitude, big construction players and companies have had to learn to</td>
<td>Rigid thinking in terms of attitude</td>
<td>Performance satisfaction</td>
</tr>
<tr>
<td>be successful thus their experience has evolved their attitude.</td>
<td>Behavioural issues and lack of connection are significant</td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>Performance issues where requirements are not met</td>
<td></td>
</tr>
<tr>
<td>Assuming that the parties are performing well</td>
<td>Personality there are people who are minded to be cooperative and some people who minded to wrench the</td>
<td></td>
</tr>
<tr>
<td>Personality, skills to build good relations</td>
<td>last drop of money</td>
<td></td>
</tr>
<tr>
<td>Good management and performance in situations</td>
<td>Poor management</td>
<td></td>
</tr>
<tr>
<td>Understanding each other’s goals and expectations</td>
<td>Inappropriate behaviour</td>
<td></td>
</tr>
<tr>
<td>Develop personal chemistry of some sort (sense of humour, trivia)</td>
<td>Turning issues to personal problems</td>
<td></td>
</tr>
<tr>
<td>Fair barging in profit and risk sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding and empathise with the other parties point of view,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment to the project is important</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong will and commitment to make things work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well written contract with good provisions</td>
<td>Non alignment of parties interests</td>
<td>Commitment through strategy</td>
</tr>
<tr>
<td>Vigorous selection partners specially contractors</td>
<td>Element of doubt and people will try to reinvent the wheel in some way which could be harmful to</td>
<td></td>
</tr>
<tr>
<td>Fair and balanced contract</td>
<td>relationships</td>
<td></td>
</tr>
<tr>
<td>Clear decision making, problem solving environment governed by defined processes not personal matters</td>
<td>Uncommitted parties</td>
<td></td>
</tr>
<tr>
<td>win-win and sharing culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear framework for accountability and expectations</td>
<td>Unbalanced contract with disproportionate risks</td>
<td>Strategy and action</td>
</tr>
<tr>
<td></td>
<td>Harsh contract conditions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unforeseen provisions opening the way for opportunism and shortcuts,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unforeseen risks and contract implications</td>
<td></td>
</tr>
</tbody>
</table>
2.5 Discussion and Framework Development

In this section the findings and the classified information from both stages of the study are collated, compared and discussed to derive a meaningful and practice framework for relationship quality in construction projects and activities. Initially the predominantly identified attributes associated with relationship quality is described and discussed. Subsequently their connections and theoretical structure is identified.

**Trust and opportunism:** As shown in Table 2.1, a bulk of studies have connected trust as a positive indicator of construction, business or other working relationships (Ling et al., 2014; Meng, 2012; Voss and Kock, 2013; Yeung et al., 2012; Zou et al., 2014). It seems that a binary of trust-opportunism controls and predicts relationships in construction projects. There is strong debate that where there is trust then opportunism is curbed (Cox and Thompson, 1997; Sako, 1992). Meng (2010) also emphasised on this binary connection when discussing the positive and negative factors affecting construction supply chain relationships. The literature search identified 30 citing which host different contexts of trust in one form or the other as a relationship attribute (see Table 2.1). Trust is perhaps the most valued re-contextualized attribute associated with relationship quality. Due to its high citing, calculated criticality of 4.20 and significance in literature of 79% trust is represented by the largest bubble in the top right hand side of Figure 2.1.

The classification and conceptualization of exhaustive interviews in Table 2.3 illustrates that construction experts also value the importance of trust for building sustainable and functional relationships in their projects. It is believed by some experts that trust has its own prerequisites and cannot exist without honesty and clear communication. Although Table 2.1 indicates that in theory trust is vital to any construction relationship; but the expert are sceptical about basing relationship solely on trust. From their vantage point it is not realistic and professional to base relationship on trust especially in construction projects
where the nature of work is very diverse and temporary. The argument is that there is not enough time and on-going work to build trust with the other party and if there was total trust, there is no guarantee that the parties were not to change or be replaced for any reason in the next project or working arrangement. This view is to some extent in line with the earlier theoretical findings concerning fear of revocation and interpersonal trust, where trust is between the employees of the organisation and not an established inter-organizational trend (Cox and Thompson, 1997). It is suggested that if employees and organisations address their issues early, quickly, honestly, within a culture of transparency, and away from the blame culture; opportunism and self-interests are curbed hence trust is achieved on all levels of employees and organisation. This ultimate trust is believed to be the best growing field for relationship quality. Trust could be earned by the parties therefore they have some control over this attribute. Moreover, the New Engineering Contract (NEC) has tried to formulize and build a more trusting and collaborative working environment in project management.

Trust is also a core ingredient in Yeung et al (2012) relational contracting sunflower model; but as argued it cannot be and should not be forced and the parties must observe trust as a behavioural trait within their relationships. The dispute resolution and relationship management experts in general believe trust is an organic bond between parties and often takes time, resources and a lot of effort for to build-up and be inserted into a relationship, therefore forcing trust will not work or benefit relationships. It is the development of both interpersonal and inter-organizational trust which significantly affects relationship quality in construction.

**General and Senior Management Commitment:** Around 16 of the examined studies in Table 2.1 have identified segments equivalent to commitment as relationship quality attributes which produce a average criticality of 3.27 and significance in literature of 42.11% (Ling et al., 2014; Yeung et al., 2012). Some studies discuss the commitment of senior
management and believe commitment is determined at the top level and is distributed through the hierarchy (Bennett et al., 2006; Kumaraswamy et al., 2005a). The argument is that commitment is demonstrated through the application of trust building, common goal development and clarification strategies. Ling Ling et al. (2014) mentioned that senior levels of organizations have the definitive and more influential role in choosing and implementing these strategies. This view is shared by many others that commitment can be best enforced by corporate and senior levels of organizations (Bennett et al., 2006; Kumaraswamy et al., 2005a; Lu and Yan, 2007). Ten out of 16 identified citations have recognized commitment at senior level as a major contributing factor to relationship quality producing a cluster with criticality of 3 and significance in literature of 26.32% (see Table 2.1). Additionally a bigger cluster with 12 citing, criticality of 3.5 and significance in literature of 31.58% represents general commitment which is inflicted by devotion and actions of the project participants (see Table 2.1). The two clusters relating to commitment are demonstrated in Figure 2.1.

Among the experts commitment is regarded as the cornerstone of building relationships in construction (see Table 2.3). It is mentioned that the right combination of people can make the worst documented contract work successfully; equally the poor management of the best documented contract can result in unconstructive behaviour; twisting the relationship in a manner that it is no longer productive. This view is very much unanimous, and experts indicate that taking appropriate actions and being persistent in actions is regarded as a demonstration of commitment therefore very important to the quality of relationships. Most of experts believe that people on all sides of the arrangement should be committed to a level or degree of relationship quality in order to make it achievable. Equally non alignment of party’s interests, element of doubt and scepticism forces people to reinvent the wheel killing commitments and reducing relationship quality. Spekman et al (1998) define commitment by the belief that the trading partner is willing to devote energy into
sustaining the relationship. Almost in all studies corresponding to relational approaches in construction “commitment” is often regarded as a must have behavioural trait for building and maintaining good quality relationships. The CII also emphasises on long-term commitment between two or more organizations for the purpose of partnering (1991). This is strongly supported by the findings of the expert interviews documented in Table 2.3. However the experts mention that once the goal is set for a certain level of relationship quality then appropriate actions and strategies such as developing personal chemistry, committing to understanding each other’s view points, fairness, commitment at senior management and other levels is essential in fulfilling the initial relational goal. Thus in their view certain actions and strategies have to be emplaced to improve commitment.

**Teamwork as a mixture of Collaboration, Communication and Cooperation:** From the classified literature in Table 2.1 a total of 25 citing have identified interwoven segments of collaboration, communication, Integration and teamwork as themes for relational configurations. Teamwork is de-contextualised through three different clusters (see Figure 2.1). The most important of these clusters is communication which is overall the third largest cluster identified with a separate citing of 16, criticality of 3.70 and significance in literature of 42.11% (see Table 2.1). This is because communication and coordination problems are common and affect both performance and productivity in construction projects (Li et al., 2000). Collaboration with criticality of 3.20, 10 citing and a significance of 26.5% in literature is another important cluster of teamwork. A smaller but however significant cluster is observed for cooperation with criticality of 2.90, citing of 6 and significance of 16% in literature (see Table 2.1).

All the experts unanimously believe that a line of clear communication and a setting for collaboration are essential to any relationship venture. Although some see communication as a facilitator to greater relationship quality but overcoming unforeseen issues, resolution of
problems, and completion of projects will be impaired without the feeling that there is a team effort going on. The fact that communication and collaboration will enforce teamwork is the most resonated issue in expert opinions classified in Table 2.3. This is more emphasised than trust maybe because trust cannot be mandated or enforced through a set of regulations but needs to be earned. Clear communication and feeling that work is performed through a team interaction can ultimately facilitate the development of trust and higher relationship quality. Conversely arrangements or contracts may have sufficient communication and collaboration links installed with great provisions but due to dogmatic views, aristocratic leadership and management no real teams could be formulated; thus relationships will crumble.

From CII’s perspective effective collaboration and cooperation is key to good relational approaches such as partnering (CII, 1991). Bennett et al. (2006) realized the power of collaborative working culture in relational approaches such as partnering in construction. Chen & Chen (2007) have advocated that collaboration and team culture is a cluster of critical success factors essential to partnering success, they considered the feedback loop and two-way communication root as vital components in team development. It has to be noted that teamwork should not be mistaken with team building, teamwork resembles that collaboration, communication and ultimately cooperation should be injected into an arrangement becoming akin to the relationship quality of the parties; on the other hand teambuilding is the methodology and strategy of injecting these factors. Trust and cooperation are formed with the aid of basic relational and teambuilding techniques (Kumaraswamy et al., 2005a).

**Strategy and actions:** In order to preserve and enhance relationships, 20 different categories of actions were identified through decontextualizing literature (see Table 2.1); shown by smaller bubbles in Figure 2.1. They have lower criticality, but in all of the literature reviewed strategies and actions have been acknowledged as facilitators or catalysts for
achieving better relationships. Table 2.1 shows 33 studies have mentioned some sort of activity or strategy as a mean of relationship enhancement.

Table 2.3 demonstrates various strategies and actions mentioned by the construction experts; potentially used in development of different relationship quality attributes. As mentioned for there is a strong feeling among experts that these attributes must be developed and built into relationships via different strategies. Therefore strategies and actions are perceived as facilitator and potential relationship quality enhancers and not attributes of relationship quality.

Performance satisfaction: all experts interviewed emphasised on a factor which was strongly imbedded in any relationship context; satisfaction with the other parties’ performance must be perceived before the relationship can survive. Although this is demonstrated in the classification of the expert interviews in Table 2.3; it was not immediately detected in the literature. However a review of literature and associated conceptualizations, illustrates that satisfaction with the expertise, skills and competence of parties is an underlying factor or a latent feature of the whole relational arrangement. In fact in general satisfaction is essential to project success (Turner and Müller, 2006). The interviews revealed that attitude, personality, sufficient experience, skills, good management and performance in different situations can affect relationship quality in working arrangements. Instead rigid thinking attitude, requirements non-conformance, personality issues, poor management, inappropriate behaviour, turning issues to personal problems and lack of connection can all be viewed as defects in performance satisfaction and adversely affects relationship quality.

Figure 2.2 is a re-contextualization of all identified relational attributes reduced to only four major clusters. This is the overall product and amalgamation of the clusters
associated to each attribute. This is performed by averaging the criticality and significance in literature measure and adding the citing associated with each attribute (see 4 columns on the right side of Table 2.1). Therefore for general clusters of trust, commitment, teamwork and Strategy and actions are identified. However the expert interviews another “performance satisfaction” is also a crucial attribute of relationship quality which needs to be considered.

2.5.1. Relationship Quality Framework in Construction

MacNeil (1974) regards contracts as a continuum to serve a proposed deal from fully transactional at one extreme to vertical integration at the other extreme; therefore all contracts except the fully transactional carry a relational element and the quality of relationships can determine the contracts appropriateness and application in working arrangements. As classified in Table 2.1, in the absence of real relationship attributes a formulized bond should endure, therefore development of relationships could be engineered (Bresnen and Marshall, 2000). The interviewees from the Practical Exhaustive Investigation stage emphasised that commitment is achieved through strategies exercised by the parties. Different sides have to strategize, understand and align their goals. A certain amount of personal chemistry with appropriate trivia could be very helpful in reducing the element of doubt and enhancing commitment. The stronger the will and commitment produced by these strategies the stronger the bond and relationship quality. According to Harper & Bernold (2005) a switch from a “zero-sum” to a “win–win” business culture is inevitable and appropriate tools are required to change adversarial relationships and support this strategy. Ling and Li (2012) revealed a network of strategies essential for creating the value required for effective management of projects.

Bases on this notion that relationship quality and its attributes can be developed through strategies; Figure 2.3 offers a conceptual framework composed of the findings in the theoretical review and the practical exhaustive investigation stage. The figure from left to
right demonstrates the actions and strategies which facilitate the development of main attributes and ultimately enhancement of relationship quality. Seven major strategies and corresponding actions which can be used individually or in combination with each other to achieve a certain level of relationship quality are illustrated. The framework initially depicts the importance of each strategy’s interaction with identified relationship quality attributes as a mean of relationship development (see Figure 2.3). A full and comprehensive discussion of the framework; concerning strategies and actions in achieving fit for purpose relationship quality is included in this section.

Figure 2.3: Conceptual framework of relationship quality in project management
There is strong evidence in literature that integrity, respect, flexible attitude plus effective coordination of staff and resources can ensure ethical behaviour and ultimately enhance relationship quality (Black et al., 2000; Cheng and Li, 2001; Drexler Jr and Larson, 2000; Kumaraswamy et al., 2005c). These actions can be implemented discretely without the involvement of the other party thus they could be regarded as individual and attitude modification strategies. The procurement strategy has been identified as the second strategy for enhancing relationship quality; relational contracting, long-term quality focus as opposed to the adversarial lowest price criteria, contract flexibility, experience in relational contracting are all considered as more formal strategies of conceptualising relationships (Bower, 2003; Cox and Thompson, 1997; Drexler Jr and Larson, 2000; Meng et al., 2011). Consistent objectives and mutually agreed goals were emphasised by different researchers as facilitators of relationship quality which often were precedents to clarity of responsibilities and contracts (Bennett et al., 2006; Chen and Chen, 2007; Davis and Walker, 2009; Meng et al., 2011; Naoum, 2003; Ng et al., 2002; Pryke, 2009; Yeung et al., 2012). These actions will lend to clarity and joint goal formulation as the third strategy.

As shown in Figure 2.3, the fourth strategy is all about joint problem solving which may be possible through joint evaluation. The goal is to eliminate problems such as conflict and dispute, and via benchmarking and continuous improvement in order to strive towards building better relationships (Bower, 2003; Chan et al., 2003; Cheng and Li, 2001; Kadefors, 2004; Larson, 1997; Lu and Yan, 2007; Meng et al., 2011; Naoum, 2003; Pryke, 2009). The fifth strategy is embracing a culture of sharing risks/rewards and recognised joint responsibilities in fairness and equality. This ultimately will lead to a win-win situation for all parties. In this kind of culture all parties feel appreciated and cared for hence increasing trust and likelihood of higher relationship quality (Bower, 2003; Chan et al., 2003; Ling et al., 2014; Meng et al., 2011; Palaneeswaran et al., 2003; Pryke, 2009).
Fragmentation in construction deprives the industry parties from the necessary skills to collaborate and develop good relational interactions. Hence strategy six is about educating and training the team as an essential prerequisite of achieving a compatible organizational culture for appropriate levels of relationship quality (Eriksson et al., 2009; Kumaraswamy et al., 2005a; Ling et al., 2014). Finally providing incentives for performance, commitment, collaboration and teamwork is another significantly remarked strategy, especially where trust is not developed or lacking (see Figure 2.3). Some experts have also suggested the practice of power in some circumstances to enforce relationship. Power is not a direct predictor of relationship quality and should not be regarded as force because when one party has power the other party has dependency exposing them to unforeseen and uncontrollable risks. Although high amount of collaboration may be exhibited due to fear of revocation but not necessarily a high quality of relationships is achieved (Cox and Thompson, 1997). Relational bonds are a voluntary participation of parties in engaging with each other and forced relationships doesn’t exist (Roberts et al., 2003). Power should be orchestrated in the form of creating opportunities and motivation by the stronger party for the weaker party. On the other hand the weaker party naturally does not like to deny itself of a powerful ally, thus will have sufficient motivation to build stronger relations (Cox and Thompson, 1997; Harper and Bernold, 2005; Kadefors, 2004; Larson, 1997; Lu and Yan, 2007; Palaneeswaran et al., 2003).

However Table 2.3 shows some actions are more popular in New Zealand; accordingly these are highlighted in Figure 2.3. Most of these actions in practice evolve around the legalities of the contract and procurement process. The New Zealand practitioners have suggested that a well written contract with good provisions and vigorous selection of partners can boost the attributes of relationship quality; these actions fall in the procurement strategy category. Fair and balanced contract was also emphasised which may fall in the
Sharing culture and win-win strategy; however they are certainly legality and procurement related as well. Even clear framework for accountability and expectations is procurement and contract related which demands clarity in contract. Clarity is a requirement of higher relationship quality; and an expectation of clear decision making and clear accountability exists before a relationship could enhance. Problem solving environment governed by defined processes instead of personal agendas is another important issue among NZ practitioners; the aim is to reduced conflicts and enforce bonds.

The framework in Figure 2.3 shows trust as the ultimate relationship enforcement level which is resonated through many different studies mentioned earlier. In fact the behavioural pattern influencing relationships is to evoke mutual trust which drives social principles and acceptance of certain practices as a general strategy, to achieve relational arrangements (Ling & Tran, 2012). In some studies trust seems to be the ultimate psychological factor for building relationships (Jin and Yng Ling, 2005).

In studies such as Yeung et al, (2012)’s work core and non-core elements associated with relational approaches are established according to their significance while other are more concern with strategies and actions leading to success factors in relationships (Chen and Chen, 2007). However with a shift in focus the more formal relational approaches could work as possible strategies for relationship quality enhancement. As demonstrated some strategies make sure parties are committed to working with each other such as incentivising, and perhaps joint problem solving; in addition certain strategies are used to administer teamwork and communication such as training, education, culture synchronization and problem solving. But all is perhaps done to build elements of trust in relationships and therefore catering for higher relationship quality in working relationships (see Figure 2.3).
Performance satisfaction is also illustrated as the driver and glue which makes the progression of commitment to teamwork and ultimately trust possible. Performance satisfaction is associated with the perception of the parties involved and can vary in time. This simply means that in every phase of the project there is perceived satisfaction of work performed by the other party which is not necessarily an indicator or resemblance of the ultimate project performance. The ultimate project performance is obtained based on the overall indicators of the project at the end.

2.5.2 The Relationship Quality Levels

Relationship quality can provide an indication of the strength and effectiveness of relationships in project management. Therefore it can be a measure to assess the appropriateness of a relationship in different circumstances. However, not all projects require the same level of relationship quality, and in order to have a relationship for a specific project condition or purpose (Cox and Thompson, 1997; Sako, 1992), some core relationship attributes have to be acknowledged, mapped and achieved through appropriate strategies and actions to achieve fit for purpose relationships (Kumaraswamy et al., 2005c). Davis and Walker (2009) have mapped out relationship development, as a central component of exchange management with five iterative phases which conceptualizes the process of relationship management. Maturity models have been proposed to explain the evolution of supply chain relationships in construction, concepts or attributes such as procurement, objective alignment, trust, collaboration, communication, problem solving, risk allocation and continuous improvement in different levels of maturity, contribute to relationship development (Meng et al., 2011). The emphasis is on a step by step approach of building relationships without making any distinctions between different strategies and attributes. However there is not a clear conceptualization of relationship development which could correspond to relationship quality levels for different construction circumstances.
Figure 2.4 clarifies the process of achieving fit for purpose relationships according to findings of this study; demonstrating relationship quality in five fundamental levels. These levels are built into working arrangements through actions, strategies and attributes according to the relational requirements of projects. In addition Table 2.4 shows three different construction cases identified from the practical exhaustive investigation and expert interviews. These cases demonstrate the practical implementation of different relational process in construction projects. In this section of the discussion the cases are used to explain levels of relationship quality in more detail.

The lowest level of relationship quality is defined as the transactional level where no relational element is included and the relations are predefined and completely governed by contract provisions. In this situation the contract is adequate for all interactions and often the scope of work performed in this level of relationship quality is extremely limited (see Figure 2.4). Supply agreements or one off purchasing arrangements of material are examples of these transaction based relationships.

Action level is the lowest level of relationship quality which includes remote relational methods and actions. These relational methodologies do not follow a particular strategy and can include any of the actions depicted in the framework of Figure 2.3. Contract adequacy is normally high at this level of relationship quality but lower than the transaction level. Case one in Table 2.4 specifies a client-contractor-subcontractor arrangement for a housing development project in which a joint charter was set to identify possible problems and the subcontractor was involved in some decision making processes. The effort invested for achieving a higher level of relationship quality is marginal and these actions can only provide limited commitment to the project and do not follow a clear relational strategy. Therefore the relationship quality is at an action level which is mainly contract driven with high contract adequacy as positioned in Figure 2.4.
Table 2.4: Identified cases during practical exhaustive investigation

<table>
<thead>
<tr>
<th></th>
<th>Case one</th>
<th>Case two</th>
<th>Case three</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Client and a sub-contractor of a housing development project</td>
<td>Partnering case, land development project</td>
<td>Infrastructure development program, national highway, Public Private Partnership (PPP) project</td>
</tr>
<tr>
<td><strong>Attributes</strong></td>
<td>The aim is to achieve commitment and teamwork</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strategies used</strong></td>
<td>The relational procurement strategy with the focus of setting clear mutual goals, training and education</td>
<td>Joint partnering agreement, training a shared culture, joint decision making, with using incentives, a problem solving mechanism</td>
<td></td>
</tr>
<tr>
<td><strong>Actions taken</strong></td>
<td>A joint charter was set to identify possible problems and also subcontractor is involved in some decision making</td>
<td>Vigorous partner selection process, Relational contracting, mutually agreed goals, Clear understanding of roles and responsibilities/ joint decision making/ Risk allocation and sharing, joint responsibility the risks were clearly described and shared in a risk workshop, ultimately a charter was agreed on</td>
<td>A partnering agreement, long term quality focus, an evaluation mechanism with benchmarking of performance, joint project charter and regular meetings, problem solving strategies, continues training plus appropriate incentives, empowerment of parties in decision making, fair risk sharing, and clarity description of roles</td>
</tr>
</tbody>
</table>

Figure 2.4: The levels of relationship quality
At the strategy level particular strategies are composed and followed to achieve certain relational arrangements; therefore more effort is put into achieving higher relationship quality compared to the action level. Contract adequacy reduces at this level and a lot of work is performed through charters and mutual agreements (see Figure 2.4). For instance where the goal is commitment or better communication certain strategies are chosen and executed through corresponding actions. The scope of effort increases since potential and beneficial strategies have to be identified to fulfil the purpose of that particular project; additionally a rigorous routine of actions must be followed to enforce greater relationship quality. Case two in Table 2.4 demonstrates a partnering case for land development. The procurement strategy focuses on setting clear mutual goals, using training, education which is in line with the strategies identified in relationship quality framework (see Figure 2.3). A list of actions taken to achieve these strategies and ensuring a certain level of cooperation, communication and commitment is also tabulated (see Table 2.4). It is obvious that the parties in this case have put more effort in achieving a higher level of relationship quality therefore their dependency on contractual provisions is reduced.

At attribute level a genuine intent is placed to take the relationship beyond formalities by trying to achieve the attributes such as commitment, teamwork, performance satisfaction and ultimately trust. Clearly the scope of effort becomes larger compared to the previous levels of relationship quality since more care and preparation is needed and certain goals have to systematically be achieved. For example in case three which is a national highway via Public Private Partnership; a level of commitment should be ensured therefore a partnering agreement is achieved (see Table 2.4). Certain strategies such as risk sharing, incentive regime and empowerment of the parties are imposed in the agreement. For communication and teamwork parties decide to formulate a charter and take part in regular meetings. A
demanding evaluation and benchmarking system is also employed to ensure performance is satisfactory. All the activities are monitored and appropriate training and education is provided to the staff and team. In this case the reliance to the contract adequacy becomes limited since there is a charter emplaced and problem solving processes are included in the agreement (see Figure 2.4).

Finally for the relationship level all attributes are pursued and trust is systematically achieved. Certain strategies should be applied to ensure commitment to the agreed arrangement from all parties and with the help of appropriate actions teamwork is channelized and amplified. The parties will assess their performance all the way through to make sure they are on track and avoid underperforming, because this can be a strong deterrent of relationships. Finally if an adequate amount of time is given trust could be achieved. The progression of these attributes is the sign of ultimate relationship quality and is illustrated in Figure 2.4 with the highest scope of effort and the lowest contract adequacy. Trust can also be obtained by acquaintance of the other parties and the belief that the other party has good intentions. The relationship quality achieved is rather an informal arrangement. It has to be mentioned that factors such as duration are also important in development of relationship quality because trust needs time to develop (Lu and Yan, 2007).

2.6 Chapter Summary

The study aims to understand the construct of relationship quality in managing construction projects. Literature review reveals concepts such as trust, commitment, and teamwork based on communication and collaboration as the main attribute of relationship quality. In addition in a framework development of relationship quality seven possible strategies were identified which could enforce these relationship attributes (see Figure 2.3). These strategies are (1) Individual and attitude modifications, (2) Procurement strategy, (3) Clarity and joint goal formulation, (4) Joint evaluation, problem solving and continuous
improvement, (5) Sharing culture and win-win approach, (6) Education, Training and culture synchronization, and (7) Incentivising and power. However expert interviews with New Zealand construction professionals perfected the conceptualizations by adding the performance attribute. These experts believed that without satisfaction of the other party’s performance, achieving good quality relationships is impossible. They also regard that the lack of performance solely can be a relationship breaker regardless of other relationship quality attributes status. It was also presented that the construction culture is more concerned with the contractual aspects of agreements and tries to develop contractual strategies and provisions for higher relationship quality in different circumstances. Clarity and transparency in work and contract is also another issue emphasised by the experts. However the general trends of strategies exhibited is similar to those identified through the literature.

Finally a conceptual model that consists of different relationship quality levels is proposed (see Figure 2.4). In this conceptualisation transaction level, action level, strategy level, attribute level and relationship level is suggested for different relationship quality ranks. These levels are enhanced by the enforcement of the previously defined actions and strategies within the relationship quality framework (see Figure 2.3), and ultimately the degree of the attributes achievement. The model demonstrates that as the level of relationship quality ascends from a fully transactional level to a fully relational level, contract adequacy decreases while effort of achievement increases.

The challenge of future research would possibly be to observe the practicality of such model via further and more detailed case studies. It is also important to observe relationship quality during significant events such as conflict and dispute which seem inevitable in complex construction projects. Furthermore ascertaining practical values for each identified attribute and strategy is essential to the best practice notion of achieving appropriate and fit for purpose relationship quality. Therefore a potential goal could be to empirically investigate
how construction parties value and judge their relationship quality based on the identified attributes.
Chapter 3

Relationship Quality Judgment Model: A Conjoint Measurement

The current chapter is based on the following article:


3.1 Introduction

It has been mentioned previously in Chapter 1 that in the past two decades the construction industry has put the spotlight on relational approaches. A move from traditional procurement strategies to more flexible and collaborative procurement styles has been orchestrated. Furthermore partnering, alliancing, joint ventures and generally relational contracting have dominated a level of industry interactions where more risky and complex projects are concerned, and the need for cooperation and collaboration is necessary (Chan et al., 2004; Lazar, 2000). It is realized that the core value of relational contracting is the quality of relationships which they can foster. Relationship quality therefore may be used to evaluate contract appropriateness for relational needs in certain projects (Jelodar and Yiu, 2012b; Roberts et al., 2003). This can increases awareness towards relationships in construction projects; in line with the industries efforts to promote relational and collaborative approaches. The overview is that the construction industry is looking for optimised relationships which could fulfil the purpose of certain procurement strategies according to project circumstances.
Therefore contracts may be selected based on the relationship quality they host to fulfil a project purpose. Despite high admiration and praise for formal methodologies such as partnering and alliancing it is not possible to apply them to all circumstances especially on projects with limited funds or different legal settings (Ke et al., 2011; Yeung et al., 2012). However the need for relational approaches is felt through a variety of different size and circumstance projects.

As acknowledged in Chapter 2 the concept relationship quality was defined in marketing and business literature with the aim of providing awareness and anchor of judgement for collaborative evaluation. Crosby et al (1990) defined relationship quality as a measure of evaluation for business relationships, while Hennig-Thurau and Klee (1997) defined it as “the degree of appropriateness of a relationship to fulfil the end needs of a customer”. However these definitions do not provide clear indications on the attributes of the concept. Roberts, et al.(2003) adopted Bagozzi (1984)’s framework of construct definition to propose a conceptual meanings explained by several attributes. There is also a consensus that relationship quality is attributed as a high order construct made of several distinct though related dimensions; in addition concepts such as trust, satisfaction, commitment have been the most agreed-on attributes for relationship quality in marketing and business context (Crosby et al., 1990; Dorsch et al., 1998; Kumar et al., 1995). Some studies have even tried to understand how different parties judge their relationships based on the mentioned concepts (Ashnai et al., 2009; Naudé and Buttle, 2000). However in construction research and practice the structure of relationship development and such frameworks in relational contracting is still rudimentary (Yeung et al., 2012). Zou et al., (2014) expressed that the nature of construction relationships outside the framework of contractual provisions is rather unexplored, despite the fact that there is much appreciation for collaboration and relational approaches.
In Chapter two through a vigorous combined methodology of literature review and expert interviews four attributes were identified to be most closely associated with relationship quality. In addition various literatures in marketing and business context where relationship quality is well used and elaborated have been explored to provide more guidance. There are also some disagreements as to what number of attributes and potentially what combination of attributes should be used in evaluating relationship quality. But generally trust and satisfaction where the main attributes associated with relationship quality. However attributes such as opportunism, commitment, behaviour, ethics and service provided were also mentioned (Crosby et al., 1990; Dorsch et al., 1998; Kumar et al., 1995). Thus the choice of attributes used in this study for construction relationship quality seems to be of the same nature. The four attributes of trust, performance satisfaction, commitment and teamwork have been identified and are applied as attributes of relationship quality in construction projects for the purpose of this chapter. The current study uses these attributes which are most closely associated with different relational approaches in different literature.

However in discussion of relational approaches a distinction should be made between informal measures of relationship enhancement which is organically developed over a period of time by identifying and knowing the most trustworthy partners and formal contractual processes such as partnering which tries to build the relationship through formalization and documentation (Bygballe et al., 2010). It seems that information and knowledge on informal process is not widely available or classified in construction literature. It is extremely difficult to have the full presence of all the aforementioned attributes in their maximum capacity in construction relationships, and often contracting parties do not have the choice of perfect partners; as mentioned in Chapter 2 certain strategies are applied to improve relationship quality especially where new working arrangements are forming (Bresnen and Marshall, 2000; Chen and Chen, 2007). In most cases, decisions must be made based on trade-off of the
attributes their level of existence in the working relationship. Although a well-structured measurement of relationship quality does not exist, the construction industry is accustomed with selection of prospective partners and relationship preferences (Meng, 2010). A lot of these selections and preferences are tacit knowledge, and there is a physiological tendency towards some attributes and features, which needs to be explored (Yeung et al., 2012). One of the main challenges is to simplify and translate this psychological based trade-off of attribute selection into applicable knowledge. On the other hand there is a need to understand the value of these attributes from the construction practitioner’s perspective. Which attributes are more valuable to the parties involved and motivates them to maintain their relationships for longer periods of time? This will lead to more informed decisions being made based on the different perspectives of the contractual parties towards their relationships. Accordingly based on the value of each attribute, the most important strategies and actions influential to relationship quality judgments may be identified. This can improve practice of relational approaches as future contribution of the current study. In general the industry needs to classify how judgments or decisions are made in determining the level of relationship quality between different parties. In other words there is a demand to evaluate the judgment and decision making process of construction participants in regards to relationship quality.

Therefore the current study aims to understand how relationship quality is perceived and judged among construction practitioners based on the most closely associated attributes to relationship quality. Thus the nature of decision making and judgments based on different levels of relationship quality is initially explored, and accordingly a utility associated to each attribute is extracted. It is also important to understand if there is a general consensus over relationship quality or are there different views or trends in judgment among construction practitioners.
3.2 Methodology

To achieve the research objectives, a form of conjoint analysis known as Conjoint Value Analysis (CVA) is applied (Orme, 2010). The method considers all constructs or attributes of a concept and their corresponding value; therefore allowing for (1) a realistic trade-off between relationship quality attributes as part of different relationship profiles; and (2) the formation of an importance index and part-worth (utility) values for the attribute levels (Naudé and Buttle, 2000). The CVA is used as the most suitable method of calculating the utility values and is used jointly with the full profile method of data collection fitted for conjoint analysis (Orme, 2010).

The objectives of conjoint analysis are to determine the contributions of various predictor variables to the dependant variable represented by the overall evaluation scores of the profiles. This illustrates and simulates the decision making process or the judgement model. It can also establish a predictive model for new combinations of attributes taken from the predictor variables (Bélanger, 2005).

Essentially the conjoint measurement classifies decision and judgment models (Green and Wind, 1975; Hair, 1995); which in this study is judgements towards relationship quality. The method is based on complex trade-offs and mathematical evaluations of the actual decision making process of industry practitioners. This real life trade-off of attributes generates a model demonstrating the utility value of each attribute in the judgement process. The method has gained considerable amount of popularity in analysing different judgements and trade-offs (Green and Rao, 1971; Green and Srinivasan, 1978; Hair, 1995, 2010). This approach explores the variations within and between the samples (Ashnai et al., 2009), and to some extent can provide answers to questions such as; (1) “what are the features that distinguish successful relationships from unsuccessful ones? (2) What makes a relationship highly valued by those within? and (3) Why do actors in a relationship wish and act to pursue
and protect a particular relationship?” (Naudé and Buttle, 2000). The other reason that conjoint analysis is chosen for this study is that in this analysis variables can be categorical and there is no need for numerical confusion (Bélanger, 2005; Green and Rao, 1971) which fits well with the scope of the investigation.

Furthermore, cluster analysis is applied to the outcomes of the conjoint analysis, for the purpose of identifying different trends in judgment. The observed utilities individually demonstrate diverse decision and judgment trends which respondents applied in ranking the relationship profiles; it is important to examine the results for meaningful patterns and groups. By administering cluster analysis groups are created based on their high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity (Hair, 2010). The basic variables used to perform the clustering procedures are utilities corresponding to levels of relationship quality attributes. Finally a second round of conjoint analysis is performed to assess the judgment criteria of the identified clusters.

### 3.3 Data Collection and Analysis

In order to collect data suitable for CVA, a survey is designed based on the full profile approach (see Appendix 5). This method of data collection is used because of its perceived realism and ability to decrees the number of comparisons, making it easier for the respondents to perform trade-offs. The full profile method is recommended when the attributes are less than six (Hair, 2010). In this approach the four attributes of trust, commitment, teamwork, and performance satisfaction corresponding to relationship quality are employed. These attributes have been developed through a comprehensive literature review and exhaustive interviews of construction professionals in Chapter 2. The attributes are categorised in three ordinal levels to make it applicable to conjoint analysis. Since four attributes at three levels are being included in the study a total of $3^4 = 81$ relationship profiles are possible from their combination, which should be included in the study and
judged by the respondents. However this is not practical and adds to the confusion of respondents; it is also highly time and resource consuming to collect judgment data based on 81 relationship profiles (Ashnai et al., 2009; Green and Wind, 1975). To minimise this problem an approach known as the fractional factorial design is used; presenting a suitable fraction of all possible combinations of attribute levels (Addelman, 1962; Green and Srinivasan, 1978; Hair, 2010; Janssens el al., 2008). This provides a balance and allows for the analysis of all the major attribute without considering all possible combinations (Orme, 2010). The consequential set is called an orthogonal array and is designed to capture the main effects for each factor level (Addelman, 1962; Green and Wind, 1975; Hair, 2010; Janssens et al., 2008). It also generates holdout cases, which are rated by respondents but are not used to build the judgment model; instead, they are used as a check on the validity of the model. The orthogonal array is scrutinised to make sure that no unacceptable design or hold out profiles is included and ultimately improve the efficiency, orthogonality and balance of the design (Hair, 2010; Kuhfeld, 1997; Kuhfeld et al., 1994).

Based on the orthogonal design thirteen relationship profiles, four of which are holdouts are generated each profile resembles a realistic relationship; containing a combination of the four defining relationship quality attribute in different levels (see Appendix 5). The respondents are asked to consider these profiles and rank them based on the level of relationship quality they represent. Ranks are used because they are more practical, easier and reliable than preference scores (Hair, 2010). In addition before the final questionnaire was sent a pilot study has been conducted to test the feasibility, timing, and understanding of the survey’s respondents. Through the obtained feedback the survey was modified and fine-tuned. Initially data was collected through the New Zealand Council of Infrastructure Development (NZCID) professional’s meeting. Then it was pursued by sending online questionnaire to communities of New Zealand industry professionals through online
groups and social media. Follow up reminders were also sent to complete the data collection process. Contacts were gathered mainly through official industry representatives and open access data bases.

3.4 Results

Out of an estimated total of 405 potential respondents a total of 91 responses were received giving a response rate 23% which is acceptable rate in comparison to many other studies (Cook et al., 2000; Sax et al., 2003; Shannon and Bradshaw, 2002). Around 13 responses were disregarded due to non-completion, lack of experience and missing values; thus a total of 78 questionnaires were used as raw data for the analysis. This suffices the rule of thumb; that the number of observations should be three times the estimated parameters, or a number equal to \(3(K - k + 1)\), where \(K\) is the total number of levels across all attributes and \(k\) is the number of attributes (Orme, 2010), hence a sample of 30 is sufficient for this analysis. On the other hand conjoint analysis differs from other multivariate techniques in that it can be performed both for individual respondents and also collectively at aggregate level. Therefore even one respondent is enough for the analysis but the higher the number of respondents the better the predictive model (Hair, 2010; Janssens et al., 2008; Orme, 2010).

Since the approach attempts to provide insight on judgement via a complex array of variables, and hypothesis testing through data collection; it is considered as exploratory by nature (Fellows and Liu, 1997); accordingly random sampling is used in choosing different construction practitioners. With a relatively large sample size of 78 almost twice as much in comparison to other similar research (Ashnai et al., 2009; Naudé, 1995; Naudé and Buttle, 2000) the potential for sampling error decreases significantly (Orme, 2010). A further 4 more responses were discarded after the first run of analysis due to logical ranking errors.

A total of 70% of the respondents had more than 10 years’ experience in their positions which provides a solid background for the data collected in this study. Most of the
respondents were either engineers (42%) or project managers and senior level executives (42%); in addition architects planners and surveyors were amongst the respondents too. Around 48.6% of the respondents were involved in public sector projects and 42% in private sector project and the rest were involved in both sectors. Most of the respondents as anticipated were either contractors (44.6%) or industry consultants (36.5%) and the remainder were clients and suppliers; who are representative of all parties involved in construction work; in addition consultants to a large extent are considered as client representatives as well. The responses capture a good mix of construction projects which resonates and demonstrate a better conclusive potential for the data collected; approximately 24.3% of respondents had worked in building and residential projects, 20.8% in industrial projects, 27.1% in commercial construction projects and finally 27.8% on Civil engineering and infrastructure projects.

3.5 Development of the Conjoint Model

As part of the CVA utility values are generated thus an assumptions for utility relationships has to be made for a more accurate representation of the respondent’s judgment trend for relationship quality via these values. Preferably less restrictive utility relationships such as the discrete assumption should be considered, however this comes at the stake of losing some statistical efficiency. The more restricted assumptions such as the linear or ideal utility relationships provide the study with more statistical efficiency. It is more effective to estimate different forms of utility relationships and identify the most appropriate for the context (Bélanger, 2005; Hair, 1995; Janssens et al., 2008). Accordingly in this study; analysis of utility values and importance index of different attribute are performed based on both discrete and linear assumptions for a comprehensive and conclusive analysis (see Table 3.1).
In CVA for the purpose of discrete analysis both Pearson’s R and Kendall’s tau correlation between the observed and estimated scores is calculated and evaluated. Both scores are very close to one and their significance level is close to zero indicating goodness of fit for the obtained utility values. However in cases where the number of profiles does not substantially exceed the number of parameters (low degree of freedom; especially in discrete conjoint measurements, due to statistical inefficiency there is a potential for over-fitting and high correlations very close to one. Subsequently a linear analysis or ideal analysis with more degrees of freedom would provide better statistical efficiency (Green and Wind, 1975; Hair, 2010).

Table 3.1: Utility and importance index for relationship quality attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Levels</th>
<th>Utilities</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Discrete</td>
<td>NOP* Discrete</td>
</tr>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-.752</td>
<td>-1.096</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.329</td>
<td>.471</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>.423</td>
<td>.625</td>
</tr>
<tr>
<td>Performance</td>
<td>No satisfaction</td>
<td>-1.797</td>
<td>-2.141</td>
</tr>
<tr>
<td>satisfaction</td>
<td>Fairly satisfied</td>
<td>.685</td>
<td>.845</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>1.113</td>
<td>1.296</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-.892</td>
<td>-1.200</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.153</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>1.045</td>
<td>1.215</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor team work</td>
<td>-.559</td>
<td>-.907</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>-.590</td>
<td>-.470</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>1.149</td>
<td>1.377</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>5.014</td>
<td>4.763</td>
</tr>
</tbody>
</table>

*New Orthogonal Plan (NOP)

On the other hand the holdout correlations are applied as a measure of model validity and to avoid this problem of fake high correlation between observed and estimated scores. Holdout profiles typically generate a lower correlation than the actual design profiles (Janssens et al., 2008) therefore as anticipated the Kendall’s tau for the hold outs is 0.67 which is lower than the design profiles, and the significance level of 0.087 < 0.1 is a sign
that the model is significant at 90% level (Janssens et al., 2008; Malhotra, 2010). For the linear model, Pearson’s R is 0.924, and Kendall’s tau for both design and holdout is 0.67 with the same significance threshold of 0.087 < 0.1. Although the discrete model generates better predictive potential, the linear model illustrates better statistical efficiency and applicability by estimation of $B$ coefficients and individual standard errors for all utility values generated from all respondents (Hair, 2010).

The ideal/quadratic assumption is also tested, and produces similar Pearson’s R and Kendall’s tau correlations as to the discrete assumption and demonstrates that fewer constraints in relationship assumption are better for the current data set. It is important to note that high reversals occur with the ideal assumption making the model less representative and appropriate (Hair, 2010; Malhotra, 2010).

Extremely high correlations were inspected thoroughly to make sure that there was no systematic error or fundamental estimation problem. For extra check and better model fit a Near Orthogonal Plan (NOP) was also investigated by excluding a more obvious relationship profile choice after the initial analysis, and replacing it by a new profile which maintains the orthogonality of the design (Addelman, 1962; Hair, 2010; Malhotra, 2010). In the discrete analysis of the NOP design, Person’s R and Kendall’s tau estimates were similar to the original orthogonal design at significance level of 0.021 < 0.05. For the linear analysis; Person’s R is at 0.890; Kendall’s tau was 0.667, while for the holdout it is close to one at the significance level of 0.021 < 0.05. The analysis shows that the NOP has a slightly better fit then the orthogonal plan. However by comparing the utilities disseminated in Table 3.1 variations between the orthogonal and NOP both in the discrete and linear form are very small and follow the same pattern.

The goodness of fit test is also performed at an individual level for each respondent. For ranked scores, both Pearson’s R and Kendall’s tau can be used as individual predictive or
goodness of fit values. Individuals with poor predictive fit should be nominated for elimination from the analysis (Bélanger, 2005; Green and Srinivasan, 1978; Hair, 2010; Malhotra, 2010; Orme, 2010). Only one of the individual respondents was deleted from the data set since it had a poor holdout correlation under the 0.4 threshold. All Pearson’s R correlations were over 0.7 threshold. Accordingly apart from three individual responses with a Kendall’s tau in the range of 0.4 to 0.6 the rest of the respondents were over the 0.6 threshold, a great majority of which had a Kendall’s tau over 0.7 limit (Hair, 2010).

The conjoint measurement calculates the importance index of each attribute involved in the analysis as an indicative parameter (Green and Srinivasan, 1978; Hair, 1995; Janssens et al., 2008; Peter Naudé, 1995). The importance index for relationship quality attribute of trust, performance satisfaction, commitment and teamwork are all included in Table 3.1, and Figure 3.1 presents a graphic illustration of these importance indexes with discrete and linear assumptions for both the orthogonal and also NOP design matrix. The other measure indicated in Table 3.1 is the utility scores of relationship quality attributes at each level resulting from both design matrix (orthogonal and NOP), which again is illustrated in discrete and linear assumptions (see Figure 3.2). Via examining Figures 3.1 and 3.2 it becomes obvious that the two models are almost identical; demonstrating the validity of the model goodness of fit and proving that the orthogonal plan describes at least 90% of the variation.

![Figure 3.1: Importance index of attributes according to design plan and utility assumption](image-url)
The analysis shows that from the respondent’s perspective performance satisfaction has the highest importance for relationship quality judgement in construction projects. Consequently it can be deduced that growing performance satisfaction will highly influence the bond and improve relationship quality levels and outcomes.

Visual examination of utilities may be required to detect the best model assumption. Normally the general trend is apparent and the model can be re-estimated with a new and better justified relationship assumption (Hair, 2010). From observational perspective illustrated in Figure 3.2 an approximate linear pattern between the obtained utility values is recognised; this can justify the appropriateness and the statistical value of the linear model. Although the linear model is a legitimate representative of the conjoint measurement it may not be an accurate predictive model compared to the discrete model (Auty, 1995; Hair, 2010; Janssens et al., 2008; Malhotra, 2010; Orme, 2010). Figure 3.2 also shows that the pattern identified for utilities is rational; meaning that with an increase in the utility of attributes the
general utility of relationship quality increase. Equation 3.1 represents the best predictive models founded on values generated based on discrete assumption:

$$U_{RQ} = U_{Trust} + U_{Performance Satisfaction} + U_{Commitment} + U_{Teamwork} + 5.014 \quad (\text{Equation 3.1})$$

Based on the identified Equation 3.1 the highest and lowest possible utility for a discrete orthogonal plan would respectively be:

$$U_{Max} = 0.423(\text{Extremely trustworthy}) + 1.113(\text{Extremely satisfied})$$
$$\quad + 1.045(\text{Extremely committed}) + 1.149(\text{Great teamwork}) + 5.014$$
$$\quad = 8.744$$

$$U_{Min} = -0.752(\text{No trust indication}) - 1.797(\text{No satisfaction}) - 0.892(\text{Not committed})$$
$$\quad - 0.559(\text{Poor teamwork}) + 5.014 = 1.014$$

 Obviously any other utility value for relationship quality will fall between the above limits and corresponds with the original ranks allocated by the industry participants. According to this the evaluation of any potential relationship scenario using the above benchmarks becomes achievable. Based on the information provided or possessed on trust, performance satisfaction, commitment and teamwork a measure of relationship quality could be assigned and scaled in the above range. The utility functions are also an indication of how trade-offs are made in the judgment process of working relationships. Furthermore by examining the utility function of each attribute individually some useful and meaningful deductions can be made.

According to Table 3.1 the utility for no trust indication is -0.752, which is almost twice the utility of extremely trustworthy partners. Consequently the absence of trust is more destructive to relationships compared to the effect of good trust enhancing relationship quality of a working arrangement. In simpler words the factor of negative trust or distrust is more decisive than positive trust in the judgment of relationship quality by construction industry practitioners.
Figure 3.3: Utility summary of the four relationship quality attributes for the discrete (left) and linear (right) assumptions
This is very much the case for performance satisfaction and teamwork; however for commitment the positive notion of the attribute is more decisive. This is graphically illustrated by the charts on the left side of Figure 3.3.

The linear model demonstrates the rate of increase for each attribute level relating to the importance index; it confirms that performance is the most significant attribute of relationship quality judgment in construction activities. If the parties focus more on performance, according to the model the chances of enhancing their relationship quality is higher in perhaps less amount of time. The discrete analysis shows that moderate teamwork has a slightly lower utility compared to poor teamwork (see Figure 3.3) which seems irrational, this is comparable with Naudé and Buttle (2000) analysis of power for relationship quality in business context and they claimed it was due to insufficient attention being paid to this particular attribute. However deeper analysis can shed more light on the matter specially by extracting different response groups; despite this the overall trend is rational and the analysis is acceptable.

3.6 Clustering the Results

In performing cluster analysis it should be noted that clusters are always found regardless of the correspondence, strength of similarity, or relationship among cluster members therefore it is best to support the procedure with strong conceptual backing. The analysis is descriptive, atheoretical and non-inferential which works better as a confirmatory component for established groups and conceptual foundations (Hair, 2010). Hierarchical clustering procedure is used since it can generate a complete set of cluster solutions ranging from all-single member clusters to one-cluster solution allowing for a more comprehensive and holistic view of clusters and does not require predetermining the number of clusters. In doing so the hierarchical framework allows for the comparison of any set of cluster solution (Hair, 2010).
The average linkage of between group clustering method is used as one of the most well established and well performed means of hierarchical clustering (Hair, 2010; Malhotra, 2010). The method has also been employed by Naudé and Buttle (2000) in their clustering of relationship quality rank ordering in business-to-business context. Others such as Green and Wind (1975) have regarded hierarchical clustering as a complementary analysis for conjoint measurements in order to classify and gain more understanding of judgment trends and decision patterns. In this technique distance is calculated based on Square Euclidean distance and furthermore there is no need to standardise the scores since all variables are utilities and are of the same nature and unit (Hair, 2010; Janssens et al., 2008; Schaninger and Buss, 1986). The analysis illustrates 73 stages of clustering with the first stage including all of the 74 objects as individual clusters. The agglomeration schedule and the dendrogram is used to analyse the clusters (Green and Wind, 1975; Hair, 2010; Janssens et al., 2008; Malhotra, 2010; Naudé and Buttle, 2000), accordingly a three or four cluster solution is recognised to be the best possible scenario. The agglomeration schedule shows the largest coefficient variation between steps 72 which is a 3 cluster solution and 71 which is a two cluster solution, furthermore there is also a large coefficient difference between the 3 cluster solution and the ultimate one cluster solution indicating variation of perception and judgement towards relationship quality exists between different clusters of respondents. Consequently a three cluster solution was thought to be appropriate however in order to have an overview of the different cluster solutions a descriptive frequency analysis of four different solutions containing a range of 2 to 5 cluster solutions was performed. It was found that although within the 3 cluster solution there was a small cluster of 4 respondents it is more logical than the 4 cluster or five cluster solution because they have other small clusters which in nature are very similar to the bigger clusters.
Figure 3.4: Dendrogram demonstrating different relationship quality judgment groups
On the other hand the 2 cluster solution is not appropriate since it involves a huge group of 70 objects which is 94.6% of the respondents in one cluster. Furthermore based on agglomeration schedule and dendrogram there is evidently a significant difference within this large respondent group, and therefore a 3 cluster solution is preferable. The frequencies for the identified three clusters are illustrated in Table 3.2.

**Table 3.2: Cluster solution frequencies**

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Valid Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>1</td>
<td>47</td>
<td>63.5</td>
<td>63.5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>23</td>
<td>31.1</td>
<td>94.6</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td></td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.3: Utility and importance index for relationship quality components within clusters**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Levels</th>
<th>Cluster1</th>
<th>Utilities Cluster2</th>
<th>Utilities Cluster3</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-.116</td>
<td>-1.705</td>
<td>-2.750</td>
<td>15.119(Cluster1)</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.430</td>
<td>-.213</td>
<td>2.250</td>
<td>35.461(Cluster2)</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>-.314</td>
<td>1.918</td>
<td>.500</td>
<td>47.656(Cluster3)</td>
</tr>
<tr>
<td>Performance</td>
<td>No satisfaction</td>
<td>-2.421</td>
<td>-.705</td>
<td>-.750</td>
<td>40.437(Cluster1)</td>
</tr>
<tr>
<td>satisfaction</td>
<td>Fairly satisfied</td>
<td>1.019</td>
<td>.019</td>
<td>.583</td>
<td>16.511(Cluster2)</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>1.402</td>
<td>.686</td>
<td>.167</td>
<td>20.078(Cluster3)</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-1.024</td>
<td>-.647</td>
<td>-.750</td>
<td>22.920(Cluster1)</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.031</td>
<td>-.444</td>
<td>.083</td>
<td>20.139(Cluster2)</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>1.054</td>
<td>1.092</td>
<td>.667</td>
<td>12.903(Cluster3)</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor team work</td>
<td>-.442</td>
<td>-.937</td>
<td>.250</td>
<td>21.524(Cluster1)</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>-.619</td>
<td>-.647</td>
<td>.083</td>
<td>27.890(Cluster2)</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>1.061</td>
<td>1.585</td>
<td>-.333</td>
<td>19.364(Cluster3)</td>
</tr>
<tr>
<td>Constant</td>
<td>5.002</td>
<td>5.039</td>
<td>5.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The rescaled distance which is based on the agglomeration analysis shown by the dendrogram in Figure 3.4 confirms the greatest distance between the three cluster and two cluster solutions. Within the three cluster solution cluster 1 is the largest and includes 47 out of 74 objects ranging from respondent 54 at the top of the dendrogram to respondent 57 (see Figure 3.4). The second cluster includes 23 objects from respondent 32 to 31 of the dendrogram demonstrated in Figure 3.4, and finally a group of 4 respondents constitute
cluster 3. Based on a separate discrete conjoint analysis performed on the three identified clusters new utility values and importance indices are extracted and tabulated in Table 3.3.

The conjoint measurement of each cluster reveal that relationship quality is perceived very differently with diverse judgment criteria among respondents. Cluster 1 is the largest and has the most impact on overall results. Respondents within cluster 1 identify relationship quality mainly by performance satisfaction and an importance index of 40.4 followed by commitment and teamwork as the main decisive attributes. In this cluster trust has the lowest effect on judgment. However cluster 2 is radically different with trust and teamwork being the main influence on judgement followed by commitment; in this cluster performance satisfaction has the lowest impact on relationship quality judgement. In cluster 3 respondents regard trust as the main criteria in judging relationship quality; however they also find performance satisfaction and teamwork important. In this cluster commitment has the lowest importance.

As demonstrated there are many different means that relationship quality is evaluated and judged by New Zealand construction practitioners, therefore the judgment criteria is not absolute and different trends exist. Figure 3.5 shows the variability of attribute importance index for relationship quality in judgment associated with the identified clusters.

![Figure 3.5: Importance index of relationship quality attribute in the identified clusters](image-url)
Table 3.3 also includes the utility values at attribute level; hence the foundation on how respondents from each cluster make their decision or base their judgment of relationship quality is understood and justified. For instance in cluster 1 higher levels of performance satisfaction have significantly higher utilities this is true for commitment as well however in the case of teamwork although there is generally an increase in utility from poor team work level to great teamwork level there is a decrease in utility in moderate teamwork level. The trend is completely distorted for trust in this cluster; this basically means that the respondents in this cluster trade off teamwork to some extent and trade-off trust to a great extend with the other two attributes in judging relationship quality, making trust the least important factor in their decision. However teamwork is not the dominant factor in any clusters and may be traded-off with performance satisfaction and trust in the two large clusters; this can explain the small irrational pattern of poor teamwork having higher utility compared to moderate teamwork level in the general discrete analysis mentioned earlier (see Table 3.1 and Figure 3.3). For cluster two and three the pattern is completely rational; in which increasing utilities means improvements in all attribute levels, with larger scales of increase indicating higher attribute importance.

Although trust is one of the important elements in any relationships it is evident from the findings that a large group of people prefer other attribute as more decisive in judging relationships. This in nature can be related to the concern that trust is not basically formed at the start of relationships and time and effort is needed to develop trust in any relational context. Some practitioners and also researchers suggest the systematically incorporating trust will improve relationships; thus trust could be the ultimate goal in a relational approaches but not a key factor in all relational levels, in fact it can be regarded as inconceivable in some relationships (Bygballe et al., 2010; Smyth and Edkins, 2007). Construction experts express that usually there is not enough time and on-going work to build
trust and if there was total trust there is no guarantee that the parties which have built trust amongst them were not to change. Having said that as mentioned in Chapter 2 a significant amount of research identifies trust as the most important and ultimate relationship level, therefore this explains the perception of other clusters which base their relationships on trust.

### 3.7 Discussion

The construction practitioners in general regard performance satisfaction as the main attribute or factor defining the quality of their relationships. In fact performance satisfaction is seen as a driver of relational development which in its absence relationships will suffer. However In the current study three clusters constituting different compositions of attributes have been observed which indicates that judging relationships quality is not unanimous or absolute. In Chapter 2 (see Figure 1.3) a framework has indicated that relationship quality could be a progression of actions and strategies into attributes such as teamwork, commitment, performance satisfaction and trust. This basic idea implies that theoretically actions and strategies could be implemented in a way that certain attributes of relationship quality is formed or strengthened. Therefore within the identified judgment trends, certain strategies and actions could be proposed to strengthen their relation perceptions and boosts their relationship quality level. For instance strategies such as joint problem solving, benchmarking and continuous improvement, strive towards early elimination of conflict and dispute will directly affect the performance (Bower, 2003; Chan et al., 2003; Cheng and Li, 2001; Kadefors, 2004; Larson, 1997; Lu and Yan, 2007; Meng et al., 2011; Naoum, 2003; Pryke, 2009). Therefore if these strategies are used the relationship quality level may be more effectively boosted among the participants of cluster one. Consistent objectives and mutually agreed goals, risk sharing, setting regular meeting and communication links, perhaps providing incentives, and coordination with senior level management, therefore can boost commitment and communication (Cox and Thompson, 1997; Harper and Bernold,
2005; Meng, 2010; Yeung et al., 2012) thus improving the relationship quality levels among the second cluster of judgment. Trust as the ultimate relational goal is achieved through a series of different strategies which may start with attitude modification, clarity, win-win mind-set and curbing the opportunistic nature of human interactions (Bower, 2003; Chan et al., 2003; Ling et al., 2014; Meng et al., 2011; Palaneeswaran et al., 2003; Pryke, 2009). This is normally attained in period of collaboration and could be extremely valuable strategies for managing the third cluster’s relationship requirements, who base their judgment of relationship quality on trust.

Thus different approaches via different choices of actions and strategies may be adopted in order to achieve certain levels of relationship quality. To understand the implications of these compositions, further study has to breakdown the attitudes and behaviours of different industry professional groups in their evaluation and judgment of relationship quality. If strategies forming relationship quality attributes are identified, justifications could be provided on how decisions are evaluated and made by combining them with the actual preferences associated with each industry group. As a result suggestions could be made for improvement of future industry practices; paving the way for better decision support systems where relationship quality evaluation as a mean of fit for purpose strategy development is necessary.

3.8 Chapter Summary

The current study seeks to address how New Zealand construction professional’s judge relationship quality based on attribute of trust, commitment, teamwork and performance satisfaction extracted through extensive literature search and exhaustive industry interviews. The utility values for each factor levels and factor importance indexes achieved by conjoint analysis indicated that performance satisfaction is the most decisive attribute with more than 30% weight compared to trust, commitment and teamwork which have almost the
same importance level of just above 20%. The analysis indicates that all the chosen attributes are important and no single attribute is neglected in the overall decision making procedure. The results of the aggregate analysis may present a myopic perspective since it is a generalization and average of the individual assessments, however the individual assessments demonstrate variety of decision logics, trade-offs and judgment criteria. The utility of the negative levels associated with attribute such as trust, performance satisfaction and teamwork is more decisive for judgment then the their respective positive levels. This implies that the absence of these attribute is more destructive to relationships compared to their presence as relationship quality boosters. Three clusters of judgment were identified among respondents through hierarchical cluster analysis. With a second round of conjoint analysis the judgment criteria of the three clusters was observed. The largest cluster judged relationship quality mainly by performance satisfaction followed by less weight given to commitment and teamwork; in this cluster trust is the least decisive. Therefore actions and strategies which can enhance performance and create more satisfaction for this group of people are of higher relational value or at least considered as genuine attempts to improve relationship quality. However the second cluster was radically different with trust and teamwork being the main influence on judgement followed by commitment; in this cluster performance satisfaction has the lowest impact on judgement. The smallest of the three clusters regard trust as the main criteria in judging relationship quality; however they found performance satisfaction and teamwork as equally important.

The use of conjoint analysis has generated utility values for all relationship quality attribute levels which could be used as a benchmark judgment model. Consequently the evaluation of any potential relationship scenario using the benchmarks set by these utility values becomes achievable. Consequently with the availability of appropriate information on the four attributes of trust, performance satisfaction, commitment and teamwork a measure of
relationship quality could be assigned and scaled within the established judgment model range. The study demonstrates that there are diverse perceptions and judgments towards relationship quality in construction projects within New Zealand construction practitioners and although there are clusters which represent majorities and minorities one final and absolute judgment criteria cannot be driven. Based on the findings and of the judgment models associated to each cluster certain managerial indications are made. For instance strategies such as joint problem solving, benchmarking and continuous improvement, strive towards early elimination of conflict and dispute will potentially enhance the relationship quality among cluster one practitioners. Consistent objectives and mutually agreed goals, risk sharing, setting regular meeting and communication links, and incentives, can boost relationship quality among cluster two. Finally attitude modification, clarity, win-win mindset and curbing the opportunistic nature of human interactions could increase trust and potentially improve relationship quality among cluster three of practitioners.

However there is a need for further research perhaps into attitudes of different industry groups towards relationship quality judgment. This may potentially explore each of judgment clusters according to these industry groups which may lend to more managerial insight into better relational practices.
Chapter 4

Relationship Quality among Construction Professionals

The current chapter is based on the following article:


4.1 Introduction

One of the concerns within the construction industry is building better teams with more sustained relational initiatives; therefore a variety of research streams have been dedicated to the issue of relational culture in a variety of construction settings. For instance Akintoye and Main (2007) have reported that the UK contractors want to engage more into collaborative relationships for risk sharing, access to innovation and technology, response to market, resource efficiency and client requirements drivers. In Chapter 1 the tendencies within the industry to embark on relational approaches were discussed. Clashes of organizational, operational, national, and/or professional cultures, point to the need for “relational integration”. It was discussed how relationship quality has been developed applied as a tool for customer retention and popular measure of relational marketing. Founded on this theory extraction from marketing and business context; it was proposed that relationship quality can be formulated in the construction project context as well. It was acknowledged that this metamorphosis is necessary and similar changes are required to develop long-term relationships and integration in construction (Pauget and Wald, 2013; Voss and Kock, 2013).
It is suggested that the concept could be regarded as an evaluation process for relational approaches in construction projects. Consequently the concept of relationship quality may be borrowed and translated from marketing literature and utilized in construction projects. However in total not all attribute used in marketing and business context may be applicable to construction, since the circumstances and constraint of the two fields are very different. Most importantly construction is highly project based and there are a diversity of professionals and industry groups involved; whereas marketing and business is predominantly a transaction oriented environment amongst buyers and sellers. Ultimately in an extensive research in Chapter 2 four elements of trust, performance satisfaction, commitment and communication were attributed to construction relationship quality of contractual parties in construction (Jelodar and Yiu, 2012a, 2012b; Jelodar et al., 2013c).

In Chapter 3 the judgement trends of the industry professionals towards relationship quality was evaluated with respect to the aforementioned attributes. The goal was to generally identify how relationship quality is perceived and judged based on the trade-off of its attributes by contracting parties. Important attributes in judgement and decision making were identified, and furthermore it was acknowledged that different trends of judgment exist. The parties do not necessarily possess a unanimous view on how relationship quality should be evaluated with other contractual parties. In fact diverse clusters of judgments with different important indices associated with relationship quality were identified. Hence in Chapter 3 it was proposed that further in-depth investigations are necessary to classify the judgement trends associated to the industry groups and professions involved in construction. The current chapter aims to identify and compare patterns of judgment within industry professional groups. Potentially each clusters of judgement with respect to different industry groups are identified, lending to specific information on how various parties value there relationships.
with others. This knowledge will provide an improved holistic managerial perspective for better relational practices.

4.2 Relational Perception and Contractual Parties

Relationships include at least a dyad of parties which may have different views and perspectives. Previous studies have attempted to make sense of these different perceptions. Therefore, many ideas have been proposed to satisfy diverse relational needs and perceptions. For instance, some have proposed benchmarking criteria to clients as the ‘best’ selection practices for choosing suitable contractual parties such as contractors (Li et al., 2001; Naoum, 2003; Palaneeswaran and Kumaraswamy, 2000a). Alongside this, ‘innovative’ contractor selection approaches by large public clients was advocated, where relationship is always a key criterion (Palaneeswaran and Kumaraswamy, 2000a, 2000b; Zhang, 2004a, 2004b). Furthermore, tracking the other party through a cooperative and non-competitive conceptual benchmarking model is a useful approach for selection of suitable bidders and achieve best ‘value for money’ (Tang et al., 2010). However, the problem with these conceptualisations is that it is only concerned about one party which in this case are the clients. These studies generally recognised client’s choice while other parties also need to satisfy their relational concerns. In fact, the construction supply chain encompasses different types of relationships at different tiers. For example, the relationship between client and main contractor may differ from the relationship between main contractor and a specialist contractor. Taking this into account, Meng (2010) developed a framework focusing on a customer–supplier relationship rather than the whole supply chain.

Certain perspective associates more responsibilities to clients and believes that they must ensure adequate understanding of the partnering relationship and expectations. Project goals should be clearly set and commitment of all stakeholders should be monitored towards these goals (Ng et al., 2002). In a study of prison construction projects in Australia, operators
specified that clashes between the builder and architect is inevitable, a lot of problems arise when builders say they cannot build and the design is faulty or ask for more money (Consoli, 2006). They also regarded “disrupted communications between consultants and principle architects”, “contractor’s opportunistic behaviour in dealing with architects”, “taking advantage of the knowledge provided”, and “inability to listen” as problematic issues between different parties. Having said that operators were generally satisfied with their architects performance; and it is accepted that a parties frustration with the other party can jeopardise the whole bid package or working arrangement, and result in loss of trust and bond (Consoli, 2006).

Yeung et al.,(2009) targeted construction senior executives and project managers in their study; an index was used to measure, monitor, and improve the performance of their individual relationship-based projects. The goal was to examine project relationships from the senior management perspective. Different investigators have tried to understand the relative usefulness of various strategies and factors, in delivering suitable contractual and non-contractual incentives in creating a relational contracting culture (Rahman and Kumaraswamy, 2008). Chan et al.(2004) studied the opinions of various parties; clients, consultants, and contractors in relation to partnering success factors. In this mixed study investigators tried to identify groups and practitioners roles in association with different relational factors. Kumaraswamy et al., (2005a) examined factors facilitating and deterring relationally integrated project teams from the contractors viewpoint. However no further insight was given whether a unified view exists within these contractor groups, or how relationships with contractors are perceived by others in the project. In the work of Cheung et al (2003) trust is once more credited as the pivotal attitudinal attribute for relational conduct. In this respect, trust building is an indispensable exercise of partnering relationships. However they do not indicate how trust can be evaluate in combination with other attributes,
and furthermore how different parties within a contractual agreement initially evaluate relationships.

The examined body of knowledge indicates that there have been some efforts in order to generalize and formulate the relational factors in construction projects. Even the differences among the perception of cultures such as Chinese and the UK as an emblem of western construction culture has been studied (Chen and Partington, 2004). The aforementioned literature demonstrates a variety of attributes which in their presence or absence contractual relationships could be positively or negatively affected. However there is lack of understanding on how different groups of industry practitioners may judge relationship quality based on these attributes. Harper and Bernold (2005) claim that in supplier assessment, the most important metrics mentioned by contractors, are quality, on-time delivery, and past working relationship; equally though they do not identify how this relationship is assessed by these contractors or any other party. Similar to the definition of relationship quality in marketing, many concepts could be attributed to relationship quality in construction; but the question is how are these attributes perceived and judged together by specific industry groups as part of an evaluation system.

As mentioned in relationship quality framework of Chapter 2 (see Figure 1.3) It is believed that training is essential for understanding and implementing relational strategies (Eriksson et al., 2009; Kumaraswamy et al., 2005a; Ling et al., 2014), nevertheless how is training possible without understanding different viewpoints and perspectives of relationships. The stability of relationships in different projects is indicated but the trends and notions that induces stability is unclear. Basically one need’s to understand how would different individual’s trade-off different attributes to assess a relationship or choose an appropriate party for their relational concerns. It is obvious that there are different parties,
roles, cultures, sector, experience levels, organisational and local cultures involved in construction industry, and will affect how relationship quality is judged.

Contracting parties can exhibit different judgment trends and models by trading-off the attributes associated to relationship quality, in accordance to what they expect from a relationship (Jelodar et al., 2014). As demonstrated there are mixed remarks and confusing feelings as to “what are the attributes associated with relationships in construction?”. These attributes have been repeatedly mentioned by industry researchers and practitioners; however the use of these attributes have been very much random. Not enough structure exists as to how significant they are in vital decision making circumstances. On the other hand since there are different parties involved with possible conflicting interests, the concept relationship quality can become ambiguous. In general there is lack of understanding on how different industry sections and groups evaluate their contractual relationships. Consequently it is necessary to explore the relationship quality judgment models among different industry groups and professionals. The four identified attributes of relationship quality classified in Chapter 2 are considered for the analysis in the current chapter. Accordingly patterns of relationship quality judgment via the application of these attributes will be identified and classified among industry groups using conjoint and correspondence analysis techniques.

4.3 Methodology

A special questionnaire was designed to collect data for Conjoint Value Analysis (CVA). The CVA is conducted through the full profile method of data collection (Orme, 2010). This method allows the construction practitioners to realistically trade-off of relationship quality attributes as part of different profiles, and as a result importance index and utility values for each attribute is generated (Naudé and Buttle, 2000). The method is based on mathematical evaluation of decisions and trade-offs made by individual industry professionals in choosing and ranking relationship quality profiles, which is also referred to
as the judgment models associated to these individuals (Green and Wind, 1975; Hair, 2010). It can also establish a predictive model for new combinations of values taken from the predictor variables (Bélanger, 2005). In order to establish a meaningful and valid base for comparison; relationship quality is defined by different levels of attributes associated to it. The application of the method is widespread in different fields of knowledge such as marketing, business, phycology, and etc. (Green and Rao, 1971; Green and Srinivasan, 1978; Hair, 2010). The data collection process is designed based on the full profile method associated with the CVA. The full profile method is much recommended when the attributes are less than six (Hair, 2010). Each of the four attributes of trust, commitment, teamwork, and performance satisfaction are divided in three levels of high, moderate or low and the combination of these attribute levels will produce different relationship quality profiles, and could be practically associated to a real individual or contractual party. Via fractional factorial design 9 different profiles representative of all the 81 possible profiles are chosen in an orthogonal design or array (Ashnai et al., 2009; Hair, 2010; Naudé and Buttle, 2000; Orme, 2010). This selection of design profiles is done by SPSS package and aims to decreases the ranking process and significantly simplifies the data collection venture without losing any analytical capability. In addition 4 holdout profiles are generated for the respondents to rank and ultimately use as a measure of conjoint validity (Green and Wind, 1975; Hair, 2010). All the thirteen profiles constituent of 9 design and 4 holdout profiles are compiled in a conjoint survey. Respondents are asked to rank the profiles form best to worst, based on the relationship quality level they represent with a contractual party. Potential respondents within different industry groups are identified to initiate the data collection process. These classifications are made by role, sector, profession experience and executive levels. Conjoint analysis differs from other multivariate techniques in a sense that it can be performed for individual respondents and also at aggregate level for all. Even one respondent
suffices the requirement for the analysis however higher numbers of respondents provide a better predictive model (Hair, 2010; Janssens et al., 2008; Orme, 2010). Consequently to perform the analysis there are no absolute requirements in terms of sample size (Orme, 2010).

The analysis is performed by SPSS software and the ranks associated by different industry groups are translated to utility estimates which represent the decision making value of each attribute level for respondents. Utility estimates are used thus a common foundation for comparison is provided and different type of attributes can be compared based on the value they represent in decision making processes. This is why they are also referred to as Utility values (Janssens et al., 2008; Orme, 2010). Collectively the utility values can provide estimates of decision making and judgement trends among different industry groups. Furthermore the difference of the lower and upper margins of utility estimates will represent the importance indexes for each attribute. The importance index associated to each attribute is a percentage which accumulates to 100% for all attributes. Higher importance indexes represent greater importance in evaluating relationship quality (Ashnai et al., 2009; Hair, 2010).

Cluster and correspondence analysis are also performed to provide addition information and analytical power to the CVA, and perhaps identify patterns of decision and judgment models associated to industry groups (Ashnai et al., 2009; Hair, 2010; Naudé and Buttle, 2000; Orme, 2010). These methods also suit the outputs of conjoint analysis and are commonly performed as a complementary method to CVA (Green and Srinivasan, 1978; Hair, 2010). In the first step cluster analysis is performed on the importance indexes generated by conjoint analysis to potentially identify different clusters of relationship quality judgment among respondents. Then correspondence analysis is carried out to presents a visual which is also referred to as the perceptual map; with the aim of identifying new underlying dimensions for the judgment of relationship quality (Naudé and Buttle, 2000).
Correspondence analysis is performed by creating a contingency matrix structure including respondents and the importance indexes generated via CVA for each respondent (Janssens et al., 2008). In the perceptual map a plot of objects is provided where similar objects are geometrically closer to each other (Green and Wind, 1975). A second correspondence analysis is carried out to map industry groups and their associated attribute importance indexes generated via conjoint analysis. This is performed to identify how these industry groups vary and associate with one another and identify the underlying structure of relationship quality judgments.

4.4 Findings

The survey was sent out to different industry participants who had more than 5 years’ experience. 74 completed responses were finally received. The conjoint analysis has been performed within different samples of groups of respondent which represent formal and well established faction of the industry. The analysis began by the classification of professions; accordingly two samples of engineers or project/executive managers were extracted from respondents. A total of 36 completed responses were identified as engineers and 31 respondents were identified as project/executive managers. In addition 7 respondents did not indicate their profession therefore were excluded from the analysis.

Table 4.1 demonstrates the utility estimates, and performance index; product of the overall conjoint analysis by profession. Figure 4.1 is a graphic illustration of the importance index associated to each attribute which lends to an overview of the judgment models. For Both groups of respondent’s performance satisfaction has the highest importance index with 30% associated to engineers and 33.3% to managers (see Table 4.1 and Figure 4.1). Therefore from the view point of these respondents the anchor of judgment in evaluating relationship quality is performance satisfaction. In engineer’s judgement of relationship quality, teamwork with the importance index of 25% was also another significant attribute;
whereas for the managers trust has the slight edge over teamwork with the importance index of 23.3%. As demonstrated by Table 4.1 and Figure 4.1 equal importance is given to the other remaining attributes by both groups. All attributes obtained significant importance, illustrating their vital role in decision making (see Table 4.1).

Table 4.1: Utility estimates and importance indexes (by profession)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
<th>Utility</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Engineers</td>
<td>Managers</td>
</tr>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-.609</td>
<td>-.808</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.133</td>
<td>.490</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>.477</td>
<td>.318</td>
</tr>
<tr>
<td>Performance satisfaction</td>
<td>No satisfaction</td>
<td>-1.717</td>
<td>-1.854</td>
</tr>
<tr>
<td></td>
<td>Fairly satisfied</td>
<td>.638</td>
<td>.766</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>1.079</td>
<td>1.088</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-.900</td>
<td>-.969</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.147</td>
<td>-.107</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>1.047</td>
<td>1.077</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor teamwork</td>
<td>-.771</td>
<td>-.372</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>-.491</td>
<td>-.716</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>1.262</td>
<td>1.088</td>
</tr>
</tbody>
</table>

Next the industry respondents were classified based on their roles as clients, contractors or consultants. A total of 36 respondents were contractors; 27 respondents were consultants and also 11 acceptable respondents identified as clients. The analysis is summarised in Table 4.2.

Figure 4.1: Judgement of relationship quality attributes based on profession
Table 4.2: Utility estimates and importance indexes (by role in project)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
<th>Contractor</th>
<th>Consultant</th>
<th>Client</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-.735</td>
<td>-.712</td>
<td>-.909</td>
<td>23.6% (Contractor)</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.367</td>
<td>.239</td>
<td>.424</td>
<td>21.6% (Consultant)</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>.367</td>
<td>.473</td>
<td>.485</td>
<td>25.7% (Client)</td>
</tr>
<tr>
<td>Performance</td>
<td>No satisfaction</td>
<td>-1.735</td>
<td>-1.749</td>
<td>-2.121</td>
<td>31.2% (Contractor)</td>
</tr>
<tr>
<td>satisfaction</td>
<td>Fairly satisfied</td>
<td>.756</td>
<td>.523</td>
<td>.848</td>
<td>31.1% (Consultant)</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>.978</td>
<td>1.226</td>
<td>1.273</td>
<td>36.1% Client</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-.938</td>
<td>-.934</td>
<td>-.636</td>
<td>20.7% (Contractor)</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.031</td>
<td>-.379</td>
<td>.000</td>
<td>23.6% (Consultant)</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>.969</td>
<td>1.313</td>
<td>.636</td>
<td>19.1% (Client)</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor teamwork</td>
<td>-.596</td>
<td>-.601</td>
<td>-.333</td>
<td>24.5% (Contractor)</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>-.549</td>
<td>-.613</td>
<td>-.667</td>
<td>23.7% (Consultant)</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>1.145</td>
<td>1.214</td>
<td>1.000</td>
<td>19.1% (Client)</td>
</tr>
</tbody>
</table>

**Figure 4.2:** Judgment of relationship quality attributes based on project role

The contractors, consultants, and clients important indexes for performance satisfaction; are respectively 31.2%, 31.1%, and 36.1% (see Table 4.2), which are the largest among the four attributes. This indicates that performance satisfaction is once more the most vital in the evaluation of relationship quality for these groups. Nevertheless there are some disagreements as to how the other attributes should be used in judgment of relationship quality. Clients value trust higher than the remaining two attributes with the importance index of 25.7%. But contractors and consultants mainly disagree on commitment where contractors find it with the lowest importance index of 20.7%. However for consultants the three
attributes of trust, commitment and teamwork have relatively the same importance index (see Figure 4.2).

Then the respondents are classified based on their involvement in private or public sector; a total of 36 respondents were involved in the public sector and 31 of them were working in the private sector. Moreover, 7 respondents did not specify their sector and were discarded. The summary of analysis is included in Table 4.3.

**Table 4.3: Utility estimates and importance indexes (by sectors)**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
<th>Utility</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Public</td>
<td>Private</td>
</tr>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-1.000</td>
<td>-.563</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.667</td>
<td>.394</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>.333</td>
<td>.168</td>
</tr>
<tr>
<td>Performance</td>
<td>No satisfaction</td>
<td>.333</td>
<td>-1.778</td>
</tr>
<tr>
<td>satisfaction</td>
<td>Fairly satisfied</td>
<td>-1.667</td>
<td>.835</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>1.333</td>
<td>.943</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-1.000</td>
<td>-1.079</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.667</td>
<td>.018</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>1.667</td>
<td>1.061</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor teamwork</td>
<td>-2.333</td>
<td>-.584</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>.333</td>
<td>-.487</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>2.000</td>
<td>1.072</td>
</tr>
</tbody>
</table>

**Figure 4.3:** Judgment of relationship quality attributes based on sector

The major difference in judgement between the public and private sector practitioners was over commitment; where the public sector participants associated a lower importance index of 20.2% in comparison with 22.7% of the private sector (see Table 4.3). The private sector has a more even approach in their judgment model of relationships and only
performance satisfaction had a significantly larger importance index compared to other attributes (see Figure 4.3).

### Table 4.4: Utility estimates and importance indexes (by industry experience)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
<th>Utilities 5-10 years</th>
<th>Utilities 10-20 years</th>
<th>Utilities &gt;20 years</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-1.053</td>
<td>-.733</td>
<td>-.504</td>
<td>26.8% (5-10 years)</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.338</td>
<td>.547</td>
<td>.111</td>
<td>19.6% (10-20 years)</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>.715</td>
<td>.187</td>
<td>.393</td>
<td>23.4% (&gt;20 years)</td>
</tr>
<tr>
<td>Performance satisfaction</td>
<td>No satisfaction</td>
<td>-1.763</td>
<td>-1.987</td>
<td>-1.645</td>
<td>31.8% (5-10 years)</td>
</tr>
<tr>
<td></td>
<td>Fairly satisfied</td>
<td>.773</td>
<td>.813</td>
<td>.483</td>
<td>34.5% (10-20 years)</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>.990</td>
<td>1.173</td>
<td>1.162</td>
<td>29.5% (&gt;20 years)</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-.778</td>
<td>-.800</td>
<td>-1.081</td>
<td>20.6% (5-10 years)</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.053</td>
<td>-.320</td>
<td>-.081</td>
<td>22.1% (10-20 years)</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>.831</td>
<td>1.120</td>
<td>1.162</td>
<td>21.8% (&gt;20 years)</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor teamwork</td>
<td>-.444</td>
<td>-.480</td>
<td>-.735</td>
<td>20.8% (5-10 years)</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>-.531</td>
<td>-.720</td>
<td>-.517</td>
<td>23.7% (10-20 years)</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>.976</td>
<td>1.200</td>
<td>1.252</td>
<td>25.3% (&gt;20 years)</td>
</tr>
</tbody>
</table>

![Figure 4.4: Judgment of relationship quality attributes based on experience level](image)

The respondents were also classified based on their levels of experience. For 23 respondents the level of experience was between 5-10 years; 25 respondents had around 10 to 20 years’ experience, and finally 26 respondents held more than 20 years of experience in
4 | Relationship Quality among Construction Professionals

collection activities and projects. 17 respondents were discarded due to inappropriate answers and missing values. The summary analysis is included in Table 4.4.

For different levels of experience performance satisfaction is also the most influential attribute in judgment of relationship quality. Performance satisfaction has received the highest importance index of 31.8%, 34.5%, and 29.5% respectively from respondent groups of 5-10 years, 10-20 years and more than 20 years’ experience (see Table 4.4). However the trend of judgment significantly changes with different levels of experience among the other three attributes (see Figure 4.4). Industry participants with 5-10 year experience generally value trust as the second influential attribute and an importance index of 26.8%. But when experience level increases the importance index of trust in judging relationships falls substantially to 19.6% making it the least influential attribute for respondents of 10-20 years of experience (see Table 4.4 and Figure 4.4). On the other hand the value of teamwork increases significantly with the increase in experience. The most experience practitioners with more than 20 year of experience have a more balanced view towards these attributes and less variation in importance indexes is observed (see Figure 4.4).

Table 4.5: Utility estimates and importance indexes by the type of work performed

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
<th>Residential</th>
<th>Utility</th>
<th>Commercial</th>
<th>Civil</th>
<th>Importance index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>There is no trust indication</td>
<td>-.765</td>
<td>-.698</td>
<td>-.698</td>
<td>-.578</td>
<td>22.8% (Residential)</td>
</tr>
<tr>
<td></td>
<td>Fairly trustworthy</td>
<td>.235</td>
<td>.302</td>
<td>.302</td>
<td>.456</td>
<td>22.4% (Commercial)</td>
</tr>
<tr>
<td></td>
<td>Extremely trustworthy</td>
<td>.530</td>
<td>.396</td>
<td>.396</td>
<td>.122</td>
<td>19.1% (Civil)</td>
</tr>
<tr>
<td>Performance</td>
<td>No satisfaction</td>
<td>-1.917</td>
<td>-1.912</td>
<td>-1.912</td>
<td>-1.953</td>
<td>32.7% (Residential)</td>
</tr>
<tr>
<td>satisfaction</td>
<td>Fairly satisfied</td>
<td>.521</td>
<td>.687</td>
<td>.687</td>
<td>.622</td>
<td>34.6% (Industrial)</td>
</tr>
<tr>
<td></td>
<td>Extremely satisfied</td>
<td>1.397</td>
<td>1.225</td>
<td>1.225</td>
<td>1.331</td>
<td>32.2% (Commercial)</td>
</tr>
<tr>
<td>Commitment</td>
<td>Not committed</td>
<td>-.803</td>
<td>-.860</td>
<td>-.860</td>
<td>-.903</td>
<td>22.0% (Residential)</td>
</tr>
<tr>
<td></td>
<td>Fairly Committed</td>
<td>-.260</td>
<td>-.177</td>
<td>-.177</td>
<td>-.194</td>
<td>22.4% (Industrial)</td>
</tr>
<tr>
<td></td>
<td>Extremely committed</td>
<td>1.063</td>
<td>1.037</td>
<td>1.037</td>
<td>1.097</td>
<td>22.3% (Commercial)</td>
</tr>
<tr>
<td></td>
<td>committed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23.2% (Civil)</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Poor team work</td>
<td>-.508</td>
<td>-.510</td>
<td>-.510</td>
<td>-.544</td>
<td>22.6% (Residential)</td>
</tr>
<tr>
<td></td>
<td>Moderate teamwork</td>
<td>-.717</td>
<td>-.587</td>
<td>-.587</td>
<td>-.603</td>
<td>23.5% (Industrial)</td>
</tr>
<tr>
<td></td>
<td>Great teamwork</td>
<td>1.225</td>
<td>1.097</td>
<td>1.097</td>
<td>1.147</td>
<td>23.1% (Commercial)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22.8% (Civil)</td>
</tr>
</tbody>
</table>
Finally the respondents were classified based on the type of work they performed. Overall 35 out 74 respondents indicated that they had worked in residential construction; 30 respondents had worked on industrial projects, 39 respondents on commercial and 40 were involved in civil engineering construction. By examining utility estimates and importance indexes very small variances are observed in the judgment trends associated with these groups as demonstrated in Table 4.5 and Figure 4.5.

### 4.5 Correspondence Analysis and Discussion

Although some indications are made by performing conjoint analysis but a graphic perceptual map generated through correspondence analysis can be very useful in demonstrating similarities and differences of judgment model; they can embolden the slightest of differences in judgment. Within the perceptual map regions of high density show the ideal points and preference tendencies of respondents.

An initial cluster analysis is performed based on high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity of the profile ranking scores completed by respondents (Hair, 2010). Hierarchical clustering procedure is used with the average linkage method of between group clustering. This works best with the square Euclidean distance measure, and has become a popular and well established method of
clustering (Malhotra, 2010). Naudé and Buttle (2000) adopted similar approach for clustering of relationship quality rank ordering in business context. According to the dendrogram and agglomeration schedule generated via cluster analysis a four cluster solution is identified (see Table 4.6). The clusters are radically different in terms of the importance indexes associated to relationship quality attributes. Cluster 1 includes 26 members with relatively stronger focus on teamwork and commitment and respective importance indexes of 27.4% and 31%. Cluster 2 containing 15 members has huge emphasis on trust with importance index of 50%, while cluster 3 is the largest with 32 members and focuses on performance satisfaction with an importance index of 48%. Finally cluster 4 with one member is totally different in judgment to the other clusters.

**Table 4.6: Clustering of the importance index generated in conjoint analysis**

<table>
<thead>
<tr>
<th>Cluster members</th>
<th>Trust</th>
<th>Performance satisfaction</th>
<th>Commitment</th>
<th>Teamwork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>26</td>
<td>19.3%</td>
<td>22.4%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>15</td>
<td>50.0%</td>
<td>14.6%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Cluster 3</td>
<td>32</td>
<td>14.3%</td>
<td>48%</td>
<td>18.5%</td>
</tr>
<tr>
<td>Cluster 4</td>
<td>1</td>
<td>7.4%</td>
<td>18.5%</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

In the analysis, clusters are always found regardless of the correspondence, strength of similarity, or relationship. Therefore conceptual backing or more explanatory power is desirable (Hair, 2010). Correspondence analysis is performed to provide this extra explanatory power by visualizing the underlying hidden structure of the data matrix in the form of a perceptual map. Similarity of judgment among different respondent are calculated and mapped. In correspondence analysis the actual distance is transformed to a pseudo distance which is broken down to distances in R dimensions and errors (Janssens et al., 2008). In this analysis the association between objects are converted into pseudo distance through a transformation function; then the difference between the distance in the solution and pseudo distance is minimised through the analysis of errors. The degree of success in this procedure is called “fit” of the solution. The procedure is illustrated by Equation 4.1:
\[ A^t = T = D + E \quad \text{(Equation 4.1)} \]

Where \( A \) is the association between the objects; in this case the respondents judgment of the four relationship quality attributes; \( t \) is the transformation function; \( T \) is transformed associations or “pseudo distance” between the respondents judgment; \( D \) is the objects in the R-dimensional space or distance in the solution, and finally \( E \) is the error which is the difference between the pseudo distance and the distance in the solution.

All the importance indexes generated through conjoint analysis are subjected to correspondence analysis. This allows for composing a contingency matrix of 74 rows representing the number of respondents and also 4 columns representing the relationship quality attributes. Correspondence analysis with the input of this two-way, two-mode data matrix identifies a common space for both the respondents and also attributes (Janssens et al., 2008). As a result a perceptual map is presented which maps all the respondents based on their judgment and their proximity to the original relationship quality attributes of trust, performance satisfaction, commitment and teamwork. The contingency matrix with 74 rows is inputted to SPSS and is restructured according to Equation 4.1 using a transformation function. Accordingly standard form of correspondence analysis with Chi-square distance is performed on the restructured data set. Symmetrical normalization is adopted since the study tries to compare the respondents (rows) and the relationship quality attributes (columns) of the contingency matrix and not just the respondents (rows) or attributes (column) within themselves. The correspondence analysis generates the perceptual map of respondents and relationship quality attributes; demonstrated in Figure 4.6.

The visualization is in line with the performed cluster analysis and confirms the four cluster solution. For example respondents 8, 68 and 72 are displayed to be very similar by their distance, which is completely in line with the agglomeration matrix and dendrogram obtained through cluster analysis. On the other hand respondent 52 of cluster 1 seems very
close to respondents 2, 21, 37, 6 and 18 of cluster 3; also respondent 71 of cluster 3 is
demonstrated close to respondents 16, 7, 41, and 54 of cluster 2 (see Figure 4.6). However
they are not in the same cluster; this is due to the fact that the dimensions shown in Figure 4.6
cannot explain all the variations within the respondent’s judgment.

![Perceptual map of respondents and relationship quality attributes](image)

**Figure 4.6:** Perceptual map of respondents and relationship quality attributes

The question is that how good is a two dimension map for total variations of
respondent judgement. In a contingency matrix with 74 active rows as respondents and 4
columns as relationship quality attributes all the variation could be presented with three
dimensions based on the $[\text{Min (74 rows, 4 columns)} - 1]$ rule (Hair, 2010; Janssens et al.,
2008; Malhotra, 2010). The two dimensions shown in the Figure 4.6 explain the largest
portions of variation which totally account for 80%. The third axis could be emplaced to
represent the third dimension and the other 20% of the variation. As a result a 3D representation would be the best way to present the data however the two dimensional representation will also provide sufficient descriptive power.

As shown in Figure 4.6, the result of the correspondence analysis demonstrates that respondents associated with the Cluster 1 use both commitment and teamwork to judge relationship quality, they are approximately within comparable distances with trust and performance satisfaction. Respondents associated with cluster 2 are identified by trust as the dominant factor in their judgment of relationship quality. It is observed that a larger and denser cluster 3 focuses on performance satisfaction as the basis of their judgement. An isolated respondent which is completely different in judgement with respondents associated to the other three clusters is also identified, and is accordingly placed in a separate cluster. It is perceived that the density of points associated with the respondent judgement around performance satisfaction and towards the top right side of the figure is high. This could visually suggest that respondents try to judge relationship quality based on the tangible attributes such as performance. Apart from this visual examination, each point is individually checked for their contribution to the inertia of each dimension. The points associated to the respondents should have a natural weight of $1/74 = 0.014$ and the points corresponding to the attributes should have a natural weight of $\frac{1}{4} = 0.25$. If the point contribution is higher than the natural threshold, they play a more important role in the interpretation of the dimension axis. This information is important in both analysing the orientation of each dimension axis and also determining the stability of the solution. Since the respondents are analysed based on their ranks of relationship quality profiles not much analytical information is obtained via examining their contribution to the two dimensions. However through examining the contribution of each attribute to the dimensions identified more of the characteristics associated to each dimension is revealed.
To make the analysis more clear, a contingency matrix is structured which included the respondent’s industry groups and their importance indexes generated by conjoint analysis (see Table 4.7). Furthermore, the four identified clusters based on respondent’s judgment trends are added to deliver mean of comparison with the industry groups; the points associated to these cluster in the perceptual map are referred to as supplementary points in the analysis (Hair, 2010; Janssens et al., 2008).

Similarly the contingency matrix of Table 4.7 is restructured and correspondence analysis is performed by SPSS. Based on the analysis, a perceptual map is generated (Figure 4.7 refers). The identified clusters of 1 to 4 are situated in greater distances from each other on the map illustrating huge difference of judgment between these clusters. Although distinct and diverse judgment models within industry groups are exhibited, there is not as much distinction and diversity among groups as industry factions compared to the original four clusters (see Figure 4.7).
Figure 4.7: Perceptual map of industry groups and relationship quality attributes

Figure 4.8: Perceptual map of industry groups without identified clusters
It can be seen that differences in opinion and judgment towards relationship quality is less obvious between the industry groups and it is more or less related with individual experiences or perhaps other underlying dimensions which needs to be explored. However there are notable distinctions to be investigated, therefore in Figure 4.8 another perceptual map is generated without the inclusion of the four identified clusters.

Based on the distance between the mapped industry groups and the relationship quality attributes; a judgment pattern can be assumed. As shown in Figure 4.6, it was noticed that a majority of respondents have the tendency to adopt more tangible attributes such as performance satisfaction to judge their relationship quality with other contracting parties. This has also been demonstrated by the importance indexes performed in conjoint analysis (see Table 4.1 to 4.5). From the objective correspondence analysis, two distinct dimensions have been observed and accordingly by corresponding and assessing industry groups more can be explained. For instance, according to Figure 4.8 respondents with 5 to 10 years’ experience have a more idealistic approach and relay more on trust in their judgment of relationships, this may be due to the fact that they are younger and more energetic practitioners willing to go all the way and apply maximum effort in order to create their reputation and future career opportunities. Interestingly practitioners with 10 to 20 years’ experience are more performance oriented in their judgments as they understand the fact that trust is an on-going endeavour in need of constant attention and care which is difficult to measure or evaluate. Therefore they go for the more tangible and measurable attributes which is more or less in the control of the parties involved.

Clients are concerned with trust and performance satisfaction because they are the most demanding party involved in construction. Clients have a sense of ownership and sponsorship; and accordingly they expect maximum effort with clear and tangible outcomes. Consultants and engineers have a tendency to assess their relationships based on
communication and teamwork; because they are generally people in charge of design implementation, and supervision; they also function as connections and representatives to the owners or clients. The public sector has a tendency towards more tangible attributes because they need to clearly evaluate the outcome of public spending. Therefore they are more performance oriented whereas the private sector has a more indifferent view towards the other three attributes. Managers have a well-adjusted view and associate relatively similar importance to all relationship quality attributes. Civil and industrial projects participants relate to performance satisfaction and communication as their main judgment criteria whereas residential and commercial projects participants base their judgments on communication, teamwork and performance satisfaction. Contractors and practitioners with over 20 years’ experience judge relationship quality based on teamwork, communication and trust and less correspondence is observed with performance satisfaction (see Figure 4.8).

Based on the observation of all the points representing industry groups and relationship quality attributes in Figure 4.8; the two dimensions can be renamed as effort of achievement and tangibility. The examination of the contributing inertia of each mapped point in Figure 4.8 will allow an objective interpretation of the produced figure. It is observed that around 93% of the variation is explained by the two dimensions illustrated in Figure 4.8. From reviewing the contribution of relationship quality attributes to these dimensions, it is observed that trust contributes significantly with 63% to the total inertia of dimension 1. Achieving trust requires a lot of build-up work and constant monitoring and cannot be enforced; it is not a short term gain and is a long term and on-going process. Therefore dimension 1 is renamed as effort of achievement since a lot of effort is required to maintain a level of trust in any relationship. In addition to have teamwork which is the second contributing attribute to the inertia of this dimension with 21%; considerable effort is also required. The other two attributes of commitment, and performance satisfaction’s
contribution is respectively at 16% and 0.2% to the total inertia of dimension 1. Conversely performance satisfaction contributes a significant 63% to dimension 2. Therefore dimension 2 is renamed as tangibility since the most tangible, and easy to assess factor in relationship quality is performance satisfaction. Performance can be evaluated based on tangible indicators of time cost and quality. Teamwork is also the second contributing attribute to dimension 2 with 22%; teamwork has tangible and observable elements as well, since it can be defined through how work is performed by the team. Trust and commitment each respectively contribute 14% and 0.1% to the inertia of dimension 2. What is certain is that contribution of performance satisfaction to dimension 1 is zero, while its contribution to dimension two is extremely high; suggesting that there is much distinction between the two dimensions, moreover the same is observed for trust.

4.6 Chapter Summary

As part of advocating the relational approaches, additional insight is required into understanding how contracting parties and industry groups value and judge their relationship quality with others. Trust, performance satisfaction, commitment, and teamwork have been associated with relationship quality and other relational approaches. This paper explains how different industry groups judge relationship quality using these attributes.

Through conjoint analysis utility estimates and importance index for the attributes are calculated. By applying cluster analysis it is understood that there are three main clusters representing fundamentally different judgement trends of the respondents. The respondent’s within the first cluster makes decisions regarding relationship quality based on teamwork and the commitment of the other party. The respondents of the second cluster base their judgment on how much they can trust others. The third cluster is the largest and respondents associated to it focus on performance satisfaction for making decisions about relationship quality. Therefore the judgement of relationship quality in construction is not unanimous and
different perceptions exist. It is imperative to evaluate and compare the judgment and perception of different industry groups. The importance index generated by conjoint analysis demonstrates that different industry groups exhibit different patterns of judgment towards relationship quality. With the aid of correspondence analysis, a visual perceptual map is generated to provide more explanatory awareness. Two different perceptual maps are generated first by involving all respondents and secondly by involving grouped respondents with relationship quality attributes.

The visual perceptual map includes two dimensions which can explain most of the variations in how respondents and associated groups correspond with relationship quality attributes. The two dimensions suggest an underlying foundation for classifying the judgement models of respondents and industry groups. After a rigorous assessment, dimension one is renamed effort of achievement since around 85% of its variation is explained by trust and teamwork. These attributes require a huge amount of efforts to be achieved and maintained. The second dimension is named tangibility and is explained mainly by performance satisfaction which is responsible for 63% of its variation.

The judgment models associated with different groups can now be associated with the new identified dimensions. This classification and visual analysis of industry groups can provide practical industry implication. For instance it is observed that clients are the most demanding group in relationship judgement. They demand both maximum effort and also tangible results when judging their relationships with others. Younger less experience industry participants are more effort driven and use maximum trust in judging relationships. On the other hand practitioners working on large-scale projects such as civil engineering and industrial tend to judge relationship quality with tangible attributes. Managers however associate similar and more equal values to each attribute. This knowledge of different judgment models associated with industry groups can be combined with the knowledge
associated to the nature of each attribute and further provide practical managerial suggestions. For instance if it is known that one party values trust and teamwork over the other attributes in evaluating relationship quality, specific strategies which can strengthen these attributes could be applied to satisfy the relational needs of the party in a more effective and efficient manner.
Chapter 5
Common Causes of Conflict and Dispute in Construction Relationships

The current chapter is based on the following article:


5.1 Introduction

In construction projects a working relationship is formed by signing a contract therefore the parties are officially bound to work with each other. It was acknowledged in Chapter 2 that most construction relationships are governed by contracts. Even continuums of contracting methodologies and relational contracting has been developed in order to procure for a more relational environment (MacNeil, 1974; Sako, 1992). These contracts have clauses and settings to assign responsibility, accountability and liability for different contracting parties. They are also equipped with problem solving mechanisms such as conflict management and dispute resolution procedures. Because like any working arrangement, a certain amount of conflict exists in construction working relationships, and the fact that conflict is inevitable and destructive if not controlled in these relationships (Cheung and Yiu, 2006). Despite other existing matters conflict can develop into disputes; and this process is to influence the professional and personal relationships within construction projects (Kumaraswamy, 1997b).
This fragmented and adversarial environment plagued with conflict and dispute is a warning sign to the construction sector. The whole causality and handling process of conflict and dispute constantly may affect the relationship quality among the parties involved (Jelodar and Yiu, 2012b). To analyse a conflict event, its whole cause-effect process on different project features and outcome should be considered and evaluated. On the other hand as demonstrated in Chapter 2 the industry is aware of the value offered by functional and good quality working relationships therefore is pushing for further advancement in relational practices (Kumaraswamy et al., 2005b; Yeung et al., 2009). If the preservation of existing relationships is performed appropriately it will produce value in terms of quality, time and even cost implications of projects (Ling et al., 2014).

In the second chapter it was proposed that through the concept of relationship quality a measure of evaluation could be created for construction relationships which could be effective in preserving relationships and contractual bonds (Jelodar et al., 2015b; Jelodar and Yiu, 2012a). The measure has been conceptualised in relational marketing context and the benefits of it has been realised (Crosby et al., 1990; Toms, 2004). In addition it is believed that certain attributes and strategies if implemented correctly may enhance relationship quality. However the investigation in Chapter 2 aimed to identify the nature of relationship quality and was performed regardless of the procurement type and contractual settings. But as mentioned most construction relationships are under the influence of contracts and they are constantly affected by conflict and dispute events. In addition the effect of conflict as the instigator of further disputes should be studied in a relationship management context. Since the contracting parties are bound by the contract and it also governs the resolution process the effect of the contract is also imperative. The current chapter aims to identify the general causes of conflict and their implications on relationship in construction contractual setting. For this purpose a three-stage approach is designed. A comprehensive literature search
followed by the review of litigation cases in New Zealand during the past five years is performed to identify the common causes of conflict and dispute. Finally interviews with dispute resolution and construction experts are conducted to examine the variation of relationship quality during conflict. It is observed that three sources of project uncertainties, contract and processes and people and behaviour host the common causes of conflict and dispute. However dispute triggers are different from the causes which created the conflict at the beginning. It is also acknowledged that three factors contract provision; evidence and reasoning are required for successful claim handling and dispute prevention or escalation.

5.2 Engagement of Common Sources of Conflict and Dispute in Construction Relations

Conflicts have been classified as differences in interests, perception method and values which are quite common in human activities. Conflicts are seen to be inevitable and a certain level of it exists in almost all relationships (Rhys Jones, 1994). However conflict can escalate into adversarial events which could have disastrous consequences, and ultimately if not managed properly will result into disputes. The Institution of Civil Engineers Arbitration Procedure defines dispute as where a claim or assertion made by one party is rejected by the other party and that rejection is not accepted (Brown and Marriott, 1993; Kumaraswamy, 1998). Dispute is a state which conflict escalates and its resolution is often sought through a third party intervention. Therefore certain events which cause conflict escalation and result in dispute could be considered as dispute triggers. In any relationship problems generally evolves through a chain of events from minor differences to conflicts and ultimately huge full scale disputes. The processes of conflict management and dispute resolution are a combination of formal and informal approaches; some of which are anticipated and foreseen in contractual procedures and some are not. Thus manifested conflict and dispute may originate from the same common sources; they are the outward behaviour exhibited by
individuals, which is perceived to affect the relationship quality of contracting parties (Jelodar et al., 2015b).

By nature these sources can lead to functional or dysfunctional conflict, therefore managing conflict in both forms is of extreme importance and can support the development of sustainable long term relationships (Toms, 2004). Claims are not always considered as negative in construction, some of them are thought to be even necessary for better evolution of design and construction processes. Hence shifting conflict to conceptual design and early phases of the construction is thought to be beneficial which can contribute to a better well-structured design and conceptualization of work procedures (Kumaraswamy, 1997b). This suggests that the timing of conflict and the manifestation of conflict triggers is extremely important to the relationship outcome. Bristow & Vasilopoulos (1995) stated ignoring or delaying the resolution of conflicts can have serious implications and lead to dispute triggers. Disputes trigger sparks of irrationality and sometimes high emotional state between the contracting parties which may negatively influence their working relationships (Harmon, 2001). In line with the current perception Cheung, et al. (2004) state that If a dispute is not resolved promptly, then it may escalate, and ultimately require litigation proceedings, which can be extremely costly for the parties concerned (love et al., 2011). On the other hand good handling of conflict can change the outcomes where relationships are concerned. This conceptualisation can portray simple implications of conflict and dispute events on construction relationships, demonstrating dependency of relationship on the timing, nature and handling of conflict and dispute events. Handling and management of conflict and dispute events involve a wide spectrum of actions and measures ranging from simple direct negotiations to mediation, arbitration, litigation, etc…, all of these approaches have certain and distinct effects on the outcomes of the projects and the on-going and future relationship quality of the contracting parties.
5.3 The Need to Explore Relationship Quality in a Conflict and Dispute Manifestation

Relationship quality in construction projects can be introduced as a systematic high order construct to deliver an assessment tool for the status of relationships in construction activities (Jelodar et al., 2015b). For this purpose a framework was suggested defining the notion relationship quality. In the previous section it was discussed that conflict and dispute can be systematically related to construction relationships; in addition their causes and management style were also considered as determinants of relationship quality in the systematic outlook (Jelodar et al., 2013c). In a systematic cycle conflict will cause relationship deterioration and poor quality relationships could be the source of further potential dispute. Therefore conflict, dispute and relationship quality could be acknowledged as cyclic concepts which can trigger one another systematically (Jelodar and Yiu, 2012b).

Based on this systematic view a monitoring tool was suggested by Jelodar and Yiu (2012a), which entails a timeline of simple causes that trigger conflict and dispute in construction. It is vital to understand the nature of these causes which can negatively influence the relationship quality and ultimately serve as an obstacle to sustainability of construction relationships. In Chapter 2 construction relationship quality was defined by the attributes of trust, satisfaction performance satisfaction, commitment and teamwork. Seemingly the emergence of conflict and dispute may have direct effects on the outcome of projects for instance performance. In addition attributes which may go beyond the project life cycle such as trust, satisfaction and also commitment of the parties involved may also be affected. Ultimately the effected attributes will define the changes of relationship quality between contractual parties (Cheung and Yiu, 2006; Jelodar and Yiu, 2012a; Love et al., 2011; Yiu and Cheung, 2004).

There are different approaches and perspectives for investigating conflict and dispute in construction, these approaches concern a variety of factors ranging from commencement
and trigger events to outcomes, handling, management and conceptual organization styles (Cheung and Yiu, 2006; Mallen, 1963; Toms, 2004). Although the handling and management of conflict and dispute is highly important and extremely influential to the outcome of sustaining relationships, they should only be investigated in full cognition of conflict and dispute events, their nature, and most importantly their causes. One of the early steps in this path may be the identification and classifications of simple causes which can directly or indirectly provoke conflict or dispute and influence the relationship quality. Many studies have been undertaken to identify causes of conflict and dispute, very few studies have actually tried to provide a dominant classifications of causes which may influence the relationships in construction projects.

The conflict and dispute resolution processes as part of overall problem solving strategy will also impact the relationship quality. In fact methods such as litigation; being the most hostile and formal method of dispute resolution, will most probably result in relationships decline (Fulbright and Jaworski, 2006; Mitkus and Mitkus, 2014). However litigation is always the last resort if other methods are non-effective (Ministry of Justice New Zealand, 2014). Hence the study of litigation and court cases can be invaluable to understanding the nature of construction relationships. The court proceedings and decisions will also provide a history of the problem which is useful for the purpose of this study and perhaps provides an evaluation of how relationships evolved during the conflict and dispute process. The current research intends to investigate the common causes of conflict and dispute through litigation cases publically available. The causes will be associated with broader and sources would be extensively studied to determine their interaction with the relationship quality of contracting parties.
5.4 Methodology

A three-stage approach was designed to achieve the objectives of this study. The approach was primarily based on pinpointing the theoretical foundations for the systematic engagement of causes and sources of conflict and dispute. Then the actual practices implemented are observed to provide an assessment of relationship quality during dispute events. The data used in this study was collected as part of a larger investigation with the theme of construction relationship quality. The three-stages approach will provide a chance for methodological triangulation since data is collected by more than one method (Eriksson et al., 2009). Each methodology stage is outlined as follows:

**Stage 1 exploring previous literature:** in this stage relevant articles and research work with the theme of conflict and dispute are identified. Accordingly a pool of possible causes and classification strategies are driven. Ultimately the general classifications are compounded into one final classification. A final causes-sources classification is suggested for conflict and disputes in construction.

**Stage 2 review of court cases:** Publically available court proceedings and decisions are identified and acquired. With a preliminary review a technique to extract appropriate data is created. Accordingly information such as the potential causes, number of causes, claim nature, entitlement and dispute triggers are extracted based on court decisions. The results are classified and disseminated via graphs and amalgamated with the previous literature review section to determine the causes-sources construct of construction conflict and dispute. This stage allows for hard evidence to be elicited and incorporated in the study.

**Stage 3 expert interviews:** at this stage, two-phase interviews are conducted to gain insight on how sources of disputes will affect relationship quality in construction practice. In the first phase conflict management and dispute resolution experts are interviewed to attain a foundation of information and practices. In the second phase actual construction experts are
interviewed to acquire their feedback on the issue. Ultimately through content analysis a simple framework is developed and demonstrated for practical interaction of dispute source with relationship quality. Expert opinion is gathered and classified to solicit the phenomenon in question and explain how relationships are affect by dispute events.

5.5 Stage 1: Exploring Previous Literature

It is very important to identify and explore the nature of the common causes and triggers of conflict and dispute, especial since the full awareness and realization of a conflict incident may be achieved in later stages of the project where a lot of resources and money has been spent. But the causes corresponding to these incident may be associated to the early stages of the project (Gardiner and Simmons, 1998). Detection and categorizing the causes will also enable the identification of avoidable causes of claims moreover assisting the mitigation of dispute; reducing the time and cost needed for correction (Kumaraswamy, 1997b). The causes of conflict and dispute have been assessed by a number of researchers each giving different classifications, however a close look at their classification will bring patterns of similarities and shared concepts to light. A lot of studies have considered disputes as the consequence of unresolved conflicts and claims, therefore these research works have suggested that the conflicts, claims and disputes arise from common sources (Diekmann and Nelson, 1985; Heath et al., 1994; Hewitt et al., 1991; Kumaraswamy, 1997a; Semple et al., 1994b; Watts and Scrivener, 1993).

Diekmann & Nelson (1985) believe that the cause of contract claims are design error or change related. Design related issues lead to incomplete contract documentation and changes are associated with uncertainties. They also mentioned differing site conditions; weather; and strikes as other sources which are all characterized as project uncertainties. In the work performed by Hewitt (1991) and Watts and Scrivener (1993) variations; change of scope; negligence in tort and delays; including damages; disruption; acceleration; and
termination were considered as the main causes of claims, while payment and time extensions have been considered as claim types and dispute sources. Nevertheless these are thought to be secondary to the main and initial causes of claims which are variations and unexpected problems or design and process matters (Conlin et al., 1996; Heath et al., 1994; Semple et al., 1994b). Different individual studies into the reasons of time and cost overruns in Australian construction projects has revealed that rework (Love, 2002), variations (Chan and Yeong, 1995; Waldron, 2006), incorrect design and incomplete documentation (Love et al., 2006; Tilley and McFallan, 2000), and late authority approvals (Waldron, 2006) are the most significant contributing factors. The result of these overruns and their corresponding causes are conflicts and disputes which could result in schedule disruption, increase in project costs and also relationship deterioration or failure (Yiu and Cheung, 2004).

The factors of uncertainty, contractual problems and opportunistic behaviour identified by Mitropoulos and Howell (2001) are similar to those recognized by Diekmann et al. (1995) which consider project, processes and people related issues as the main sources of conflict and ultimately dispute. Additionally Yousefi (2009) has classified the dispute causes into contractual causes, organizational causes and technical causes, but Mitropoulos and Howell(2001) and Diekmann et al.(1995) suggested a broad classification of conflict and dispute causes which is more comprehensive; accordingly most of the significant causes and sources will fall within the range of three main classes. Love et al. (2010) also stated that …“scope changes that arise from the innate uncertainty that exists within the project management system (e.g. scope changes, design errors, site conditions), poor contract documentation that arise from the organizational system (e.g. inadequate/incomplete design information, ambiguities in contract documents), and behavioural adaptations of individuals within the people system (e.g. poor communication, poor management, skill and experience,
and personality traits) are key causal factors contributing to dispute”. The above mentioned classes are elaborated as follows:

*Project uncertainty:* are the general causes of change beyond the expectation of the parties involved in construction projects (CII, 1995b; Diekmann and Nelson, 1985). Williamson (1979) also has regarded uncertainty as one of the main contributing factors to contractual problems and disputes. Yate (1998) considered inclement weather conditions and Waldron (Waldron, 2006) viewed site conditions and availability of resources associated with different levels of uncertainty and possible causes of disputes.

*Contract and process,* which includes imperfect contracts and unrealistic performance expectations, this could also encompass design errors which can lead to complexity, ambiguities, and malfunctions in documentations and processes. Due to extensive, elongated and complex documentation of construction contracts disagreements or dispute seems highly likely within contracting obligations and expectations. In addition when a contracting party’s perception is that the other party is not meeting contractual obligations or expectations they will claim for their losses in terms of time and cost which may also trigger disputes (Semple *et al.*, 1994b). Yate (1998) pinpointed that the main types of construction dispute arise from the contract documents. Totterdill (1991) perceives that technical, legal, and managerial dispute issues must have a contractual reference. It is believed that bounded rationality or contract incompleteness will assist opportunistic behaviour which can develop into dispute (Williamson, 1975).

*People and behaviour;* are generally due to poor communication, poor interpersonal skills, opportunistic behaviour and cognitive dissonance. Bristow and Vasilopoulos (1995) and Sykes (1996) have also emphasised concern over personality issues and advised that disputes are due to unrealistic expectations, lack of team spirit and misunderstandings.
Other management literature and theories also strengthen the same perception. Williamson’s (1979) framework of market failure about the combination of “environmental” and “behavioural” factors and their association with contractual problems was elaborated and applied in construction by (Mitropoulos and Howell, 2001). This visualisation and connection of such framework with construction is relatively straightforward and understandable. Construction projects are normally associated with high levels of uncertainty and complexity which makes it almost impossible to foresee every contingency (bounded rationality). Consequently problems that are not clearly conditioned in the contract may ascend (contractual problems). After a construction project begins, the ability to change to other contractual parties is very limited and highly unlikely (small numbers), this limitation and inability to change the contracting party’s may trigger opportunistic behaviours from one party taking advantage of the other party’s limitations. Therefore it can be said that the combination of project uncertainty, contractual problems and opportunistic behaviour can cause problems and disputes in construction projects and activities (Mitropoulos and Howell, 2001).

5.6 Stage 2: Review of Court Cases

The primary source of data for this stage of the research was extracted from the publically available information and court decisions accessible at the Building Dispute Tribunal (Building Dispute Tribunal, 2014) and also Dispute Tribunal of the Ministry of Justice (Ministry of Justice New Zealand, 2014). Under the Official Information Act 1982 and based on a formal request to the ministry of justice New Zealand; information relating to the construction dispute cases in the high court was obtained. A total of 123 construction court cases were identified through the period of 2009 to 2014; after an initial investigation 22 of the court decisions were removed due to insufficient information. Consequently 101 court decisions were acceptable for the current research. Litigation cases were chosen firstly
because official documentation of these cases exists which are publicly available and secondly serious causes of conflict and dispute which can have adverse effects on relationship quality can be identified. All the decisions were based on formal claims with different sources and causes, thus a framework is established to explore the necessary information based on the claim and the court judgment process. This data extracting framework basically involves the following steps:

- Information such as claim amount, dates, parties in dispute are recorded as demographic information
- An order of events and timeline for each case and judgment process is established (see Figure 5.1)
- Triggering event, potential causes and also sources of dispute are documented
- Detail on the potential causes are obtained through analysis of the Judges opinions
- Information is categorised and documented according to the timeline of the case

Figure 5.1: Timeline of information extracted

Figure 5.1 demonstrates the timeline order used in the current study. It should be noted that the causes and reasons which lead to the need for a claim can be called entitlement issues (Dickmann and Nelson, 1985). Thus every claim category could be defined an entitlement issues for resolved conflicts. Every claim application has a basis (causes and
effects), contractual and legal foundation for payment (entitlement), and quantified damages (Semple et al., 1994b).

Most of the evaluated claims within the identified court cases had multiple causes of dispute and only 30% of the total cases had only one cause for dispute. This indicates that conflict and dispute in construction activities are generally complex events in nature with multiple causes which can influence the situation through direct and systematic interactions. Figure 5.2 shows the frequency of cases with different number of potential causes.

![Figure 5.2: Court cases based on the number of causes extracted](image)

The disputant’s records were also extracted through the available public documents. Figure 5.3 demonstrates a classification of the disputants based on the claimant which filed the initial claim. In light of these 33 clients were the claimants taking the contractor to court and 28 contractors were the claimant taking the client to court. This indicates that a little over 60% of the cases were between contractors and clients; the actions were directly taken by the parties or their representatives. Construction disputes are dominated by contractor client issues were traditionally the perception is that one parties gain is the others loss. There are significant numbers of disputes which ether involve subcontractors or suppliers. A total of
13 cases were between contractors and subcontractors; 5 cases involved contractor and supplier; 1 case of client supplier; 1 case of client subcontractor; 3 cases of supplier contractor; 1 case of supplier client were respectively identified mounting to 24% of the total cases. The rest of the cases involved the council, property owners or creditors with around 14% of the total number. It is observed that approximately 85% of the disputes in litigation relate to major project participants such as clients, contractors, subcontractors and suppliers and generally happen during project execution and completion. This is a serious defect which influences working relationships and can influence the outcome of projects.

**Figure 5.3:** Frequency of disputant parties extracted for the court cases
Figure 5.4: Extracted common causes of conflict and dispute

Figure 5.4 shows all the identified potential causes within the 101 conflict cases and most problems arise from a combination of these causes. After identifying the dispute case the causes were extracted via the aforementioned framework. These causes are the common between the initial conflict and ultimately the dispute in process which was identified in the judge’s decision. As mentioned before nearly 70% of the cases had more than one cause of conflict thus the total number of causes identified in total was 206 causes within the possible 101 cases. The most popular causes were opportunistic behaviour with frequency of 25, breach of contract with 24, and contract and documentation problem with 18 times occurrence. As discussed these causes can be the result of either the humanistic nature of
conflicts or the fact that no contract is complete and perfect. Poor workmanship, variation, work delay, communication issues, financial and cash flow issue, and payment delays and problems account for 58 causes which are a significant number. These causes generally relate to the process of work, people’s mistakes and contract condition. In fact the identified 26 categories of causes (see Figure 5.4) can be all simplified and classified into broader sources for conflict and dispute.

Some of the causes are process related implying that these causes occur because of incomplete processes or the lack of experience in completion of the processes. Furthermore the associated claim is usually about an incomplete or faulty process. Work delays, variations, time limitation, scope issue, quality issues, payment delay and problems, incomplete work, design errors and damages can all be process related causes; accounting for 30% of the common causes. Cost dispute issues, contract misinterpretation, contract documentation problem and breach of contract are all directly related to contract condition and account for a little over 24% of the established causes. However processes their outcomes and deliverables are usually cautioned and seen within the contract thus the two sources of contract and processes are interwoven with each other.

Site conditions, natural disaster, technical quibbles and even availability of sufficient cash flow and resource are all uncertainty related causes. Therefore the project uncertainty creates around 9% of the disputes (see Figure 5.4). The project uncertainty related causes have the lowest frequency in courts this is maybe because there are strong provisions or contingencies such as insurance for unforeseen and uncertain events; therefore they generally do not end in dispute.

Some causes are due to human and people’s errors which can directly influence project outcomes such as third party involvement, poor workmanship, negligence and carelessness, communication issues and conflicting interests comprising more than 21% of
the total causes identified (see Figure 5.4). Behavioural problems can also be harmful especially to the working relationship and also indirectly influence the project outcomes. Identified causes such opportunistic behaviour, poor working ethics, engineer prejudice, and culture add up to 15% of the total causes. Behavioural causes have also a small share of the overall causality of dispute and this is perhaps because these causes are not structured in the contract with appropriate provisions. It is very difficult to legally conceptualize behaviour related issues and associate certain entitlements to them.

As evident a combination of different causes will probably result in conflict or dispute incidents in other words in a case of conflict and dispute it is hard to say just one factor has caused such a problem, it is most probable that dispute causes are interwoven and could not be isolated (Kumaraswamy, 1997a). Mitropoulos & Howell (2001) also advocated that there was not one overriding factor as the critical cause of the dispute, but a combination of key factors.

**Table 5.1:** Classification of the most causes identified by sources

<table>
<thead>
<tr>
<th>Sources</th>
<th>Project Uncertainties</th>
<th>Contract and Processes</th>
<th>People and Behaviour</th>
</tr>
</thead>
</table>
| Causes  | - Environmental issues and weather  
          - Site conditions; limitations; and access restrictions  
          - Technical problems due to complexity of design and construction.  
          - Availability of resources | - Delays in payments  
          - Time constraints  
          - Delays in work, possessions and site equipment  
          - Design errors, ambiguities and change orders  
          - Contract documents ambiguities  
          - Inappropriate risk sharing  
          - Quality problems | - Opportunistic and adversarial behaviour  
          - Poor communication and misunderstandings  
          - Experience with the type of work performed  
          - Lack of team spirit |

References (Construction Industry Institute, 1995b; Diekmann and Girard, 1995; Kumaraswamy, 1997a, 1997b; Mitropoulos and Howell, 2001; Waldron, 2006; Wiliamson, 1979; Yates, 1998)


3 (Bristow and Vasilopoulos, 1995; Construction Industry Institute, 1995b; Killian, 2003; Mitropoulos and Howell, 2001; Sykes, 1996; Yiu and Cheung, 2004)

Table 5.1 shows the classification of the most significant causes established based on the previous literature section and confirmed by the second stage of methodology which was
an empirical investigation in construction dispute court cases. All the causes are classified into three distinct sources; these sources are respectively known as project uncertainty, contract and process, and also people and behaviour. These are the sources which give rise to the classified causes and accordingly the combination of these causes will probably justify most conflict or dispute cases.

Figure 5.5: Frequency of dispute triggers

Although that conflict and dispute may have common causes one has to make distinctions between triggers of a conflict and future events which may trigger dispute. Delays are often causes of dispute and they are not considered as causes of conflict since they can directly cause an entitlement or claim to be launched. Figure 5.5 classifies the triggering events of dispute which were extracted through the data mining framework. These triggering events are the official legitimate justifications that why are these dispute cases pursued in litigation courts.

Nearly half (47.5%) of the reasons that disputes were resolved in court are because no response was made to payment claim and is interpreted as one party’s discontent with the
other party’s payment claim. Outstanding balance was also responsible for around 23% of the disputes in litigation. Cost dispute and cost of repair respectively contributes around 10% and 7% to the total triggers of dispute. The rest of the triggers to these litigation cases were defective construction, damages, workload more than anticipation, unclear documents, cost revaluation, and damages due to payment delay and contract termination. Therefore it can be deducted that different cause could cause conflict but it cannot be implied that the same causes will trigger disputes, in fact Claims which end in disputes have different characteristics to those who are resolved (Diekmann and Nelson, 1985).

5.7 Stage 3: Expert Interviews

After establishing the causes and triggers of conflict and dispute in construction the next step is to identify how they affect relationships among parties involved. The goal is to identify how and based on what dimensions within the contract, these causes will contribute to quality of contractual relationships. A series of qualitative interviews were performed in two phases. If there is little empirical evidence about a concept or phenomenon a qualitative approach would be the best way (Creswell, 2009).

Primarily experienced construction dispute resolution experts were identified thorough Arbitrators' and Mediators' Institute of New Zealand (AMINZ). Using the AMINZ database, we first drew a sample of dispute resolution experts which were then contacted by email and phone to seek their support for this research. A total of 11 interviews were conducted and theoretical saturation was achieved. The interviewees were a mixture of arbitrators, mediators and adjudicators which also had experience in relationship management and negotiation during conflict and dispute cases. A semi-structured interview was designed to fit the purpose of this study (Punch, 2005). This entailed primary and fundamental questions followed by clarification questions. The interviews were electronically recorded,
transcribed and accordingly content analysis was performed. The main questions asked from
the experts in the first phase are as follows:

- Please provide a classification of different types of conflict or dispute which may
  arise in construction projects?
- What are the characteristics of more harmful conflicts for the relationship quality
  of the parties involved?
- What is generally required for a conflict or dispute to be resolved in a good spirit
  of respect and collaboration; ultimately preserving trust and satisfaction in the
  relationship?

In the next phase construction professionals were approached and interviewed face-to-
face which is considered as the most reliable method of data collection (Morris, 2006). From
the publically available contacts and primary desk research and field investigations 20 highly
experiences construction professional which were generally senior managers, project
managers, engineers and quantity surveyors were contacted and identified which 10 of them
agreed to take part in the investigation. The professionals were interviewed specifically
based on their latest conflict or dispute cases handled by them. Again a semi structured
approach was used and the following questions were asked:

- Please provide a description of the conflict in process and your handling methods
  or strategies.
- Are all the elements of evidence, reasoning and contractual provisions available
  for each claim or conflict situation?
- If these conditions are not satisfied how does the potential dispute affect progress
  and affect the relationships involved?

A platform of information is built in the first phase through investigating dispute
resolution and contract management experts. The second phase is to link construction
professional’s perspective to the developed platforms and brings into light their perspective of handling construction conflict as the actual and first hand parties involved. It is acknowledged by these professional that conflicts always exist but not all of them will manifest itself into dispute. Although the dispute cases have been investigated so far there is a need to perform this stage to grasp a more comprehensive picture of conflicts and disputes.

5.7.1 Findings

There is a strong consensus among the dispute resolution experts interviewed in the first phase that when conflicts emerge to the surface and claims are launched, it is the claim process that defines the fate of the conflict; this is also outlined by Kumaraswamy (1997b). This suggests that the existence of contract provisions were entitlements are clearly stated can be helpful in construction conflict. It is believed that “strong evidence and reasoning is required to justify the entitlement to that claim”. Basically all disputes must have some sort of contractual reference for recognition (Totterdill, 1991).

As discussed in the previous section conflict and dispute sources could be project, uncertainty, contract, processes, people or behaviour related. The practitioners believe that with respect to their sources there is different ways of handling these conflicts. However all agreed that negotiation would be the first step since there is a fear of more formal approaches. In dealing with any conflict contractual provisions are the essence, but the general consent is that conflicts should not be taken to a personal level because it can be extremely harmful. Out of these sources people and behavioural related issues have more potential to escalate to more personal levels. In addition according to the conflict management expert’s; conflict arising from people and behaviour issues have a totally different repercussion and create a more controversial setting. These problems normally manifest because of opportunistic and adversarial behaviour, poor communication, misunderstandings, lack of experience with the type of work performed and lack of team spirit. These issues are very difficult to be
conceptualised and incorporated into the contract provisions thus making the claim process extremely difficult, frustrating and adversarial. Behavioural issues are extremely unstable, unpredictable and also dispute provoking specially with less reinforced contract provisions available.

Generally environmental issues, weather, site conditions, technical problems due to design complexity and availability of resources are causes associated with uncertainty. The interviewees generally believe with appropriate evidence and reasoning these causes could be negotiated and prior to the availability of contract provisions a suitable claim can be launched. However contracts normally will not cover every contingency of uncertainty which make it difficult for the plaintiff to launch the claim. Uncertainty related issues if not included in the contract are normally dealt by the measure of mutual understanding between the parties involved in construction; accordingly claims are accepted through insurance and other compensation policies.

For conflicts sourcing from contract and processes which may include issues such as delays in payments, time constraints, delays in work, design errors, ambiguities, change orders, contract documents obscurities, inappropriate risk sharing and quality problems normally some sort of contract provision exists, although every contingency may not be seen for. This is because contracts normally recognise the need for changes during the project. Hence many clauses are included to acknowledge that certain changes are contract and process related.

Although the dispute resolution experts in the first phase of the interviews regarded contract provisions necessary for any claim entitlement, the construction professionals believe too many provisions, regulations, and formalities could be problematic. In some cases due to too much complexity, too much ambiguity within contract clauses conflict and dispute
will emerge (Semple et al., 1994b). There is a belief that every provision for claim entitlement could be a potential trigger of dispute.

Both groups of interviewees believe that there is a good chance that with sufficient evidence and appropriate reasoning the claim could be successful and a greater dispute can be avoided. However contract and document ambiguities can make the interpretation of these provisions and clauses difficult causing the claims to trigger future disputes. The understanding of the contract provisions by contractual parties may be different; if there is lack of serious pre-contract audits or meetings to clear all the interpretational inconsistencies of the contract.

Because the chain of conflicts, claims and disputes does not always rise from a single source each claim must be analysed in terms of its causality and sources before any handling method or decision is applied. After generalising the interviews it is observed that in specific conflicts which the causes are not controllable; for instance weather issues, accidents, market and financial uncertainties, the responsibility and liability factor is relative to the nature of the cause. Therefore in addressing any claim or conflict due to these causes, normally a distinction between what was controllable and what was uncontrollable is made. This means there are elements and dimension of control which should be taken to account in conflict and dispute resolution. For instance in behaviour control is involved and is the result of conscious choices and actions. Parties believe that although in most of the people and behaviour related issues liability may not be well structured in the contract but these issues can be prevented and are controllable by the people in charge. So if occurred, conflict goes through a rough and personal stage which makes the treatment of it difficult and the chances of further disputes are imminent.
5.7.2 Relationship Quality in a Conflict and Dispute Incidents - Analysis of Interviews

Claims if not handled appropriately may trigger adverse dispute incidents which by all means can affect the relationship quality of the parties. A step before applying certain management tactic or strategy would probably be to identify the actual sources of conflict and the subsequent claim. This key information is required for analysing the claim entitlement via reasoning and evidence; accomplished by some sort of provision in the contract. As mentioned the claim maybe a mixture of sources identified in Table 5.1, and it is important to understand where each claim will stand in terms of its causes, formation and source structure. It can be hypothesised that each claim initially has proportions of all the three general source domains of project uncertainties, contract and processes, and people and behaviour. In addition each two sources can be compared successively and analysed to provide a better understanding of the structure of each claim. For instance a manifested claim is tested to determine if it the cause of it originates in the general source groups of project uncertainties or contract and processes as illustrated in Figure 5.6.

If the claim falls in the Figure 5.6(a) section it indicates that the dominant causes is project uncertainty related and at the same time contract and process related issues have very little impact on the formation of the claim. Subsequently a separate analysis between project uncertainties related causes and people and behaviour issues should be made. If a claim which has a weak root in the two sources of project uncertainties and contract and processes occurs, the possible cause of claim could be people and behaviour issues; this is demonstrated by the yellow area (see Figure 5.6(c)). As mentioned before provisions for behavioural issues are generally unlikely and ambiguous. Therefore the conflict may exist but conceptualising and formulating a claim entitlement becomes very difficult within the confined of construction contract. On the other hand the aforementioned causes can be extremely problematic since they can escalate into a personal level. This may guide the conflicts into an
elevated level and possibly further infuriating dispute in addition when issues become personal and provisions and guidelines are lacking interpretations and justifications will be more biased. Self-interests will dominate the relationships and a win loose attitude befits the norm by all sides involved in the conflict. Consequently trust and satisfaction of the other party is lost commitment is weakened and normal communication and teamwork is disrupted. Under these circumstances working relationships will suffer and relationship quality will deteriorate, and the conflict escalates into a more formal dispute process such as litigation in which there is a potential for total relationship breakage.

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<tbody>
<tr>
<td>A</td>
<td>Dominant cause: <strong>project uncertainty related</strong></td>
<td><strong>B</strong></td>
</tr>
<tr>
<td></td>
<td>Contract provision availability: <strong>highly likely</strong></td>
<td>Contract provision availability: <strong>highly likely</strong></td>
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<tr>
<td></td>
<td>Next step: <strong>Compare with people and behaviour issues</strong></td>
<td>Next step: <strong>Compare with people and behaviour issues</strong></td>
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| C | Dominant cause: **Probably people and behaviour related** | **D** | Dominant cause: **Contract and Processes related** |
|   | Contract provision availability: **unclear** | Contract provision availability: **highly likely** |
|   | More likely to have adverse effects on relationships | Next step: **Compare with people and behaviour issues** |

**Figure 5.6:** Analysis of claims based on project uncertainty against contract and processes related sources

Project uncertainty related sources are also required to be assessed against people and behaviour related issues in some stage, especially if project uncertainty has been identified as the sources of conflict and claim in the previous stage. Figure 5.7(a) illustrates this analysis; in this case the dominant source of conflict and claim is project uncertainty. But Figure 5.7(b) indicated in yellow represents conflicts which stem from both of the project uncertainty and also people and behaviour sources which make the situation more complex. There is a strong chance that provisions exist for project uncertainty issues but on the other hand the presence
of provisions for people and behaviour issues seems to be unclear even if they exist in the first place.

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<tr>
<td><strong>Dominant cause:</strong> project uncertainty related</td>
<td><strong>Dominant cause:</strong> Both</td>
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<tr>
<td>Contract provision availability: highly likely</td>
<td>Contract provision availability: unclear</td>
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<td>Next step: Compare with Contract and Processes</td>
<td>Next step: Compare with Contract and Processes</td>
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<tr>
<td>There is chance of opportunistic behaviour and adverse relationship implications</td>
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<tr>
<td><strong>Dominant cause:</strong> Probably Contract and Processes related</td>
<td><strong>Dominant cause:</strong> people and behaviour related</td>
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<td>Contract provision availability: highly likely</td>
<td>Contract provision availability: unclear</td>
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<td>If a good case is built then there is a chance of claim acceptance and relationship retention</td>
<td>Next step: Compare with Contract and Processes</td>
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<td>More likely to have adverse effects on relationships</td>
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**Figure 5.7:** Analysis of claims based on project uncertainty against people and behaviour issues

If the contractual provisions for people and behaviour issues are weak then there is a chance of opportunism to take advantage of the other causes of conflict and dispute which in this case project is uncertainty, this can also seriously lead to relationship malfunction. Figure 5.7(c) in green, represents a situation where none of the above mentioned causes are the reason behind the conflict or claim; then there is a chance that contract and processes related sources are the prime source. In these circumstances if a good case is built with proper evidence, reasoning and all importantly sufficient contract provisions which for these sources are most likely to be available; the claim is expected to be accepted in good spirit. Since there is no opportunism or behavioural issues involved and all the provisions are clearly set and the contract is adequate then the impact on trust and performance satisfaction is minimised and the future relationship of the parties is retained in an appropriate manner. If the sources of conflict fall within Figure 5.7(d) in yellow; the dominant cause are people and behaviour issues, hence the possibility of more adverse relationships is stronger. This is basically
because contract provisions are unlikely to be sufficient for these causes and even if provisions are available they are most probably very unclear in correspondence with behavioural issues.

Similar to comparing project uncertainty sources, the contract and processes related sources can also be compared with the people and behaviour issues. Figure 5.8(a) and (d) represent the dominant presence of contract and process relates sources and people and behaviour issues respectively. Figure 5.8(b) specifies that both sources have a strong effect on the conflict and claim process. Since one of the sources is directly people and behaviour related; relationships could be fragile and at the verge of deterioration if opportunism is not curbed. Figure 5.8(c) demonstrated in green, on the other hand specifies the other source which is project uncertainty as the most probable explanation for the conflict episode thus if evidence and reasoning are sufficient; in light of contract provisions there is a high chance of effective conflict resolution and relationship retention.

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<th>Dominant cause: Contract and Processes related</th>
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<td>A</td>
<td>Contract provision availability: highly likely</td>
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<td>Next step: Compare with project uncertainty</td>
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<td>Contract provision availability: highly likely</td>
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<tr>
<td></td>
<td>If a good case is built then there is a chance of claim acceptance and relationship retention</td>
<td>Next step: Compare with project uncertainty</td>
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<th>D</th>
<th>Dominant cause: people and behaviour related</th>
<th>More likely to have adverse effects on relationships</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Contract provision availability: unclear</td>
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**Figure 5.8:** Analysis of claims based on contract and process against people and behaviour issues

This is a simple methodology to analyse which of the sources or situation has the most potential to stir up more conflict. Although simple common causes of conflicts, claims and disputes are observed as the primary cause of conflicts and claims they are not the
ultimate triggers of relationship deterioration, in fact often what causes decline in relationship quality is the mismanagement and mishandling of conflict and claims when they emerge.

5.8 Chapter Summary

There are vast amounts of literature available on the causation of conflict and dispute; these causes have either been quoted individually or categorised based on their logical relevance to one another. Different common causes of conflict and disputes are identified by examining both the literature and real construction cases (see Table 5.1). However the delay related causes are not associated with conflict since they will normally lead into an entitlement and dispute directly. Although the causes have been further categorised by associating three main sources of project uncertainty; contract and process; and also people and behaviour issues as common sources for conflicts, claims and disputes further empirical testing can be performed to identify and confirm these categories and furthermore identify the latent patterns behind these causes.

It is important to understand that although these identified causes and sources may be the early triggers to conflict and dispute, however they are not the ultimate triggers of adverse dispute resolution approaches such as litigation or arbitration which can affect relationships in construction projects. What can be regarded as the ultimate triggers of these drastic measures are opportunism and also initial handling of conflict or dispute situations. Consequently the incompetency to handle these situations can be a trigger for dispute escalation and ultimately an impediment to relationship retention and sustainability. On the other hand contract provisions and contingencies plus evidence and reasoning are all vital determinants of conflict and dispute management thus their implication, availability, or unavailability can either act as a mean of relationship retention or even as impediments to sustainable relationships.
As emphasised before the time of conflict manifestation and identification is also key to the outcome of conflicts. The earlier occurrence of conflict can make it easier for the parties to reach an agreement or settlement. Thus investigation and identification of time associated with the initial triggers to a conflict incident, and also the time of conflict manifestation could ultimately be useful in reducing the impediments to sustainable relationships in construction projects.
Chapter 6
Causes of Conflict in Association with Relationships Quality

The current chapter is based on the following article:


6.1 Introduction

Conflict exists in any human transaction, social structure or projects; and incompatibility of goals and values makes conflict inevitable among construction practitioners (Leung *et al*., 2013). Many studies have tried to describe and categorise some common causes of conflict and dispute in construction (Kumaraswamy, 1997a; Mitkus and Mitkus, 2014; Semple *et al*., 1994a). Accordingly through a study of publically available construction dispute cases and literature in Chapter 5, these causes have been investigated within New Zealand construction industry. The causes could emerge from environmental issues, weather, site conditions, limitations, and access restrictions to technical problems due to complexity of design, unavailability of resources, delays and time constraints (Killian, 2003; Mitropoulos and Howell, 2001; Waldron, 2006; Yiu and Cheung, 2004). On the other hand, change orders, contract ambiguities, inappropriate risk sharing and opportunistic behaviour has also been regarded as causes of conflict and potential disputes (Kumaraswamy, 1997a; Mitropoulos and Howell, 2001; Yiu and Cheung, 2004).
An important implication of conflict is its negative effect on the relationship quality among contracting parties. Relationships are seen as strategies in achieving better performance and productivity, therefore the understanding of project relationship status becomes a serious issue. In the previous chapter a qualitative assessment was performed to identify how these conflict causes could be categorised by different sources and associated to contractual relationships in construction. However in assessing the association of conflict and relationship quality a valid argument is that if a contract is perceived as a bond or marriage should all conflicts be regarded as negative events; more importantly conflict should not be treated as an isolated phenomenon; in fact it has a process model (Pondy, 1967; Rahim, 1983); which its deterministic effects on relationships should be explored. Conflict can be a collection of systematic events generated through triggers and causes; or regenerated through snowballing into other causes and consequences. Even new conflicts can rise as a consequence of previous one’s (Jelodar and Yiu, 2012b). Although some general implications were made through a qualitative analysis carried out in the previous chapter, the link between causes of the conflict process and relationship quality needs to be empirically tested. In order to address objective five of the thesis; the current chapter is dedicated to evaluate how relationship quality and its associated attributes are affected by the causes of conflict. In order to perform this investigation the relationship quality attributes of trust, performance satisfaction, commitment and teamwork identified in Chapter 2 and determined causes of conflict in Chapter 5 are utilised. A survey is conducted to collect appropriate data analysis is performed through Multiple Regression Analysis (MRA) via the stepwise backward elimination technique.

6.2 Conflict Process and Relationship Quality Attributes in Construction

One of the possible threats to any relationship is conflict and uncontrolled consequences associated with it. Poor management and inadequate handling of conflict
incidents can bring about serious disputes among the parties involved, therefore not only damaging the relational work environment, but the cost and duration of projects may significantly increase (Hartman and Jergeas, 1995). In theory conflict can influence relational attributes and ultimately affect the overall relationship quality of the parties involved in the project. However it has not been established that how this influence may progress from the earlier causes and triggers. Much too often conflict remains hidden for some time, normally occurring when a large proportion of the project budget has already been spent; with acceptance that there is defects and inefficiencies and end result different to expectations. This is when corrective actions which are normally expensive, wasteful and time consuming for construction products and processes are considered (Abudayyeh, 1994). Alongside this the relationships of the parties involved endures serious strains and may even be destroyed due to lack of preparation and insight on the mechanism of different causes on this hidden and suddenly emerging conflict.

There are normally two different methods of explaining conflict incidents. Sometimes conflicts are investigated structurally in terms of the underlying structure and conditions that shape the construct; accompanied with the assumption that the conditions are to a certain degree fixed or slow to change; this is called the structural model of conflict (Thomas, 1976). Another way to assess conflict is to distinguish the stages or events within a conflict episode, and to determine how each stage feeds into or relates to the other. This process based model assumes that conflict is a continuous, avoidable process, with each incident affecting the next (Jelodar et al., 2015b; Pondy, 1967; Thomas, 1976). Consequently it is important to identify and explore the nature of the common causes and triggers of conflict and dispute. Especial when the awareness of a conflict incident may come in later stages of the project where a lot of resources and money has been spent; while the causes corresponding to the incident are associated with the early stages of the project (Gardiner and Simmons, 1998). In
general the effect of each conflict cause should be investigated on attributes associated with relationship quality, because first of all conflicts and their respective causes could influence these attributes. Secondly different conflicts handling situations will require diagnostic instructions for relationship management.

Some researchers have tried to understand the causes and possibly the sources of conflict (Chen et al., 2014; Jelodar et al., 2013b). However because dispute is considered as the consequence of unresolved conflicts and claims, there is a large consensus that conflict and dispute share common sources and causes (Diekmann and Nelson, 1985; Jelodar and Yiu, 2012b; Kumaraswamy, 1997a; Semple et al., 1994b; Watts and Scrivener, 1993). In the current study the effect of these causes on relationship quality attributes is investigated. Finally based on empirical findings the effect of these causes on relationship quality is discussed.

6.3 Methodology

The hypothesis is that there is a link between causes of conflict and relationship quality attributes. To verify this hypothesis, a questionnaire survey has been conducted. The respondents are well informed industry participants who have at least 5 years of experience. The survey was anonymous and designed through the online survey monkey tool. Industry bodies and organisations were contacted via their online social networks to identify potential respondent groups. Furthermore industry contacts, meetings and conferences were also used as a mean of promoting participation in research. This survey adopted a realistic approach. The respondents were asked to report on a real conflict incidents in their most recent construction projects. To achieve this, data was collected to capture information on the causes of conflict and the four main attributes of trust, performance satisfaction, commitment and teamwork (Jelodar et al., 2015b). The causes of conflict were listed in the questionnaire and the respondents are asked to assess the degree of contribution to conflict with a 5-point Likert
Causes of Conflict in Association with Relationships Quality

scale. For this purpose the categorised causes of conflict excluding the delay related causes which are mainly dispute related are extracted from chapter 5 (see Table 5.1). The respondents were also required to rate their relationship quality according to the conflict situation. A copy of the questionnaire is included in Appendix 5. The following causes are used:

C1: Environmental issues and weather conditions; C2: Site conditions limitations and access restrictions; C3: Technical problems due to complexity of design and construction; C4: Unavailability of resources; C5: Time constraints; C6: Design errors, ambiguities and change orders; C7: Contract documents ambiguities; C8: Inappropriate risk sharing; C9: Quality problems; C10: Opportunistic and adversarial behaviour; C11: Poor communication and misunderstandings; C12: Lack of experience with the type of work performed; C13: Lack of collaborative spirit.

In order to analyse the data, Multiple Regression Analysis (MRA) has been adopted. The analysis aims to find links between the common causes of conflict with each of the attributes associated with relationship quality of the construction parties. Stepwise backward elimination technique is recommended as there is relatively large number of predictor variables (Chan et al., 2004; Jafarzadeh et al., 2013). This technique allows for the consideration of all of these variables at the first step; before achieving the best combination of predictor variables. The technique eliminates insignificant variables at each step creating new subsets with a different predictability capability. The general criterion is to include all independent variables to maximize the incremental predictive ($R^2$) power corresponding to each subset; however for the purpose of validity this may need to be adjusted since some of these variables are not significantly contributing to the predictive ability of the model. Consequently adjusted $R^2$ is also examined to make sure the effect of increasing the number of variables is seen on the prediction model (Chatterjee and Hadi, 2013; Hair, 2010).
Another way to identify the best subset is to apply the subset with the absolute minimum $t$ value greater than one rule (Chatterjee and Hadi, 2013). This is a less stringent criterion compared to the absolute $t$ value greater than the cut-off $t$ criterion; allowing for more variables to be considered; potentially leading to a more statistically suitable model with greater predictive power (Chatterjee and Hadi, 2013). Another criterion is to calculate the Root Mean Square (RMS) based on $RMS_p = SSE/(n - p)$; where $SSE$ is the residual sum of squares, $n$ is the sample size and $p$ is one plus the number of independent variables. The subset with the lowest RMS is the best combination of predictor variables for the model (Hair, 2010; Jafarzadeh et al., 2013). The 13 identified causes of conflict as predictor variables are included in models 1 to 5; illustrating the first subset of the regression models.

As a result the following models are proposed for MRA in this study:

Model 1:  
$$Y_{\text{trust}} = b_0 + b_1C_1 + b_2C_2 + b_3C_3 + b_4C_4 + b_5C_5 + b_6C_6 + b_7C_7 + b_8C_8 + b_9C_9 + b_{10}C_{10} + b_{11}C_{11} + b_{12}C_{12} + b_{13}C_{13} + \varepsilon$$

Model 2:  
$$Y_{\text{performance satisfaction}} = b_0 + b_1C_1 + b_2C_2 + b_3C_3 + b_4C_4 + b_5C_5 + b_6C_6 + b_7C_7 + b_8C_8 + b_9C_9 + b_{10}C_{10} + b_{11}C_{11} + b_{12}C_{12} + b_{13}C_{13} + \varepsilon$$

Model 3:  
$$Y_{\text{commitment}} = b_0 + b_1C_1 + b_2C_2 + b_3C_3 + b_4C_4 + b_5C_5 + b_6C_6 + b_7C_7 + b_8C_8 + b_9C_9 + b_{10}C_{10} + b_{11}C_{11} + b_{12}C_{12} + b_{13}C_{13} + \varepsilon$$

Model 4:  
$$Y_{\text{teamwork}} = b_0 + b_1C_1 + b_2C_2 + b_3C_3 + b_4C_4 + b_5C_5 + b_6C_6 + b_7C_7 + b_8C_8 + b_9C_9 + b_{10}C_{10} + b_{11}C_{11} + b_{12}C_{12} + b_{13}C_{13} + \varepsilon$$

Model 5:  
$$Y_{\text{relationship quality}} = b_0 + b_1C_1 + b_2C_2 + b_3C_3 + b_4C_4 + b_5C_5 + b_6C_6 + b_7C_7 + b_8C_8 + b_9C_9 + b_{10}C_{10} + b_{11}C_{11} + b_{12}C_{12} + b_{13}C_{13} + \varepsilon$$

Where $C_i$ are the causes of conflict; $b_i$ are regression coefficients and $\varepsilon$ is the error term.

Ultimately the following regression model is composed for testing the association of the four attributes to relationship quality:

Model 6:  
$$Y_{\text{relationship quality}} = b_0 + b_1X_{\text{trust}} + b_2X_{\text{performance}} + b_3X_{\text{commitment}} + b_4X_{\text{teamwork}} + \varepsilon$$

Where $X_i$ are the relationship quality attributes; $b_i$ are regression coefficients and $\varepsilon$ is the error term.
Before conducting the MRA some diagnostic tests are conducted to make sure the data set defining each variable is fit the analysis (Chatterjee and Hadi, 2013). The analysis and all assumption checks are performed with the aid of SPSS package. Initially the correlation of all the variables involved in the analysis is explored to make sure muticolinearity will not be a problematic for the analysis (Hair, 2010). In addition Variance Inflation Factor (VIF) is also assessed as a separate measure of muticolinearity for each variable included in the prediction models, there are recommendations that VIF should be less than 10 (Tabachnick and Fidell, 2012); and some recommend less than 5 as the threshold (Hair, 2010).

The null plot is a scatterplot of standardize residual (ZRESID) and standardized predicted value (ZPRED); which demonstrates the randomness of the residuals; if no obvious pattern is detected the assumption of linearity is met (Hair, 2010; Janssens et al., 2008). Furthermore the dispersion of residuals in the null plot is a measure of that hetroscedasticity which should also be examined. Other tests such as Breusch-Pagan and Koenker tests are respectively performed for measure of hetroscedasticity; if significance level for both tests is higher 0.05 the null hypothesis is accepted and homoscedasticity is met (Hair, 2010; Janssens et al., 2008; Tabachnick and Fidell, 2012). Normality of the standardised residuals is also of concern in MRA (Chatterjee and Hadi, 2013; Jafarzadeh et al., 2013). Two separate visuals of histogram and normal probability plot generated by SPSS are used to check the assumption of normality (Hair, 2010; Xiao and Proverbs, 2003). In addition the Kolmogrove-Smirnov and Shapiro-wilk tests could be performed on the standardised residuals; if the significance level of the two tests is greater than 0.05; then the null hypothesis \( H_0 = \text{standardised residuals are normally distributed} \) is accepted and the distribution of the residuals is normal(Janssens et al., 2008).
6.4 Results

It was approximated that 550 respondents can partake in the study. A total 124 respondents took part in the research producing a response rate of around 23% making it an acceptable when compared to similar studies (Cook et al., 2000; Sax et al., 2003; Shannon and Bradshaw, 2002). Since the study is of exploratory nature simple random sampling is used similar to studies carried out by Yiu and Law (2011) and Fong and Chu (2006). The data collection process extended over 5 month period. After the initial examination of data 109 cases were regarded fit to be included in the analysis and 15 responses were discarded because of missing information or irrational responses.

Approximately 34% of the respondents worked as engineers and consultants; 34% had also contractor experience, more than 23% were clients and another 23% were project managers. The majority of respondents, up to 60% had experience in civil engineering projects; about 28% had experience in commercial building projects; more than 21% were experienced in building and housing projects, and 11% of the respondents were involved in maintenance and renovation projects. This indicates a good and comprehensive mix of professions, parties and projects from the construction industry. In terms of experience most of the respondents were senior members of their organisation. More than 57% of the respondents had over 20 years of experience; 21% had between 15 to 20 years of experience; 4% with 10 to 15 years of experience; 8.5% with 5 to 10 years of experience and another 8.5% with less than 5 years of experience.

6.5 Data Screening and Diagnostics

The data is gathered via the use of 5-point Likert scale; accordingly the normality of the data distribution could be improved through the application of natural logarithm function.
Table 6.1: Correlation matrix

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<td>-.145</td>
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<td>-.058</td>
<td>-.036</td>
<td>-.147</td>
<td>.001</td>
<td>.094</td>
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<td>.239*</td>
<td>.144</td>
<td>.278**</td>
<td>.194*</td>
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<td>.167</td>
<td>.143</td>
<td>-.029</td>
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<td>.137</td>
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<td>.141</td>
<td>.160</td>
<td>.717**</td>
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</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).
The log-log or double log function is applied to both dependent and independent variables. This transformation increases the linearity between dependent and independent variables within the MRA model (Hair, 2010; Jafarzadeh et al., 2013). It is also equally important to interpret the final results according to the current transformation function.

In the first step correlations of all the variables involved in the analysis is checked to make sure multicollinearity will not be problematic for the analysis; accordingly the correlations are tabulated in Table 6.1. Correlations between conflict causes are relatively low suggesting they could be used in an MRA analysis without the concern of multicollinearity.

The attributes of relationship quality show higher correlation with each other however all correlations except for one are under 0.6 which strongly indicates that multicollinearity is not a problem (see Table 6.1). In addition all VIFs for all predictor variables in the models were well below 3 therefor enforcing the fact that multicollinearity is not a concern in any of the proposed models. Before estimating each predictor model the assumption of linearity is also tested using the null plot. No particular pattern was exhibited for the null plots associated to the proposed models, thus the assumption of linearity is met for all models.

The evenly dispersed residuals suggest that heteroscedasticity should not be an issue for the estimated models either. For extra assurance SPSS syntax is used and Breusch-Pagan and Koenker tests are respectively performed for measure of heteroscedasticity; test values correspond to 9.02 and 14.11 with the respective significance levels of 0.77 and 0.36 for the first model both greater than 0.05; reinforcing the null hypothesis of homoscedasticity. The same results are exhibited for all the other models tested by MRA.

Normality of the standardized residuals is also of concern in MRA. Via examining the histogram of the standardized residuals (see Figure 6.1(a)) and normal probability plot (see Figure 6.1(b)) generated by SPSS all models seem to have met the assumption of normality. Figure 1 demonstrates the two main visuals used for assumption testing and data diagnosis.
before performing MRA, based on prediction model 1. In addition the Kolmogrove-Smirnov test and Shapiro-wilk test are performed on the standardised residuals; the significance level of the two tests for model 1 are respectively 0.183 and 0.06 greater than 0.05 indicating that the null hypothesis \( H_0 = \text{standardised residuals are normally distributed} \) is accepted and the distribution of the residuals is normal. All the aforementioned diagnostic and screening processes have been performed prior to each model estimate, to make sure the MRA analysis for each set of predictor and predicted variables is meaning full and valid.

![Figure 6.1: Normality assumption visuals](image)

**6.6 Stepwise Linear Regression (Backward Elimination Technique)**

The regression model 1 attempts to assess the contribution of each cause of conflict to trust. Table 6.2 illustrates all the subsets derived by applying the backward elimination technique for model one. By eliminating predictor models at each step the predictive power indicated by coefficient of determination \( R^2 \) decreases. However the increase in adjusted \( R^2 \) reveals that the variables being eliminated are insignificant. Subset 8 is the best predictor for trust with the maximum adjusted \( R^2 \) of 0.287 (see Table 6.2). From subset 9 onwards the adjusted \( R^2 \) also decreases; showing a fall in the real predictive power of the model. Subset 8 includes the largest amount of significant variables with the lowest amount of insignificant variables. The absolute minimum \( t \) value greater than one rule is also applied and once more
subset 8 is the first with the absolute minimum $t$ value of 1.137 which is greater than 1; and is verified as best predictor subset. Subset 8 has the lowest calculated RMS of 0.172 and the lowest standard error of estimate ($\sigma$) of 0.412 among all others, confirming the subset as the most statistically suitable for model 1 (see Table 6.2).

Table 6.2: Backward elimination technique with trust as dependent variable (Model 1)

<table>
<thead>
<tr>
<th>Subset</th>
<th>Independent Variables (causes of conflict)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>SSE</th>
<th>RMS</th>
<th>$\sigma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13</td>
<td>.351</td>
<td>.255</td>
<td>15.636</td>
<td>.180</td>
<td>.422</td>
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<tr>
<td>2</td>
<td>C1, C2, C3, C4, C5, C6, C7, C8, C10, C11, C12, C13</td>
<td>.350</td>
<td>.262</td>
<td>15.649</td>
<td>.178</td>
<td>.419</td>
</tr>
<tr>
<td>3</td>
<td>C1, C2, C3, C4, C5, C6, C7, C8, C10, C11, C12</td>
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<td>.269</td>
<td>15.685</td>
<td>.176</td>
<td>.417</td>
</tr>
<tr>
<td>4</td>
<td>C1, C2, C3, C5, C6, C7, C8, C10, C11, C12</td>
<td>.345</td>
<td>.273</td>
<td>15.774</td>
<td>.175</td>
<td>.416</td>
</tr>
<tr>
<td>5</td>
<td>C1, C2, C3, C5, C6, C8, C10, C11, C12</td>
<td>.341</td>
<td>.276</td>
<td>15.875</td>
<td>.174</td>
<td>.415</td>
</tr>
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<td>6</td>
<td>C1, C2, C3, C5, C6, C8, C10, C11</td>
<td>.338</td>
<td>.281</td>
<td>15.941</td>
<td>.173</td>
<td>.414</td>
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<tr>
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<td>.172</td>
<td>.413</td>
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<tr>
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<td>.172</td>
<td>.412</td>
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<td>9</td>
<td>C1, C2, C5, C8, C10</td>
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<td>.284</td>
<td>16.375</td>
<td>.172</td>
<td>.413</td>
</tr>
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<td>.277</td>
<td>16.709</td>
<td>.174</td>
<td>.415</td>
</tr>
<tr>
<td>11</td>
<td>C1, C8, C10</td>
<td>.287</td>
<td>.265</td>
<td>17.166</td>
<td>.177</td>
<td>.419</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The statistics for subset 8 as the best predictive representative for model 1 is extracted and included in Table 6.7. Accordingly the contribution of environmental issues and weather conditions (C5) to trust is positive and significant at 5% level of significance. Opportunistic and adversarial behaviour (C2) and Inappropriate risk sharing (C10) are significant at 1% level of significance with negative association to trust. The Other three causes respectively; limitations and access restrictions (C1), poor communication and misunderstandings (C8) and time constraints (C11) although improve the predictive power of the model but are statistically insignificant contributors for trust. By observing the relatively low adjusted $R^2$ of 0.287 it is realised that conflict causes cannot comprehensively explain the variation of trust in conflict cases. This is a sign that other factors could potentially play a more significant role in defining trust.

The dependent variable in model 2 is performance satisfaction. Similar to model 1 both $R^2$ and adjusted $R^2$ are examined as a measure of analysis validity (see Table 6.3).
subset with the maximum adjusted $R^2$ of 0.154 is chosen, however it has low contribution in actually predicting variations of performance satisfaction. In fact performance satisfaction has the lowest dependency to causes of conflict due to its low $R^2$. The chosen subset is the first with the absolute minimum $t$ value of 1.196 greater than one, satisfying the criterion for best subset selection. Other measures such as RMS and standard error of estimate ($\sigma$) have the minimum values of 0.220 and 0.466 respectively; thus verify the best subset selection (see Table 6.3). The statistics for this subset of model 2 is included in Table 6.7. Accordingly quality problems (C9) are significant and negatively associated with performance satisfaction at 0.05 level of significance. Other negatively associated causes are time constraints (C5) and technical problems due to complexity of design and construction (C3). Unavailability of resources (C4) and design errors, ambiguities and change orders (C6) are causes which are significant and positively associated with the dependent variable. This suggest that alterations and changes in the design with the involvement of all parties especially contractors can enhance the construction process and boost performance satisfaction although as mentioned earlier the effect is minor.

**Table 6.3:** Backward elimination technique with performance satisfaction as dependent variable (Model 2)

<table>
<thead>
<tr>
<th>Subset</th>
<th>Independent Variables (causes of conflict)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>SSE</th>
<th>RMS</th>
<th>$\sigma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13</td>
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<td>.109</td>
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<td>.232</td>
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<td>.230</td>
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<td>.228</td>
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<td>.144</td>
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<td>.223</td>
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<td>.154</td>
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*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).
The same process is performed for model 3 where commitment is the dependent variable; the best predictor subset for the model has a maximum adjusted $R^2$ of 0.163; a minimum $t$ value of 1.322 greater than one, lowest RMS of 0.142 and minimum standard error of estimate ($\sigma$) of 0.375 (see Table 6.4). The low adjusted $R^2$ is an indication that conflict causes on their own are not the best predictors of relationship quality attributes. The statistics for this subset as the best predictor for model 3 is included in Table 6.7. Causes such as poor communication (C11) and contract documents ambiguities (C7) are negatively associated with commitment and are significant respectively at 0.01 and 0.05 levels of significance. Unavailability of resources (C4) is significant and positively associated with the predicted variable at 0.05 level of significance. Quality problems (C9) and Technical problems due to complexity of design and construction (C3) are also identified in the subset but are not statistically significant.

Teamwork is assumed as the dependent variable in model 4. Step wise backward elimination technique shows that best subset has an adjusted $R^2$ of 0.325, with the absolute minimum $t$ value of 1.237 greater than one. The RMS and standard error of estimate ($\sigma$) are at the lowest levels of 0.099 and 0.314 as indicators of the best subset selection (see Table 6.5). This model exhibits the strongest association with the causes of conflict among all relationship quality attributes; and that variations of teamwork as an attribute is explained by causes of conflict more than any other discussed in this study. The statistics of the identified subset is included in Table 6.7 under model 4. Causes such as contract documents ambiguities (C7), inappropriate risk sharing (C8), opportunistic and adversarial behaviour (C10) are negatively associated with teamwork and are also significant at 0.01% level of significance. On the other hands site conditions, limitations and access restrictions (C2), quality problems (C9) and Lack of experience with the type of work performed (C12) are
positively associated with teamwork which are also statistically significant. More causes are significantly associated with teamwork compared to the other three attributes.

Table 6.4: Backward elimination technique with commitment as dependent variable (Model 3)

<table>
<thead>
<tr>
<th>Subset</th>
<th>Independent Variables (causes of conflict)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>SSE</th>
<th>RMS</th>
<th>$\sigma$</th>
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<tr>
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<td>12.887</td>
<td>.150</td>
<td>.385</td>
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<td>.380</td>
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<td>13.016</td>
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<td>.378</td>
</tr>
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<td>6</td>
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<td>.222</td>
<td>.154</td>
<td>13.047</td>
<td>.143</td>
<td>.377</td>
</tr>
<tr>
<td>7</td>
<td>C3, C4, C7, C9, C10, C11, C13</td>
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<td>.160</td>
<td>13.097</td>
<td>.142</td>
<td>.375</td>
</tr>
<tr>
<td>8</td>
<td>C3, C4, C7, C9, C11, C13</td>
<td>.211</td>
<td>.161</td>
<td>13.234</td>
<td>.142</td>
<td>.375</td>
</tr>
<tr>
<td>9</td>
<td>C3, C4, C7, C9, C11</td>
<td>.204</td>
<td>.163</td>
<td>13.344</td>
<td>.142</td>
<td>.375</td>
</tr>
<tr>
<td>10</td>
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<td>.156</td>
<td>13.589</td>
<td>.143</td>
<td>.376</td>
</tr>
<tr>
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<td>C4, C7, C11</td>
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<td>.151</td>
<td>13.815</td>
<td>.144</td>
<td>.377</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 6.5: Backward elimination technique with teamwork as dependent variable (Model 4)

<table>
<thead>
<tr>
<th>Subset</th>
<th>Independent Variables (causes of conflict)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>SSE</th>
<th>RMS</th>
<th>$\sigma$</th>
</tr>
</thead>
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<td>.310</td>
<td>9.055</td>
<td>.102</td>
<td>.317</td>
</tr>
<tr>
<td>3</td>
<td>C1, C2, C5, C6, C7, C8, C9, C10, C11, C12, C13</td>
<td>.390</td>
<td>.316</td>
<td>9.072</td>
<td>.101</td>
<td>.316</td>
</tr>
<tr>
<td>4</td>
<td>C1, C2, C5, C6, C7, C8, C9, C10, C12, C13</td>
<td>.387</td>
<td>.320</td>
<td>9.112</td>
<td>.100</td>
<td>.315</td>
</tr>
<tr>
<td>5</td>
<td>C1, C2, C5, C7, C8, C9, C10, C12, C13</td>
<td>.384</td>
<td>.324</td>
<td>9.16</td>
<td>.100</td>
<td>.314</td>
</tr>
<tr>
<td>6</td>
<td>C1, C2, C7, C8, C9, C10, C12, C13</td>
<td><strong>.378</strong></td>
<td><strong>.325</strong></td>
<td>9.242</td>
<td><strong>.099</strong></td>
<td><strong>.314</strong></td>
</tr>
<tr>
<td>7</td>
<td>C2, C7, C8, C9, C10, C12, C13</td>
<td>.368</td>
<td>.322</td>
<td>9.393</td>
<td>.100</td>
<td>.314</td>
</tr>
<tr>
<td>8</td>
<td>C2, C7, C8, C9, C10, C12</td>
<td>.353</td>
<td>.313</td>
<td>9.612</td>
<td>.101</td>
<td>.316</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 6.6: Backward elimination technique with relationship quality as dependent variable (Model 5)

<table>
<thead>
<tr>
<th>Subset</th>
<th>Independent Variables (causes of conflict)</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>SSE</th>
<th>RMS</th>
<th>$\sigma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13</td>
<td>.429</td>
<td>.343</td>
<td>10.946</td>
<td>.129</td>
<td>.357</td>
</tr>
<tr>
<td>2</td>
<td>C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13</td>
<td>.429</td>
<td>.350</td>
<td>10.946</td>
<td>.127</td>
<td>.355</td>
</tr>
<tr>
<td>3</td>
<td>C2, C3, C5, C6, C7, C8, C9, C10, C11, C12, C13</td>
<td>.429</td>
<td>.358</td>
<td>10.949</td>
<td>.126</td>
<td>.353</td>
</tr>
<tr>
<td>4</td>
<td>C2, C3, C5, C7, C8, C9, C10, C11, C12, C13</td>
<td>.428</td>
<td>.364</td>
<td>10.971</td>
<td>.125</td>
<td>.351</td>
</tr>
<tr>
<td>5</td>
<td>C2, C3, C5, C7, C8, C9, C10, C11, C12</td>
<td>.426</td>
<td>.369</td>
<td>11.002</td>
<td>.124</td>
<td>.350</td>
</tr>
<tr>
<td>6</td>
<td>C2, C3, C5, C7, C8, C9, C10, C11</td>
<td>.425</td>
<td>.374</td>
<td>11.026</td>
<td>.123</td>
<td>.348</td>
</tr>
<tr>
<td>7</td>
<td>C2, C3, C7, C8, C9, C10, C11</td>
<td><strong>.420</strong></td>
<td><strong>.376</strong></td>
<td>11.121</td>
<td><strong>.122</strong></td>
<td><strong>.348</strong></td>
</tr>
<tr>
<td>8</td>
<td>C3, C7, C8, C9, C10, C11</td>
<td>.403</td>
<td>.365</td>
<td>11.439</td>
<td>.124</td>
<td>.351</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

For model 5 the perceived relationship quality of the respondents is included as a dependent variable, and the stepwise technique is applied. This model has a higher $R^2$ and
adjusted $R^2$ in comparison to the attributes used for relationship quality. This suggests that more of the perceived relationship quality is explained by the causes of conflict. The best subset for this model acquires an $R^2$ of 0.420 and an adjusted $R^2$ of 0.376 suggesting that still a lot of variations in relationship quality remains unexplained (see Table 6.6 ). The absolute minimum $t$ value of 1.623 greater than one is obtained, in addition the subset has the lowest values of RMS and standard error of estimate ($\sigma$) respectively with 0.122 and 0.348 confirming its appropriateness (see Table 6.6). The statistics for this subset is also included in Table 6.7 under model 5.

It is observed in Table 6.7 that causes such as contract documents ambiguities (C7), opportunistic and adversarial behaviour (C10) both significant at 0.01 level of significance, and poor communication (C11) significant at 0.05 level of significance are all negatively associated with relationship quality. On the other hand only technical problems due to complexity of design and construction (C3) is positively associated to relationship quality at 0.01 level of significance.

For the final assessment the link between the chosen attributes of relationship quality and the perceived relationship quality is assessed by MRA analysis; illustrated by model 6. The test statistics are summarised in Table 6.8; importantly all the chosen attributes show significant and positive association with relationship quality. Teamwork with the standardised coefficient of 0.504 shows the strongest association with the dependent variable and is significant at 0.01 level of significance.

Trust is the second strongest contributor with the standardised coefficient of 0.249 significant at 0.01 level of significance. Commitment and performance satisfaction respectively with standardized coefficients of 0.162 and 0.122 are significant at 0.05 level of significance. This significant and positive association of the attributes shows that the four...
chosen relationship quality attributes confirmed by the literature review suite the purpose of this study and are appropriately selected.

**Table 6.7**: Statistics of the best subset indicated for relationship quality attribute models

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variables</th>
<th>Regression statistics</th>
<th>Regression statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$R^2$</td>
<td>Adjusted $R^2$</td>
</tr>
<tr>
<td><strong>Trust</strong> (Model 1)</td>
<td>Constant</td>
<td>.404**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental conditions</td>
<td>.181</td>
<td>.188</td>
</tr>
<tr>
<td></td>
<td>Site conditions and limitations</td>
<td>.136</td>
<td>.148</td>
</tr>
<tr>
<td></td>
<td>Time constraints</td>
<td>.329</td>
<td>.287</td>
</tr>
<tr>
<td></td>
<td>Inappropriate risk sharing</td>
<td>-.485**</td>
<td>.544</td>
</tr>
<tr>
<td></td>
<td>Opportunistic behaviour</td>
<td>-.257**</td>
<td>-.278</td>
</tr>
<tr>
<td></td>
<td>Poor communication</td>
<td>.124</td>
<td>.106</td>
</tr>
<tr>
<td><strong>Performance satisfaction</strong> (Model 2)</td>
<td>Constant</td>
<td>.430**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site conditions and limitations</td>
<td>.185</td>
<td>.190</td>
</tr>
<tr>
<td></td>
<td>Technical problems due to complexity</td>
<td>-.186</td>
<td>-.173</td>
</tr>
<tr>
<td></td>
<td>Unavailability of resources</td>
<td>.212</td>
<td>.157</td>
</tr>
<tr>
<td></td>
<td>Time constraints</td>
<td>-.162</td>
<td>-.180</td>
</tr>
<tr>
<td></td>
<td>Design ambiguities and change orders</td>
<td>.342**</td>
<td>.345</td>
</tr>
<tr>
<td></td>
<td>Quality problems</td>
<td>-.231*</td>
<td>-.245</td>
</tr>
<tr>
<td></td>
<td>Lack of experience</td>
<td>.126</td>
<td>.132</td>
</tr>
<tr>
<td><strong>Commitment</strong> (Model 3)</td>
<td>Constant</td>
<td>1.298**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical problems due to complexity</td>
<td>.120</td>
<td>.151</td>
</tr>
<tr>
<td></td>
<td>Unavailability of resources</td>
<td>.204</td>
<td>.163</td>
</tr>
<tr>
<td></td>
<td>Contract ambiguities</td>
<td>-.229**</td>
<td>-.300</td>
</tr>
<tr>
<td></td>
<td>Quality problems</td>
<td>-.153</td>
<td>-.198</td>
</tr>
<tr>
<td></td>
<td>Poor communication</td>
<td>-.201*</td>
<td>-.186</td>
</tr>
<tr>
<td><strong>Teamwork</strong> (Model 4)</td>
<td>Constant</td>
<td>.930**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental conditions</td>
<td>.085</td>
<td>.112</td>
</tr>
<tr>
<td></td>
<td>Site conditions and limitations</td>
<td>.198**</td>
<td>.267</td>
</tr>
<tr>
<td></td>
<td>Contract ambiguities</td>
<td>.378</td>
<td>.325</td>
</tr>
<tr>
<td></td>
<td>Inappropriate risk sharing</td>
<td>-.196**</td>
<td>-.280</td>
</tr>
<tr>
<td></td>
<td>Quality problems</td>
<td>.215**</td>
<td>.299</td>
</tr>
<tr>
<td></td>
<td>Opportunistic behaviour</td>
<td>-.196**</td>
<td>-.260</td>
</tr>
<tr>
<td></td>
<td>Lack of experience</td>
<td>.176*</td>
<td>.245</td>
</tr>
<tr>
<td></td>
<td>Lack of collaborative spirit</td>
<td>-.131</td>
<td>-.179</td>
</tr>
<tr>
<td><strong>Relationship Quality</strong> (Model 5)</td>
<td>Constant</td>
<td>1.061</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site conditions and limitations</td>
<td>.117</td>
<td>.140</td>
</tr>
<tr>
<td></td>
<td>Technical problems due to complexity</td>
<td>.370**</td>
<td>.428</td>
</tr>
<tr>
<td></td>
<td>Contract ambiguities</td>
<td>.420</td>
<td>.376</td>
</tr>
<tr>
<td></td>
<td>Inappropriate risk sharing</td>
<td>-.344**</td>
<td>-.420</td>
</tr>
<tr>
<td></td>
<td>Quality problems</td>
<td>.132</td>
<td>.163</td>
</tr>
<tr>
<td></td>
<td>Opportunistic behaviour</td>
<td>.151</td>
<td>.181</td>
</tr>
<tr>
<td></td>
<td>Poor communication and</td>
<td>-.282**</td>
<td>-.318</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
Causes of Conflict in Association with Relationships Quality

Table 6.8: Test statistics for the relationship quality (Model 6)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>Regression statistics</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients(Beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship quality</td>
<td>Constant</td>
<td>.756</td>
<td>-.073</td>
<td>.249</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>.233**</td>
<td>.112*</td>
<td>.122</td>
</tr>
<tr>
<td></td>
<td>Performance satisfaction</td>
<td>.112*</td>
<td>.162*</td>
<td>.162</td>
</tr>
<tr>
<td></td>
<td>Commitment</td>
<td>.548**</td>
<td>.504</td>
<td></td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

The statistical significance of the attributes implies that the variation of these attributes will affect the relationship quality of the parties involved. Thus a unit increase of an attribute such as trust has mathematical inferences. The model coefficients are demonstrated in Table 6.8; and suggest for instance that a unit of increase in the parameter representing trust will increase the variable representing relationship quality by 0.249. However when interpreting the results using regression coefficients it is acknowledged that all data have undergone a natural logarithm function transformation; therefore the following mathematical transformations should be performed:

\[
\ln \left( RQ_{\text{trust}=i} \right) - \ln \left( RQ_{\text{trust}=i-1} \right) = 0.249 \implies \ln \left( \frac{RQ_{\text{trust}=i}}{RQ_{\text{trust}=i-1}} \right) = 0.249
\]

\[
\rightarrow RQ_{\text{trust}=i} = e^{0.249} \times RQ_{\text{trust}=i-1}
\]

\[
\rightarrow RQ_{\text{trust}=i} = 1.28 RQ_{\text{trust}=i-1}
\]

Therefore for a potential unit of increase in trust there is a 28% increase in relationship quality. The same procedure is performed for the other attributes and it is identified that for a unit increase in performance satisfaction, commitment and teamwork; relationship quality will respectively increase by 13%, 18% and 66%. Hence teamwork has the most influence on relationship quality. This mathematical implication of the analysis although may not be possible to implement in real project scenarios but can provides a scale or a sense of how relationship quality is affected by the selected attributes.
6.7 Discussion and Contributions

The results demonstrate that some conflict causes significantly influence relationship quality and the associated attributes. However the low coefficient of determination ($R^2$) obtained for the examined models demonstrates that most of the variation of relationship quality or its attributes remain unexplained. This means that the causes solely cannot be responsible for relationship variations. This is in line with the fact that conflict can be managed, possibly to the extent of preventing potential disputes (Fenn et al., 1997). Poor and inadequate handling of conflict not only could damage the working environment, but the cost and duration of projects may significantly increase (Brockman, 2013; Hartman and Jergeas, 1995). Therefore as shown by the research findings the consequential process occurring after the appearance of causes may be more important to the working relationships compared to the causes themselves.

It is demonstrated that not all causes of conflict will have a negative effect on relationship quality and its associated attributes. As demonstrated in model 2 Unavailability of resources and design errors, ambiguities and change orders significantly effects performance satisfaction or commitment but not necessarily in a negatively way, they trigger more effort and joint decision making. Gardiner and Simmons, (1995) similarly associate inevitable change orders in project duration with functional conflict and advocate that in well setup projects, changes do not progress into dysfunctional conflict. In addition site condition limitation and lack of experience could positively enhance more collaboration and teamwork among the contracting parties. Accordingly not all conflicts seem to be destructive; in fact functional conflicts can be useful to the outcome of the projects (Robbins, 2009).

However as illustrated in Table 6.7 most of the causes which significantly affect relationship quality and its attributes have a negative effect. Inappropriate risk sharing and opportunistic and adversarial behaviour will have dysfunctional effects on trust and
teamwork (models 1 and 4); quality problems will significantly reduce performance satisfaction (model 2). Commitment is negatively influenced by contract documents ambiguities and poor communication and misunderstandings (model 3); in addition teamwork is also negatively influenced by contract documents ambiguities and lack of collaborative spirit (model 4). Therefore the destructive nature of these causes is empirically illustrated in this study. In accordance Kumaraswamy (1997b) stress the need to differentiate destructive or dysfunctional conflict which leads into dispute and targets relationships, from constructive or functional conflict. According to Chen et al., (2014) a moderate level of task-related conflict which is functional plus a low level of relationship-related conflict improve cost performance.

The study reveals three significant causes that negatively influence relationship quality as contract documents ambiguities, opportunistic and adversarial behaviour and poor communication and misunderstandings. Thomas (1976) identified behaviour as the outbound consequence of conflict conceptualization, and associated components of orientation, strategic objectives, and tactics with it. It is thought that each parties behaviour will influence the others behaviour lending to dynamic and reactionary alterations of behaviour. With the tactics and choices of behaviour identified, control increases over escalation and reduction of conflict and ultimately allowing improved management of relationship quality for different purposes. In addition Grisham (2013) believe that the biggest hurdles in conflict resolution are normally emotional interactions under the influence of adversarial behaviour. Mitkus and Mitkus (2014) associate poor communication as the main source of conflict which is in prompt need of efficient managing tactics and strategies.

It has to be acknowledged that not all of the four examined relationship quality attributes in the research are achievable in a given period of time. Some attributes will need more effort to sustain or are less tangible; for example trust requires considerable amount of
time and effort to build up between parties (Ling and Tran, 2012; Meng, 2012; Yeung et al., 2012). Therefore if relationship quality is of concern in a particular construction arrangement then a plan may be required to focus on the attributes which have more chance of success in revitalizing the relationship in the project time frame and circumstances. Therefore it is vital to understand the causality of each attribute and type of strategies required to generate them in particular project circumstances to reach a certain degree of relationship quality.

The study with the aid of empirical evidence reveals that the relationship quality attributes selected through previous literature all significantly contribute in explaining the variation of relationship quality of construction project. However teamwork is the most significantly associated attribute to relationship quality (see Table 6.8). Based on the model statistics further insight is provided (see Table 6.7); for instance conflict causes with significant negative impact on teamwork are contract documents ambiguities, inappropriate risk sharing, and opportunistic behaviour. Therefore if the goal is to strategize and maintain relationships through teamwork then strategies and actions which could prevent or resolve such causes should be applied in appropriate project instances. Teamwork is the most effected attribute by the identified causes of conflict (see Table 6.7, model 4) and it also has the most influence on relationship quality (see Table 6.8); accordingly controlling or preventing causes such as contract document ambiguities, inappropriate risk sharing, opportunistic behaviour, lack of collaborative spirit can have a positive influence on teamwork. Strategies and actions could be planned out to enhance teamwork for the benefit of the working relationships.

6.8 Chapter Summary

The study focuses on empirically understanding how causes of conflict could associate to attributes of relationship quality and ultimately relationship quality itself. Five different MRA models are proposed to test how the causes of conflict are associated with
trust, performance satisfaction, commitment, teamwork, and perceived relationship quality of the contracting parties. The study suggests that the causes of conflict cannot explain all of the variation in relationship quality attributes, thus other important factors should be investigated, especially what happens after these causes emerge.

Causes such as Unavailability of resources; design errors, ambiguities and change orders; site condition limitation; and lack of experience are statistically significant and positively affect relationship quality and its attributes. Although their association with positive relational outcomes is exhibited; they cannot be categorized as functional conflict causes for certain and further investigation is required. On the other hand causes such as contract documents ambiguities; inappropriate risk sharing; opportunistic and adversarial behaviour; poor communication and misunderstandings; and quality problems all have negative influences on relationship quality and its accredited attributes. Similarly these causes could not be attributed to dysfunctional conflict just because they seem harmful to working relationships in construction projects. However further research is recommended to perhaps classify conflict type into functional and dysfunctional conflict and investigate if such structure exists. Secondly the association of conflict sources with this classification may be investigated.

This study empirically demonstrates that all the chosen attributes are statistically significant in correspondence with relationship quality and furthermore the most significant attribute is teamwork which has a stronger total effect than the other attributes. Based on the proposed models each relationship attribute is associated with a unique set of negatively and positively significant causes of conflict. With the aforementioned information at hand individual strategies into controlling and managing relationships through each of these attributes could be compiled and proposed.
Chapter 7

Effect of Conflict Source and Type on Relationship Quality

The current chapter is based on the following article:


7.1 Introduction

It has been established that a significant determinant of relationships is manifested conflict (Jelodar et al., 2015b); therefore it’s identification, classification, and handling is a strong initiative in construction management. Elmarsafi (2008) after reviewing construction law literature and research papers (Casinelli, 2005; Hanna and Gunduz, 2005; Harmon, 2003a; Singh, 2000; Thelen et al., 2007; Xiao and Proverbs, 2003) have stated that poorly managed disputes and uncontrolled outcomes of conflicts, are more common in construction than any other industry. The construction sector is paying a huge price for out of control and relationship defecting conflicts which are very common and have the tendency to develop into full scale disputes. This is why many studies have attempted to understand the nature of this phenomenon (Kumaraswamy, 1997b; Yiu and Cheung, 2007). Post conflict effects are of critical importance since they can influence the success of construction projects, the bonding of the construction team and ultimately may change the direction of a developing construction work. In addition conflict type can negatively impact the cost and time performance of construction projects (Chen et al., 2014).
This may lead to disputes which could be very aggressive and relationship deteriorating. On the other hand there is a belief that conflicts may inspire critical debate and revaluation of operations and project processes. As a result it may provoke effective teamwork and increase performance and productivity, or result in innovation and new technologies. In addition strategic long-term relations may be feasible; this is why interactionism acknowledges the constructive effects of conflict under certain circumstances (Robbins, 2009).

In the previous chapter the individual causes of conflict were assessed to evaluate their effect on relationship quality. However a lot of variation in relationship quality and its attributes remained unexplained. It was observed that the causes had a mixture of positive and negative effects of relationship quality; hence further research was recommended to identify how conflict manifests after the emergence of their associated causes. It was suggested that the type of conflict should be investigated to determine if structuring conflict into functional and dysfunction is appropriate or not. Afterwards the association of conflict sources and conflict type with relationship quality should be examined to create a more realistic understanding of the conflict process in construction projects. Accordingly the current chapter attempts to investigate Objective 6 of this thesis and determine the consequent effect of conflict sources and conflict type on relationship quality of the contracting parties. In Chapter 5 a structure for conflict sources was identified based on categorising causes of conflict. However this structure was extracted from previous literature and expert opinion, and further empirical investigations could be performed to clarify the structure of conflict sources. A survey is designed and carried out to collect information on conflict process and relationship quality of the contracting parties. Factor analysis is applied to study the structure associated with conflict sources and type therefore creating new categories and factors. Afterwards these factors are treated as new identified variables and the
association of conflict sources and conflict type on relationship quality is examined via the application of Multiple Regression Analysis (MLR).

### 7.2 Conflict Process and Relationship Quality

Conflict can be categorized into different types having various impacts of constructive and destructive nature also known as functional and dysfunctional respectively (Amason, 1996; Toms, 2004). This differentiation of conflict types is also observed in construction (Chen et al., 2014; Kumaraswamy, 1997b). Many investigations have tried to address negative aspects where conflict is supposed to be dysfunctional and some others have looked into a more functional side of conflicts (Robbins, 2009). The basic idea was that these two types of conflict are negatively correlated; implying that the presence of one is the absence of the other (Menon et al., 1996). Constructive form can inspire direct negotiation, brainstorming and possibly joint problem solving, therefore if managed well; can provide stability and balance of resource and power (Toms, 2004). Generally based on this view, to obtain win-win outcomes offered by value engineering in construction, conflict should be maintained at an optimum level (Leung et al., 2013). Others perceive an imaginary line suggesting the level of conflict below the line is considered functional with positive outcomes and the level of conflict above the line was dysfunctional with a negative outcome (Rosenberg and Stern, 1970, 1971). In this view being functional or dysfunctional is associated to the amount of conflict. In the third view there is a clear distinction in nature of functional and dysfunctional conflict suggesting that both of them may occur at the same time; in addition cases were exhibited in which high level of both functional and dysfunctional conflict exists concurrently (Amason, 1996).

Gardiner and Simmons (1992) suggested that understanding project conflict can change the occurrence of damage triggered by its dysfunctional form; leading to a more controlled environment. This is thought to lay the foundation for functional conflict.
Generally functional conflict is associated with change and the fact that change is inevitable in evolving designs; due to external influences it may continuously transpire throughout the whole project duration. This advocates that well setup and thought through projects do not progress into dysfunctional conflict (Gardiner and Simmons, 1995).

In another study performed by Gardiner & Simmons (1998), a brief review of the more important causes effecting dysfunctional conflict was conducted. It was concluded that the people who were the parties involved in projects had the most influential role on the emergence or demise of dysfunctional conflict in comparison with the practiced procedures or systems in place. Inter-organizational team building was suggested as a mean of reducing conditions of latent conflict in construction. In line with a series of studies performed by Gardiner & Simmons on the issue, Kumaraswamy (1997b) emphasised the need to differentiate destructive or dysfunctional conflict from constructive or functional conflict. Because it is believed that dispute is pursued to imply prolonged disagreements as an effect of destructive conflicts; lending to time consuming costly and relationship damaging outcomes. Accordingly conflict aftermath and how conflict manifests itself is of great importance in construction.

There is not a unanimous agreement on how should conflicts be evaluated in construction; they are normally evaluated based on their impact and outcomes on the project. Thus in this sense they are evaluated by lag indicators; which means the effect is only apparent in the conflict aftermath. However researchers in various fields have tried to capture the quality of conflict and provide a measure for conflict evaluation through a series of statements. Brown et al., (1983) were mainly concerned with frequency of disagreement as an indicator. Gaski and Nevin (1985) developed a scale to measure conflict in general founded on a ten question criteria in marketing. Maltz and Kohli (2000) on the other hand looked at
organisation functions and evaluated conflict based on problem detecting statements Jehn’s (1992) also developed a scale for evaluating conflict; there scale is important because it aims to measure both functional and dysfunctional conflict. The scale has been developed to study group conflict; however it has been utilised and retested in various fields of marketing, management and business by different researchers (Amason, 1996; Plank and Francis, 2001; Toms, 2004).

In organisational management and psychology short term effects of conflicts can be change orders and claims; but in the long term they can influence achievement by having repercussions on trust and satisfaction (Thomas, 1976). Trust and satisfactions are major components of relationship status and relationship quality (Crosby et al., 1990); hence it becomes apparent that conflicts in the long-term will influence relationship quality. In addition Bristow & Vasilopoulos (1995) have acknowledged the fact that construction conflict after developing into dispute can have adverse effects on relationships. Chen et al. (2014) have categorised conflict into relationship-related, process-related and task-related; and identified that relationship-related conflict has a negative impact on project cost performance, whereas task-related conflict influences project cost performance in an inverse-U shaped manner.

In a theory mentioned by Jelodar et al., (2015b) relationship quality is regarded as a measurement tool which can be systematically influenced by the events of conflict, dispute, their antecedents and consequences. Other important aspect in the systematic view of conflict and relationship quality is that how conflict sources and causes can progress; and ultimately impact relationship quality. A bulk of studies and literature exists on the issues of conflict causes; however Jelodar et al, (2013b) have provided a classification of common causes for conflict and dispute based on past research. These causes could range from environmental,
Site conditions, restrictions to technical problems due to complexity of design, delays and time constraints (Killian, 2003; Mitkus and Mitkus, 2014; Mitropoulos and Howell, 2001; Waldron, 2006; Yiu and Cheung, 2004).

As mentioned some studies have focused on conflict aftermath and how the type of manifested conflict may affect project outcomes, however some others have directed their attention to the causes of conflict. This is a clear indication that conflict is a process of sequential events from its initial triggers or causes to its aftermath. This is in line with Pondy’s (1967) process model for conflict. Implications of these events have been studied in construction and even the relational consequence of these events on contractual parties (Cheung et al., 2006b; Harmon, 2003a). However there is lack of evidence to link the conflict process as a whole to relationship quality in construction projects.

When the conflict process is discussed a distinction should be made between conflict causes, sources and types. Based on the above mentioned literature it can be deducted that causes are the triggers and reason behind conflict event, whereas sources are the categories in which these causes belong to. Conflict type is an indication of how the outcome of conflict manifests itself. Accordingly there is a need to understand how sources of conflict could impact type of conflict in their functional or dysfunctional nature and ultimately how they may affect relationship quality of the contracting party in the form of manifested conflict. The current study aims to (1) identify how cause of conflict can be categorised into underlying sources (2) investigate the structure of functional or dysfunctional conflict in construction and (3) explore the link between conflict sources, conflict types and relationship quality of the contracting parties.
Effect of Conflict Source and Type on Relationship Quality

7.3 Methodology

To achieve objectives of the study, a questionnaire survey has been designed to evaluate a real life conflict event based on the respondent’s experience. The respondents were asked to report on a recent conflict incident in one of their completed projects. They were specifically asked to indicate the causes and type of conflict in addition to the relationship quality of the contracting parties. Furthermore in a separate section demographic information such as experience, type of construction work, sector, and position of the respondents have been collected.

The causes of conflict used in the design of the questionnaire have been identified and structure in Chapter 5 (see Figure 5.1). The respondents were asked to indicate and rate the contribution of the causes to the conflict situation with a 5 point Likert scale ranging from 1 (no contribution) to 5 (Extreme contribution). For evaluating conflict type Jehn (1992)’s scale is used, this scale constitutes of seven items to measures functional conflict and dysfunctional conflict. These items have been used in prior studies of conflict within different disciplines (Amason, 1996; Jehn and Mannix, 2001; Plank and Francis, 2001; Toms, 2004). The items in the scale are modified to suite the purpose of measuring conflict in construction. The scaled items are incorporated in the final questionnaire and are listed as follows:

- The anger between you and the opposing party
- The disagreements over different ideas between you and the opposing party
- The personal friction between you and the opposing party
- The personality clash between you and the opposing party
- The differences about the content of the decision between you and the opposing party
- The tension between you and the opposing party
- The general differences of opinion between you and the opposing party
The respondents were asked to evaluate the above statements via a 5-point Likert scale ranging from 1 (none) to 5 (extreme) to indicate conflict type. Concurrently the respondents were asked to rank their perceived relationship quality on a 5–point Likert scale where 1 is at the verge of break and 5 is extremely strong relationship. A copy of the questionnaire is included in Appendix 6.

To evaluate the contribution of the identified conflict causes, the scores are transformed into relative importance indices. This Relative Importance Indices (RII) demonstrated by Equation 7.1 was used by Kometa et al. (1994) to evaluate clients' organizational attributes affecting project consultants' performance; since then other studies have also adopted this method for evaluating different issues (Chan & Kumaraswamy, 1997; Yiu, 2007).

\[
RII = \frac{\sum w.A}{A \times N} (0 \leq RII \leq 1) \quad \text{(Equation 7.1)}
\]

Where \( w \), is the weighting given to each factor by the respondents and ranges from 1 to 5 where “1” is least contribution and “5” the most contribution, \( A \) is the highest weight (i.e. 5 in our case) and \( N \) is the total number of the sample.

Then by applying Principle Component Factor Analysis (PCFA) the underlying constructs or factors associated with the causes of conflict is identified. The PCFA methodology is centred around highly correlated items or variables which could be considered as one single group or factor (Pallant, 2010). Accordingly these new factors structured from causes of conflict could be renamed as conflict sources in construction projects. Grouping highly correlated variables and finding new structures reduces the possibility of overlap or correlation in applying further statistical tests; in fact this issue has such importance that regardless of using factor analysis researchers normally check for
correlation among variable to avoid errors introduced by them in multivariable measurements (Hair, 2010).

Factor analysis is also applied to the above mentioned conflict type scale to identify and confirm the presence of functional or dysfunctional conflict. PCFA has been used in many studies in a variety of knowledge areas for both variable reduction and also measurement scale testing (Cheung and Yeung, 1998; Cheung and Yeung, 1998; Jehn and Mannix, 2001). In case of the later the variables are substituted as items in a scale, subsequently the items are evaluated and associated with underplaying components or factors (Thompson, 2004). Accordingly in this study for evaluating conflict type PCFA is applied to Jehn (1992)’s modified seven scale item for construction conflict circumstances. The aim of PCFA here is not data reduction but to test the scale and provide measurement of conflict type. The scale has been used for the same purpose in other studies (Jehn and Mannix, 2001; Toms, 2004).

![conflict sources](identifier based on causes)  ![Conflict type](functional/dysfunctional)  ![Relationship quality](

**Figure 7.1:** The association of the conflict process and relationship quality

Based on PCFA results; sources of conflict and the two types of functional and dysfunctional conflict will be classified as components of conflict process in construction. Accordingly to identify the link of these components and relationship quality of the contracting parties multiple regression analysis (MRA) is applied. Figure 7.1 demonstrates the association of the conflict process and relationship quality. The hypothesis is that while
conflict sources may affect conflict type; they would both be antecedents to relationship quality.

7.4 Data collection

Respondents from contractors, clients, project managers, engineers, quantity surveyors, architects and consultants working in the New Zealand construction industry have been recognised as the target for this study. The survey was anonymous and designed through the online survey monkey tool. The respondents have been identified via industry contacts, meetings and conferences; in addition through industry bodies and social media larger groups of target were recognised. Simple random sampling was used, the sampling method is consistent with similar studies such as Yiu and Law (Fong and Chu, 2006; Yiu and Law, 2011). Approximately 550 potential respondents were identified. The online survey was communicated to the identified respondents directly or through their organizational body or professional social media groups. By following up and sending reminder emails and notifications finally a total of 124 questionnaires were returned in three follow up rounds mounting to response rate of 23%.

7.5 Results

A total of 109 complete respondents were accepted for the study and 15 were disregarded due to response errors and missing values. The number of respondents allows for a verity of analytical, statistical and mathematical tools and techniques to be implemented. A diverse mix of respondents participated in the study. The majority of respondents; approximately 60% had experience in civil engineering projects; about 28% had worked in commercial building projects; more than 21% of had acquired experience in building and housing projects, and 11% were involved in other projects. The respondents also were generally experienced professionals with approximately 57% of the respondents over 20 years of experience; 21% with 15 to 20 years of experience; and the rest between 5 to 15
years’ experience. The respondents were categorised in three categories for their positions and role in projects; roughly 34% of the respondents worked as engineers and consultants; 34% had also contractor experience, more than 23% were clients and another 23% were project managers.

### 7.5.1 Causes and Source Analysis of Conflict

One of the simplest methods to evaluate the contribution of the identified conflict causes is to transform them into relative importance indices. This index is calculated for each conflict cause via Equation 7.1; accordingly the rankings provided are illustrated in Figure 7.2. The most important causes contributing to conflicts are opportunistic adversarial behaviour, poor communication, design errors, time constraints and contract ambiguities. On the other hand inappropriate risk sharing, unavailability of resources, and environmental and weather conditions had the least contribution to conflict events.

Because of the variety and the number of causes identified for conflict it is difficult to use all in any statistical analysis with limited number of data points. PCFA is used both for data reduction and also identifying the underlying factors which could be sources of conflict. In performing PCFA the first step would be to check for the suitability of data. Kaiser-Mayer-Olkin (KMO) measure of sampling adequacy and Bartlett’ test is used as a measure of suitability for factor analysis (Yiu and Law, 2011). SPSS software package is used to perform the analysis. The P-value <0.001 for Bartlett’s Test of sphericity shows that all correlations within the correlations matrix are statistically significant, making the factor analysis meaningful (Janssens et al., 2008; Pallant, 2010). Furthermore the anti-image correlation matrix was also studied and all the values were relatively small and close to zero suggesting the underlying dimensions do exist and factor analysis is relevant (Janssens et al., 2008). All measures of sampling adequacy on the anti-image diagonal were higher than 0.5 and there is no need to eliminate any variable at this stage. The KMO measure of sampling adequacy is
0.743>0.5 thus performing factor analysis is fitting (Hair, 2010; Turner and Müller, 2006). Communalities table demonstrates initial variances of 1; since the variable measurements are standardised, through the extraction of principle component analysis the magnitude of the communalities are re-assessed. This specifies how much of the variance associated with each variable is explained by the factors. The two causes of “Lack of experience with the type of work performed” and “inappropriate risk sharing” had a low extracted communality of 0.475, and 0.479 respectively.

![Figure 7.2: Relative Importance Index (RII) of conflict causes](image)

Crobach’s alpha is used as a measure of Internal consistency to assess the reliability of the data collected (Cronbach, 1951; Norušis and Inc, 2006). The calculated Cronbach’s alpha coefficient is 0.813> 0.8 and is considered as acceptable cut-off value for general research purposes (Loo, 2001). Although this is not a measurement scale but this reliability measure will provide some indications into how each conflict cause will load onto the underlying factor. In addition both “correlated item-total correlation” and “coronaches alpha
if item deleted” measures are assessed. This indicates that “Environmental issues and weather conditions” and “Site conditions limitations and access restrictions” should be eliminated from the causes because they respectively have very low correlated item-total correlation values of 0.243 and 0.198; and Cronbach’s alpha increases to 0.824 resulting in improved reliability.

Table 7.1: Rotated Component Matrix for Conflict Sources

<table>
<thead>
<tr>
<th>Conflict causes</th>
<th>Factors 1</th>
<th>Factors 2</th>
<th>Factors 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical problems due to complexity of design and construction</td>
<td>.756</td>
<td>.266</td>
<td>.068</td>
</tr>
<tr>
<td>Quality problems</td>
<td>.735</td>
<td>.139</td>
<td>.174</td>
</tr>
<tr>
<td>Unavailability of resources</td>
<td>.664</td>
<td>.205</td>
<td>.210</td>
</tr>
<tr>
<td><strong>Constraints and Ambiguities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract documents ambiguities</td>
<td>.090</td>
<td>.872</td>
<td>.048</td>
</tr>
<tr>
<td>Design errors, ambiguities and change orders</td>
<td>.300</td>
<td>.804</td>
<td>.026</td>
</tr>
<tr>
<td>Time constraints</td>
<td>.494</td>
<td>.645</td>
<td>-.082</td>
</tr>
<tr>
<td><strong>Team Behaviour</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor communication and misunderstandings</td>
<td>-.160</td>
<td>.381</td>
<td>.802</td>
</tr>
<tr>
<td>Lack of team spirit</td>
<td>.307</td>
<td>-.125</td>
<td>.774</td>
</tr>
<tr>
<td>Opportunistic and adversarial behaviour</td>
<td>.407</td>
<td>-.140</td>
<td>.637</td>
</tr>
</tbody>
</table>


After performing all the pre-testing, PCFA is performed by extracting factors based on the eigenvalue-greater-than-1 principle; using the scree plot three loading factors are established. Component matrix are rotated via VARIMAX rotation in order to get more exclusive factor loadings (Yiu and Law, 2011). Ultimately three different factors could be extracted. The sample size is 109 and according to Janssens et al., (2008) a minimum factor loading of 0.5 is required for assigning variables to identified factors. Consequently “inappropriate risk sharing” and “Lack of experience with the type of work performed” could not be assigned to any of the main factors and are eliminated; in addition these causes had low communality extraction scores as well as relatively low importance index (see Figure 7.2) making them more viable to elimination. After eliminating all the undesired causes of conflict from the analysis the PCFA is performed once more; this time the fixed number of
factors to extract is set at three since there is previous knowledge available (Hair, 2010; Tabachnick and Fidell, 2012). Table 7.1 demonstrates the loadings on the identified three factors.

As a result of the PCFA, most of the uncertainty related causes such as “Environmental issues and weather conditions” and “Site conditions limitations and access restrictions” are eliminated as their contribution is low and not exclusive to particular factors. This suggests that maybe the contract provisions for uncertainty are strong or the parties involved have perhaps more acceptance towards these causes, and will lead to less conflict (Jelodar et al., 2015a). However the remaining causes load on to the following three factors which are renamed as; (1) technical performance; (2) constraints and ambiguities; and (3) team behaviour. The three extracted factors explain more than 67% of the variations in the data which is an acceptable range for the analysis (Child, 2006).

7.5.2 Analysis of Conflict Type

For evaluating the presence of functional and dysfunctional conflict PCFA is applied to Jehn (1992)’s seven scale item is modified for construction circumstances. The Cronbach’s alpha calculated by SPSS is 0.869 and acceptable for measure of internal consistency and is interpreted that around 87% of the variance of the score is true and reliable. This measure is of extreme importance especially when a scale of measurement is being tested (Cronbach, 1951; Hair, 2010). The measure is comparable to previous studies performed using this scale of measurement for conflict type (Amason, 1996; Loo, 2001; Plank and Francis, 2001; Toms, 2004). Correlated item-to-total correlation and Cronbach’s alpha if item deleted is examined; all items are suitable for conflict type measurement.

Similar to the previous section the P-value <0.001 for Bartlett’s Test of sphericity makes the factor analysis meaning full. The anti-image correlation matrix was also studied.
and all the values were relatively small and close to zero; thus underlying dimensions will exist and factor analysis is relevant. All measures of sampling adequacy on the anti-image diagonal were higher than 0.5 and valid. The KMO measure of sampling adequacy is 0.804 > 0.5; an indication that performing factor analysis is suitable for the dataset.

**Table 7.2: Conflict type Rotated Component Matrix**

<table>
<thead>
<tr>
<th>Conflict Scale</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Dysfunctional Conflict</strong></td>
<td></td>
</tr>
<tr>
<td>The personal friction between you and the opposing party</td>
<td>.931</td>
</tr>
<tr>
<td>The personality clash between you and the opposing party</td>
<td>.869</td>
</tr>
<tr>
<td>The anger between you and the opposing party</td>
<td>.771</td>
</tr>
<tr>
<td><strong>Functional Conflict</strong></td>
<td></td>
</tr>
<tr>
<td>The general differences of opinion between you and the opposing party</td>
<td>.120</td>
</tr>
<tr>
<td>The differences about the content of the decision between you and the opposing party</td>
<td>.311</td>
</tr>
</tbody>
</table>


a. Rotation converged in 3 iterations.

PCFA is performed via VARIMAX rotation and Kaiser normalization in SPSS. A two factor structure for conflict is derived and accepted for construction cases in line with previous literature on conflict nature (Jehn and Mannix, 2001; Toms, 2004). It is observed that the two factors account for an acceptable 71% variation in the data; hence the two factor solution seems appropriate (Child, 2006). Factor loadings are checked independently with associated communality of each item. The item “The disagreements over different ideas between you and the opposing party” was eliminated because it loads strongly to both factors. It also has the lowest extraction communality of 0.456 which is significantly lower than the other items in the scale. The item “The tension between you and the opposing party” is also deleted from the analysis because of its high factor loading for both factors. PCFA is performed once more with the exclusion of the eliminated items as illustrated in Table 7.2. The two identified factors fit in perfectly with the available literature associated with conflict type (Amason, 1996; Chen et al., 2014; Kumaraswamy, 1997b; Toms, 2004). Therefore the two factors can respectively named as dysfunctional and functional conflict.
7.5.3 Model Development for Multiple Regression Analysis (MRA)

After using PCFA for variable reduction, identifying conflict sources and measuring conflict type; an adjusted model linking sources of conflict, conflict type and relationship quality is achieved and demonstrated in Figure 7.3. This model is a modification of the hypothesis explained in the methodology section (see Figure 7.1).

The model demonstrates the association of the three identified sources of conflict with the two categories of conflict types and relationship quality. In order to test the adjusted model and assess their individual contributions and dependencies using MRA; each of the model components should be treated as new composite variables also known as factor scales (Yiu and Lai, 2009). To achieve this, composite scales were calculated for each of the three conflict sources identified in Table 7.1. These composite scales were obtained by averaging the scores given by the respondents for each subgroup associated to these conflict sources. Two composite scales of conflict type were also developed according to the subgroups associated in Table 7.2. According to the adjusted model in Figure 7.3 and the derived factors scales a number of regression models are proposed to demonstrate the possible dependencies of the new composite variables (see Table 7.3).

The regression equations in Table 7.3 show the theoretical relationship between different components of the adjusted model (see Figure 7.3). In theory sources will affect
type of conflict and also the relationship quality of contracting parties in construction. Furthermore conflict type will also have a potential effect on relationship quality. In the following sections the model structures shown in Table 7.3 are analysed via MRA.

**Table 7.3:** Regression models for sources of conflict, conflict type and relationship quality

<table>
<thead>
<tr>
<th>Description</th>
<th>Regression model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between conflict sources and type (Model 1)</td>
<td>[ Y_{\text{functional}} = b_0 + b_1X_{\text{techni cal performance}} + b_2X_{\text{ambiguities}} + b_3X_{\text{team behavior}} + \varepsilon ] (1.1)</td>
</tr>
<tr>
<td></td>
<td>[ Y_{\text{dysfunctional}} = b_0 + b_1X_{\text{technical performance}} + b_2X_{\text{ambiguities}} + b_3X_{\text{team behavior}} + \varepsilon ] (1.2)</td>
</tr>
<tr>
<td>Between conflict type and perceived relationship quality (Model 2)</td>
<td>[ Y_{\text{relationship quality}} = b_0 + b_1X_{\text{functional conflict}} + b_2X_{\text{dysfunctional conflict}} + \varepsilon ] (2)</td>
</tr>
<tr>
<td>Between conflict sources and perceived relationship quality (Model 3)</td>
<td>[ Y_{\text{relationship quality}} = b_0 + b_1X_{\text{technical performance}} + b_2X_{\text{ambiguities}} + b_3X_{\text{team behavior}} + \varepsilon ] (3)</td>
</tr>
<tr>
<td>Between conflict sources, type of conflict and perceived relationship quality (Model 4)</td>
<td>[ Y_{\text{relationship quality}} = b_0 + b_1X_{\text{technical performance}} + b_2X_{\text{ambiguities}} + b_3X_{\text{team behavior}} + \varepsilon ] (4.1)</td>
</tr>
<tr>
<td></td>
<td>[ Y_{\text{relationship quality}} = b_0 + b_1X_{\text{functional conflict}} + b_2X_{\text{dysfunctional conflict}} + \varepsilon ] (4.2)</td>
</tr>
<tr>
<td></td>
<td>[ Y_{\text{relationship quality}} = b_0 + b_1X_{\text{technical performance}} + b_2X_{\text{ambiguities}} + b_3X_{\text{team behavior}} + b_4X_{\text{functional conflict}} + \varepsilon ] (4.3)</td>
</tr>
</tbody>
</table>

\[ Y = \text{Dependent Variable}, X_i = \text{Independent Variable}, b_i = \text{Coefficients}, \varepsilon = \text{Disturbance Term} \]

### 7.5.4 Dependencies of Conflict Sources and Conflict Type (MRA analysis of Model 1)

In the first step all assumptions of MRA are checked for both the individual variable and the variate to make sure the variables are in compliance with the analysis. First the relationship between dependent variable being functional conflict and conflict sources is assessed; demonstrated by model 1.1 (see Table 7.3). Then the same process of analysis is performed for dysfunctional conflict and the identified sources according to model 1.2 (see Table 7.3). The 109 independently obtained data points from respondents are included in the study. This suffices the independence of data assumption and indicates that there is sufficient number of observations for the three main independent variables identified (conflict sources); producing a ratio of 36:1 observations. The assumption of equal appearing intervals will allow for the 5-point Likert scale to be considered as an interval scale for the variables.
(Janssens et al., 2008) in this assumption an increase in scale is justifiable and proportional to the scale (Hair, 2010). Since the dependent and independent variables are products of the Likert the use of MRA can be justified; as similarly performed in different studies (Cheung et al., 2006a; Yiu and Lai, 2009). SPSS statistical package is used to conduct MRA and check preceding assumptions.

**Table 7.4:** Correlation Matrix of all variables included in MRA

<table>
<thead>
<tr>
<th></th>
<th>Technical Performance</th>
<th>Constraints and Ambiguities</th>
<th>Team Behaviour</th>
<th>Functional Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints and Ambiguities</td>
<td>.510***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team Behaviour</td>
<td>.396**</td>
<td>.132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional Conflict</td>
<td>-.050</td>
<td>.230*</td>
<td>.242*</td>
<td>.463**</td>
</tr>
<tr>
<td>Dysfunctional Conflict</td>
<td>.121</td>
<td>.151</td>
<td>.465**</td>
<td>.463**</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

The correlation between all the independent variables included in MRA is assessed; this is demonstrated in the correlation matrix of Table 7.4. All correlations are below 0.60 which is an indication that the problem of multicollinearity does not exist (Janssens et al., 2008). In order to have a better indication of multicollinearity, Variance Inflation Factor (VIF) is also examined; all VIFs are well below 3 therefor multicollinearity is not a problem for this study (Chatterjee and Hadi, 2013; Hair, 2010; Tabachnick and Fidell, 2012).

**Figure 7.4:** Visual illustration of normality for standardised residuals

(a) Histogram

(b) Q-Q plot
Residual (the difference between the observed and predicted values for the dependant variable) is used as the principle measure of prediction error. No pattern in standardize residual (ZRESID) and standardized predicted value (ZPRED) scatterplot is observed, therefore a randomness of the residuals is confirmed. This is referred to as the null plot indicating no pattern; therefore the linearity assumption is met (Hair, 2010). It also indicates that the relevant variables have been included in the model (Janssens *et al.*, 2008). The relative equal dispersion of the residuals also rules out Heteroscedasticity (Chatterjee and Hadi, 2013; Hair, 2010).

In regression analysis involving the least squares approach the standardized residuals should be normally distributed (Tabachnick and Fidell, 2012). The histogram and normal probability plot for these residuals are extracted and demonstrated in Figure 7.4 a, and b. Both visuals suggest the normality assumption is legitimate for the data set (Hair, 2010; Xiao and Proverbs, 2003). The Kolmogrove-Smirnov and Shapiro-wilk tests are performed on the standardised residuals, the significance level of the two tests are respectively 0.200 and 0.322 both greater than the 0.05 and confirming the null hypothesis and normality of the distribution (Janssens *et al.*, 2008; Norušis, 2011). Two outliers were identified based on the two standard deviations from the mean rule; their extreme values were assessed by observing the response trends of the data. After further checks inconsistency of response was exhibited and these outliers were excluded (Hair, 2010; Tabachnick and Fidell, 2012). The model is finalised and test statistics are calculated.

The same processes of data screening and diagnostic tests are performed for the construct of model 1.2 one (see Table 7.3); which includes conflict sources as independent variables and dysfunctional conflict as dependent variable. Similarly all assumptions of linearity, homoscedasticity, multicollinearity, normality were examined. However for extra assurance on Heteroscedasticity; Breusch-Pagan and Koenker tests are performed these tests
respectively exhibited a value of 2.156 and 3.213 and significance levels of 0.54 and 0.36 which were both greater than 0.05; reinforcing the null hypothesis of homoscedasticity (Janssens et al., 2008). All VIF scores were below 3, reinforcing the no multicolinearity assumption. Consequently all assumptions of MRA are met and confirmed. Due to limited number of independent variables (conflict sources) for both models 1.1, and 1.2 (see Table 7.3); in performing MRA all possible combinations of independent variables referred to as subsets have been tested (Chatterjee and Hadi, 2013). The best subsets with the highest $R^2$ are the ones with all the three conflict sources included in the regression equation (see Table 7.5).

As demonstrated in Table 7.5 all three identified sources have a significant relationship with functional conflict. However for dysfunctional conflict the only significantly and positive association is with the team behaviour source. The coefficients of determinations ($R^2$) exhibited are 0.234 for the functional conflict (model 1.1) and 0.272 for dysfunctional conflict (model 1.2). The low ($R^2$) is comparable to similar studies with the use of MRA (Amason, 1996; Plank and Francis, 2001; Toms, 2004; Yiu and Lai, 2009). In general for such studies where behavioural elements and human nature are investigated the $R^2$ is normally at a lower level (Chatterjee and Hadi, 2013; Hair, 2010; Tabachnick and

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>Regression statistics</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients(Beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$R^2$</td>
<td>$Adjusted R^2$</td>
<td>$F$-model</td>
</tr>
<tr>
<td><strong>Functional conflict</strong></td>
<td></td>
<td>.234</td>
<td>.211</td>
<td>10.463</td>
</tr>
<tr>
<td>(model 1.1)</td>
<td>Constant</td>
<td></td>
<td>2.023</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical Performance</td>
<td></td>
<td>-.385**</td>
<td>-.410**</td>
</tr>
<tr>
<td></td>
<td>Constraints and</td>
<td></td>
<td>.311**</td>
<td>.397**</td>
</tr>
<tr>
<td></td>
<td>Ambiguities</td>
<td></td>
<td>.379**</td>
<td>.403**</td>
</tr>
<tr>
<td></td>
<td>Team Behaviour</td>
<td></td>
<td>.311**</td>
<td>.397**</td>
</tr>
<tr>
<td><strong>Dysfunctional conflict</strong></td>
<td></td>
<td>.272</td>
<td>.251</td>
<td>12.831</td>
</tr>
<tr>
<td>(model 1.2)</td>
<td>Constant</td>
<td></td>
<td>.727</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical Performance</td>
<td></td>
<td>-.182</td>
<td>-.171</td>
</tr>
<tr>
<td></td>
<td>Constraints and</td>
<td></td>
<td>.139</td>
<td>.160</td>
</tr>
<tr>
<td></td>
<td>Ambiguities</td>
<td></td>
<td>.570**</td>
<td>.543**</td>
</tr>
<tr>
<td></td>
<td>Team Behaviour</td>
<td></td>
<td>.570**</td>
<td>.543**</td>
</tr>
</tbody>
</table>

**. Significant at the 0.01 level (2-tailed), *. Significant at the 0.05 level (2-tailed).
Fidell, 2012). It is illustrated that although functional conflict can manifest through any of the identified source, dysfunctional conflicts are more affected by team behaviour related sources.

**7.5.5 Dependencies of Relationship Quality (MRA of Models 2, 3 and 4)**

The next step is to observe the association of conflict sources and conflict type with relationship quality of contracting parties both individually and combined. The models tested in this section are models 2, 3, 4.1, 4.2, and 4.3 (see Table 7.3) where relationship quality is the dependent variable. After performing assumption verifications and diagnostic tests MRA is performed and results are documented in Table 7.6.

It is realized that conflict type explains more variations of relationship quality compared to sources of conflict. Model 2 (see Table 7.6) produces an $R^2$ of 0.590; however model 3 (see Table 7.6) which associates conflict sources only produces an $R^2$ of 0.268 which is significantly lower. In comparison with conflict sources conflict type is a better predictor of relationship quality among contracting parties.

In model 2 functional conflict is positively associated with perceived relationship quality, whereas dysfunctional conflict exhibits a negative relationship. Both conflict types are statistically significant at $p \leq 0.01$. On the other hand in model 3 (see Table 7.6) the only significant source of conflict as a predictor of relationship quality is team behaviour, which has a relatively strong and negative association with perceived relationship quality. Technical performance has a slight positive relationship with the dependent variable, in addition constraints and ambiguities have a slight negative relationship with the dependent variable; but none of the two latter sources are statistically significant in the current dataset.
### Table 7.6: Regression models with perceived relationship quality as dependent variable

<table>
<thead>
<tr>
<th></th>
<th>Model 2: conflict type</th>
<th>Model 3: sources of conflict</th>
<th>Model 4.1: effect with functional conflict</th>
<th>Model 4.2: effect with dysfunctional conflict</th>
<th>Model 4.3: combined effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficients</td>
<td>Standardized Coefficients</td>
<td>Coefficients</td>
<td>Standardized Coefficients</td>
<td>Coefficients</td>
</tr>
<tr>
<td>Constant</td>
<td>4.19**</td>
<td>4.74**</td>
<td>4.80</td>
<td>5.29</td>
<td>4.70**</td>
</tr>
<tr>
<td>Functional Conflict</td>
<td>.271**</td>
<td>.238**</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Dysfunctional Conflict</td>
<td>-.856**</td>
<td>-.840**</td>
<td>---</td>
<td>-.024</td>
<td>-.021</td>
</tr>
<tr>
<td>Technical Performance</td>
<td>---</td>
<td>---</td>
<td>.079</td>
<td>.072</td>
<td>.070</td>
</tr>
<tr>
<td>Constraints and Ambiguities</td>
<td>---</td>
<td>---</td>
<td>-.054</td>
<td>-.059</td>
<td>-.048</td>
</tr>
<tr>
<td>Team Behaviour</td>
<td>---</td>
<td>---</td>
<td>-.596**</td>
<td>-.536**</td>
<td>-.590</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.590</td>
<td>.268</td>
<td>.269</td>
<td>.591</td>
<td>.634</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>.582</td>
<td>.247</td>
<td>.240</td>
<td>.575</td>
<td>.616</td>
</tr>
<tr>
<td>F-model</td>
<td>74.71**</td>
<td>12.59**</td>
<td>9.366**</td>
<td>36.865**</td>
<td>35.061**</td>
</tr>
<tr>
<td>F-Change</td>
<td>0.052</td>
<td>80.543**</td>
<td>50.594**</td>
<td></td>
<td>(model 2)</td>
</tr>
</tbody>
</table>

* Significant at the 0.05 level (2-tailed)

** Significant at the 0.01 level (2-tailed).
It is observed that the combined models 4.3 (see Table 7.6) is the best predictor of perceived relationship quality among respondents and produces an $R^2$ of 0.634. In this model variables such as technical performance and constraints and ambiguities are insignificant variables. Although the inclusion of these variables increases $R^2$ statistically; they simultaneously reduce degree of freedom in the model resulting in a decreased adjusted $R^2$. Consequently the inclusion of these variables in the model is not beneficial for statistical inferences (Chatterjee and Hadi, 2013; Hair, 2010; Norušis, 2011). The best combined regression model for predicting relationship quality in the current data set would include team behaviour (conflict source), functional conflict (conflict type) and dysfunctional conflict (conflict type) as significant and independent variable. The final regression model is estimated with the inclusion of the aforementioned variables and presented by Equation 7.2:

$$Y_{\text{perceived relationship quality}} = 4.74 - 0.25X_{\text{team behavior}} + 0.26X_{\text{functional conflict}} - 0.75X_{\text{dysfunctional conflict}} + \varepsilon \quad \text{(Equation 7.2)}$$

The $R^2$ produced for the above model is 0.633 but the adjusted $R^2$ is at 0.623 with the F-value of 59.274. All regression coefficients and the F-value are significant at $p \leq 0.01$ indicating the model is a good predictor of perceived relationship quality. The value of adjusted $R^2$ is very close to the value of $R^2$ confirming that all selected variables in the model are appropriate, and the final model is valid since the predictability and generalizability does not change after adjustment of $R^2$ (Chatterjee and Hadi, 2013; Hair, 2010).

### 7.6 Discussion

The results from factor analysis indicate that the previously identified causes of conflict can be grouped in three broader categories or underlying factors. These three categories are identified as conflict sources and are respectively named, technical performance, constraints and ambiguities and team behaviour. Previously in Chapter 5
project uncertainty was also identified as a major source of project conflict; however the study shows that although uncertainty related cases may have a strong initial presence in project conflict they are not included in the final categorization of construction sources which affect relationship quality. One of the reasons could be that contract provisions have improved and respond to many of the destructive outcomes of uncertainties encountered in construction projects (Jelodar et al., 2015a).

The sources categorised in this study can only explain some of the variations in relationship quality. Therefore the study focuses on other events which may happen in a conflict situation, with a probable effect on relationship quality. By including Jehn’s (1992) conflict type scale and analysing the data through factor analysis, two major underlying factors are identified. The two factors capture both functional and dysfunctional conflict in construction cases. In order to find more explanation on how these conflict types are evolved; their link with the previously identified and categorised sources are tested through the application of MRA. A diverse variety of conflict causes arising from the three identified sources may lead to the manifestation of functional conflict; however dysfunctional conflict is closely linked with team behaviour source and the other two sources do not show significant contributions to dysfunctional conflict. The low $R^2$ of models 1.1 and 1.2 (see Table 7.5) indicates that a lot of variations in conflict type remain unexplored and other factors most probably will have effects on how conflict manifests.

The effect of conflict type without the original conflict sources was also tested on relationship quality and demonstrated by model 2 (see Table 7.6). An $R^2$ of 0.590 is observed which is significantly higher than the $R^2$ associated with conflict sources as independent variables (model 3). Accordingly conflict type can explain more of the relationship quality between the contracting parties then conflict source. To be specific both functional and
dysfunctional conflict as independent variables are tested in separate models 4.2, and 4.3 (see Table 7.6); the MRA analysis demonstrates that the model with dysfunctional conflict has a significantly higher predictive power with $R^2$ of 0.591 compared to $R^2$ of 0.269 for the model including functional conflict. This can provide further insight that the destructive effect of negative outcomes could be far more deterministic and damaging to a relationship compared to the constructive effect of a potential positive outcome in construction projects. It has been proposed that some amount of conflict can provide stability, and balance of power and resources. In this view new countervailing forces are considered beneficial and valuable to the relationship of contracting parties. This was first recognised by Assael (1969) as the constructive or functional conflict theory. It was picked up and also referred to in construction research, and the need to make distinctions between functional and dysfunctional conflict was emphasised (Chen et al., 2014; Kumaraswamy, 1997b; Robbins, 2009). This study empirically and statistically demonstrates a clear difference in origin, and also aftermath of both functional and dysfunctional conflict. However from a statistical point of view; team behaviour as the only source in combination with functional and dysfunctional conflict are significantly associated with relationship quality (see Equation 7.2).

Based on the findings strategies could be suggested to reduce problems occurring from the team behaviour related issues, which has the most destructive impact on relationship quality. According to previous construction literature, some of these strategies could be, constant monitoring of communication loops in preventing misunderstandings; use of illustrative and demonstrative workshops; advancing on a win-win perspective with appropriate and fair risk sharing mechanisms, appropriate training for controlling behavioural issues; curbing adversarial behaviour; and coordination of staff to ensure ethical behaviour of team members (Eriksson et al., 2009; Kumaraswamy et al., 2005c; Ling et al., 2014; Yeung et al., 2012).
7.7 Chapter Summary

This study via gathering data from real conflict cases has made some new empirical inference in the association of conflict sources, types and relationship quality. Three main sources have been identified for conflict in construction projects. These sources have been namely identified as technical performance, constraints and ambiguities and team behaviour. The study also confirms the presence of functional and dysfunction type of conflict using the available data set. It was identified that any of three identified sources may lead to the manifestation of functional conflict; however team behaviour is the only significant source associated with dysfunctional conflict. It is generally observed that type of conflict being functional or dysfunctional has a significantly stronger association to relationship quality of contracting partners when compared with the conflict sources. Therefore it could be said that although the causes of conflict and conflict source is important; how the conflict manifests and how it is handled is of more significance to construction relationships.

Dysfunctional conflict has the strongest negative association with relationship quality. On the other hand functional conflict has a positive but much marginal contribution to relationship quality. Therefore the best suggestion would be to prevent dysfunctional manifestation of conflict if the goal is to preserve relationships rather than encouraging functional conflict and critical discussions. Team behaviour as a source of conflict can provoke dysfunctional conflict and is the only conflict source with significant negative contribution to relationship quality. While the industry practitioners should keep an eye on all causes and sources of conflict and keep tracking them for the whole project period there should be more effort put into resolving behavioural issues if the goal is to have a more prosperous and healthier working relationship. Furthermore poor communication and misunderstandings, lack of team spirit, opportunistic and adversarial behaviour can have immense negative effects on relationship quality of the contracting parties.
8.1 Introduction

In previous chapters it was acknowledged that a variety of issues such as communication and reporting matrix, procurement strategy, clarity, education and training conflict, dispute and their handling mechanisms may affect relationships and its associated attributes. Based on the findings of Chapter 2, 6 and 7 it can be suggested that relational attributes, strategies and processes emplaced, and events such as conflict within project scope could be systematically intertwined. Events such as conflict and dispute incidents, and their handling strategy due to their impact on relationship quality, should undergo extensive scrutiny (Jelodar and Yiu, 2012b), which was fully acknowledged in Chapter 5. However due to the frequent occurrence and importance of incidents such as conflict and dispute it is vital to understand what could be the potential construct of a systematic framework involving conflict/dispute and relationship quality. Furthermore can relationship quality deterioration be seen as the systems failure in sustained relationships?
The current study will suggest and demonstrate a systematic framework representing the interactions of conflict and dispute events with the relationship quality of the parties involved; in addition system reliability theories are applied to model failure and relationship deterioration within the systematic framework. Although the framework focuses on conflict and dispute, this kind of systematic view could be applicable to other events in future studies.

General system theory is applied and a systematic framework is produced. Two different case studies are undertaken to represent the systematic framework; which verifies that changes in contracting circumstances and built environment culture can affect the layers of the system. Through system reliability theories a fault tree is derived within the framework. Consequently the progression of simple events into relationship deterioration as system failure could be formulized. The ability to have such indications about relationship quality may help increase performance alongside stirring sustainable procurement. Future studies can work on the component interaction of such systematic framework to construct a more practical and adequate system. Furthermore if empirical data is collected the systematic framework could be tested, and accordingly the importance and the contribution of different events to system failure become accessible.

8.2 Relational Approaches in Construction

In modern construction project procurement the goal is inspiring clients, consultants, contractors and suppliers to work together towards improving quality, lower costs, dispute mitigation, innovation, and sharing risks. The challenge is to overcome the project focused perception in the industry and advocate a more valuable relationship-based model (Love et al., 2002). A consensus exists that the current code of conduct and traditional procurement strategies accustomed with the construction industry are to a large extent responsible for the existing fragmentation and deficiencies (Love et al., 2002). However the industry has tried to make changes; collaboration and communication has been advocated; in addition early
involvement of experts and project participants in form of applying constructability concepts has been suggested (Jelodar et al., 2013a). Contracting methodologies have undergone major revisions and changes. A part from this the increase in construction industrialization is driving changes to business models and practitioners are realizing the value of long-term relationships (Bygballe et al., 2010).

Although relationships status is considered a key factor in developing and streamlining construction projects, there are major differences into how they are formed or enforced (Jelodar and Yiu, 2012a; Yeung et al., 2012; Zou et al., 2014). Some believe it is a gradual and organic development of trust, and commitment between parties which only endures in a significant period of time (Bygballe et al., 2010). However on the other hand there is a vision that relationships could be engineered in contractual and working arrangements. These two different perspectives plus the difficult nature of relationships in construction projects has produced a lot of confusion as to what elements may define or influence relationships. However agreed constructs for defining and evaluating relationships exists in marketing and business research. In these knowledge areas customer retention is important, thus the concept of relationship quality was introduced to provide an indication of relationship status between buyer and seller (Crosby et al., 1990).

As mentioned before in Chapter 2 similarly the movement of relationship preservation and sustainable procurement within the construction industry has started (Pheng, 1999). Consequently understanding relationships and their associated quality in different projects is essential. Parties with the ability to assess and monitor relationships will have better ability to plan, take pre-emptive or if necessary corrective actions in their relationships. In addition with the information on relationship quality in hand parties can also plan their actions based on their relational preferences. The basic idea is to observe the right quality of relationship and assign it to the right circumstance.
In this study relationship quality is associated with major attributes, strategies and actions that may be systematically interconnected with each other. It is known that conflict and dispute incidents are very common in construction and some even believe that they are inevitable; threatening the long-term relationship of project participants (Barnett, 1997; Cheung and Yiu, 2006). Conflict and dispute are triggered and manifested through a succession of events and dealt with thorough certain handling strategies; all of which will most probably have implications on relationships. Hence a systematic framework which demonstrates the interrelation between conflict, dispute, and relationship quality in construction projects could be envisioned.

**8.3 Relationship Quality in Conflict and Dispute Incidents**

Different models and structures have been suggested to conceptualize relationship quality making it applicable to different types of business relationships, however as indicated by Crosby et al (1990) the general consensus regards relationship quality as a high order construct with antecedents and outcomes. In line with this four different variable layers of triggering, antecedent, moderation and the outcome plus a constant layer of relationship quality determinants has been proposed in construction projects (Jelodar and Yiu, 2012b). Basic events initiating changes in relationship quality specify the triggering layer which can influence both the antecedent layer and relationship quality. for instance conflict and dispute causes could be included in the triggering layer since they affect relationships; even there handling and resolution styles most probably will affect the relationships (Gardiner and Simmons, 1992). The antecedent layer is a complex layer containing conflict represented by Pondy’s (1967) process model and ultimately dispute as illustrated in Figure 8.1. They are seen as important antecedents which mainly negatively influence relationship quality in construction Chaudhuri (1997, 1998).
Figure 8.1: The general systematic framework of relationship quality for construction

Ignoring or delaying the resolution of conflicts can have serious implications for present and future relationships of the parties involved in construction activities and projects (Bristow and Vasilopoulos, 1995). However component of the conflict process model; as part of the antecedent layer, can positively or negatively influence relationship quality. The framework in Figure 8.1 is all about the systematic influence of conflict/dispute events on relationship quality; hence the next layer of influence for relationship quality is the moderation layer which includes conflicts and disputes managing strategies (see Figure 8.1). Contrary to the previous layers the final layer is the outcome layer and is influenced by the relationship quality.

In this approach the bench mark relationship quality is dependent on variations of associated attributes. These attributes are included in the relationship quality (constant) layer of the framework (see Figure 8.1). Having conducted a thorough literature search trust has emerged as the most important relational attribute or component in construction (Ling et al.,
2014; Meng, 2010; Yeung et al., 2012). Trust is profoundly positive on relationship quality and it can also control opportunistic tendencies of different parties lending to a healthier relationship (Cox and Thompson, 1997). It is believed that collaboration coexists with communication under the umbrella of teamwork as another indicator of relationship quality. Che Ibrahim et al (2013) have advised that apart from leadership; trust, respect, and a single team focus; collective understanding; commitment from project alliance board; creation of single and co-located alliance team; and free flow communication were also means of achieving team integration. Without effective teamwork there will be deficiencies in joint understanding and planning which could compromise the relationship (Chen and Chen, 2007). Commitment through the top management and leadership should be injected and provoked in relationships (Bennett et al., 2006; Ling et al., 2014). Lack of commitment will reduce quality and organizations will suffer which could also be disastrous to relationships (Rahman and Kumaraswamy, 2004). Satisfaction has always been associated with customer retention in business environment (Crosby et al., 1990; Hennig-Thurau and Klee, 1997); however in construction parties should be satisfied with a series of elements which resemble performance. In fact (Yeung et al., 2007) have indicated that success in relational approaches such as partnering is heavily dependent on satisfaction with time and cost performance and top management commitment.

In addition some strategies and actions were also described to maintain and facilitate these main attributes resulting in better relationship quality; these strategies are sometimes confused with the original attributes of relationship quality. For instance sharing information and resources, fair risk allocation, win-win attitude, integrity, respectful behaviour, training, leadership support to incentivising the parties into collaboration are all example of such strategies (Bygballe et al., 2010; Ling and Li, 2012; Ling et al., 2014; Meng, 2010; Yeung et al., 2012).
8.4 Methodology

In order to demonstrate a systematic view of relationship quality the earlier framework presented by Jelodar and Yiu (2012b) is modified and disseminated as a proposed system for relationship quality. This generic system model for relationship quality in construction activities is justified via general systems theory which could be employed as a communication and translation mechanism for different areas of science and engineering (Blanchard and Fabrycky, 2011). The outcome system model is demonstrated via two case studies in the construction project conflict, dispute and contract arrangement settings. The cases are selected with different contractual arrangements to demonstrate the potential systematic change in the proposed generic model. For each of the cases a system framework is derived, this system framework is the basis for applying system analysis tools such as system reliability analysis, and ultimately a fault tree is developed to demonstrate the possible failure models of the two potential system frameworks. The Fault Tree Analysis (FTA) provides an indication on possible causes that may result in relationship failure in different working and contractual environments.

8.5 Model Conception: Systematic Approach to Relationship Quality

The framework of Jelodar and Yiu (2012b) demonstrates that a chain of events can influence relationship quality in construction projects. The focal point however is to identify a model that represents relationship quality in the best possible manner. In this framework the events of the first three layers will simultaneously affect each other in addition to the relationship quality and outcome layer; influencing attributes such as trust, teamwork, commitment and performance satisfaction. This forms the basic idea that a systematic concept may be suitable for this structure. The system mind set has different perspectives and interpretation. systems have been defined as an organized complex or unitary whole formed by the assemblage or combination of things or parts (Kast and Rosenzweig, 1970). It has also
been regarded as functionally related parts forming a unitary whole with the emphasis on functional relationships not just any procedure (Blanchard and Fabrycky, 2011). Hitchins (2007) believed that systems possess some degree of order and the fact that a discernible pattern or configuration exists. What is generally observed is that in systems generic theories; relationships, dependencies or interdependencies transpire among different components in order to serve a purpose.

Systems are identified with their components, attributes and relationships. Components are the basic parts of a system, attributes are the properties of each components and the system as a whole, finally relationships are the links between pairs of components; in order for the pair to operate as part of the whole and contributing to the system purpose. State is the situation of the system in a certain point of time which may vary during a period of time, and is highly dependent on system attributes and relationships. The observed changes of system state within a time frame exhibits system behaviour, and a set of system behaviours with their corresponding timing and sequence will create a process, it is vital to highlight that a process engaging one component may influence the process of another component (Blanchard and Fabrycky, 2011). The basic implication of this is that different concepts can be represented through a system or subsystems within broader systems (Blanchard and Fabrycky, 2011). In conceptual systems symbols represent the attributes of components, ideas plans, concepts and hypothesis.

8.6 Representing Relationship Quality Systems through Case Studies

The elaborated systematic framework suggests that unique models can be drawn for relationship quality in different construction project. The events of the first three layers associated to the system are variable, and are a function of the project conditions; whereas the relationship quality layer is constant throughout different projects and comprises of relational
attributes discussed earlier. In this section two cases are used to illustrate the different compositions of the relationship quality; summary of the cases are included in Table 8.1.

**Case one:** Although that any potential cause can occur and trigger conflict or dispute; some causes could be more probable according to the conditions of the project. For instance in the case of the highway project, part of governments and the client organization’s responsibility is to free all the lands for the root and also control the existing traffic. If the client or the government fails to do so, this may result in late availability of site and limitations in access which are project uncertainty related causes. Other causes may be due to rigid time constraints of the FIDIC contract associated with this particular case, thus disputes may arise which is more contract and process related, or even poor communication could trigger conflict because the contract is rather fragmented into design-bid-built procedures. Thus some causes are more probable then others as illustrated in the multi-layered system of case one (see Figure 8.3).

**Table 8.1: Case study description**

<table>
<thead>
<tr>
<th></th>
<th>Case one</th>
<th>Case two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project type</strong></td>
<td>Infrastructure- Ring Road Project</td>
<td>Commercial- Multi story</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Upgrading of 33.4 km of highway 14.2km of bituminous asphalt concrete surfacing 19.2km of new road 41 new structures, 6 flyover bridges, 23 pedestrian bridges, and 12 culverts.</td>
<td>Constructed of a pre-cast concrete structure with a substantial concrete shear core at the centre, 15-level, and 12 levels of office space Contemporary architectural design NZ Green Building</td>
</tr>
<tr>
<td><strong>Procurement strategy</strong></td>
<td>Design-bid-built</td>
<td>Design-Built</td>
</tr>
<tr>
<td><strong>Dispute resolution process</strong></td>
<td>Starts with Dispute Adjudication Board (DAB) then amicable settlement and the last resort is arbitration.</td>
<td>The proposed dispute resolution procedure of this contract starts with engineer review, then mediation if not settled, through dispute tribunal or arbitration.</td>
</tr>
<tr>
<td><strong>Project Size</strong></td>
<td>USD 67.25 million in the main contract for the road construction and USD 18.77 million In a supplemental contract.</td>
<td>NZD$120 million</td>
</tr>
</tbody>
</table>
For the antecedent layer the occurrence of both functional and dysfunctional conflicts are probable as well as claims and disputes. But as far as the moderation layer is concerned the contract has previously defined means of conflict management and dispute resolution. The events of this layer range from Dispute Adjudication Board (DAB) to amicable settlement or arbitration. However amicable settlement itself may be obtained through a variety of different methods (direct negotiation, the engineers recommendation, mediation and conciliation) (Totterdill, 2006); which may diversely affect relationship quality. The events in the layers may or may not occur; or several loops of the events may occur each time triggering different conflicts or disputes. Causes may trigger other conflict and dispute events at the same time or in different points of time in line with the discussion in the model conception.

![Systematic framework for case one](image)

**Figure 8.2:** Systematic framework for case one

**Case two:** Although like the previous case any cause of conflict and dispute may occur some causes are more likely to occur according to nature of project; such as technical problems due to complexity of design and construction, design errors, ambiguities, change orders, and lack of experience with the type of work performed. For the antecedent layer
functional, dysfunctional conflicts and disputes may occur. The contract conditions determine
the dispute resolution process in four general steps which is completely different with the
conditions mentioned in the previous case (see Table 8.1). A similar systematic illustration is
drawn for this case and is quite different compared to the first case (see Figure 8.4). The
systematic approach allows the practitioners to draw their unique system based on the events
that are most likely to happen in the related project. The framework provides a mean of
evaluation for relationship quality at each step of the project since most of the events
influential events are indicated in the corresponding layers.

![Figure 8.3: Systematic framework for case two](image)

8.6.1 The Application of System Reliability Analysis

Functions, tools and techniques available in general systems theory could also be
applied for better assessment and arrangement of the system framework. For relationships,
deterioration or failure can be regarded as an undesired outcome accordingly though the use
of system reliability analysis root causes of relationship deterioration could be identified and
assessed. Concepts such as quality, availability, safety, security, and dependability are closely
and deeply associated with systems reliability (Høyland and Rausand, 2009). Quality is
regarded as conformance to specification in satisfying the needs and reliability is the ability to continue this conformance via the developed system. Reliability could be seen as an extension of quality into a time domain. The best phases for reliability engineering are the conceptual and design phase of the system. Valid and reliable assessment of reliability will lead the way for better engineering of the system thus enhancing quality and operations (Hitchins, 2007).

The causal nature of risks analysis is predominantly accomplished by reliability techniques such as Failure Mode and Effect Analysis (FMEA); in addition Fault Tree Analysis (FTA). Høyland and Rausand (2009) defined the fault tree as “a logic diagram that displays the interrelationships between a potential critical event (accident) in a system and the possible reasons for this event”. FTA is suitable for analysing the relationship quality system because it allows the consideration of environmental conditions, human errors, normal events and also specific component failures. The fault tree can be either qualitative or quantitative and normally aims to; list the possible combinations of factors, errors, events, and component failures that may result in a critical event in the system. The Fault Tree Analysis (FTA) also helps to identify the probability of occurrence associated to a critical event during a specified time interval.

8.6.2 System Failure Models for Case Studies

After analysing the two mentioned cases it was established that the system framework for each case is a dynamic system which is influenced by a number of layers and their incorporated events; specific to the condition of each case. The failure of relationship quality system is defined as the failure of system components situated in the assigned layers of the system in balancing each other out in favour of a retained beneficial relationship to all sides. Conflict management and dispute resolution strategies in the moderation layer are
functioning to balance prohibit or moderate possible conflicts and disputes emerging in the antecedent layer which is in succession of initial events in the triggering layer.

System failure models such as Fault Tree Analysis (FTA) try to encapsulate and evaluate the possible failure of the system according to the components derived for each project discussed. FTA graphically associates and links the simple system components (basic events) to the system state or failure which is the top event. This graphical illustration is justified by logical symbolism called gates. In drawing the fault tree the top event is normally the system failure notion. Accordingly for this framework the top event would be deterioration of relationship quality. The fault tree for both of the previous cases is driven based on their unique system frameworks. Figure 8.5 shows the fault trees related to the mentioned cases. On the left side the sequence of events related to the triggering and antecedent layer with its association to relationship quality is logically mapped out. As a result the simple triggers that may affect relationship quality are linked to the top event. This side remains the same for both cases despite the fact that the probabilities of occurrence for these basic events are different in the two cases. The right side however is associated with the moderation layer; and due to differences in contract type and dispute resolution procedures of each case the fault tree logical mapping is completely different. This difference is clearly exemplified in Figure 8.5 by encircling the dispute resolution procedures related to the moderation layer of each case. The logical gates and standards used in the FTA model are also shown in Figure 8.5.

8.5.1 Model Conception: Emergence of Relationship Quality as a System

The key question is that does relationship quality exhibit any compatibility with the systematic preview mentioned in the previous section. The first step is to identify the possible components of relationship quality. This means to include the boundaries and constraints which may determine the components and the potential links of the model, and
conceptualizing the most appropriate fitted behaviours and processes for the system. In construction activities when a professional setting for collaboration is created such as a project charter, the potential parties begin to know each other even before initiation of actual work and a framework for relationships is formed. This framework is born and shaped through the local working environment, legal setting, and working culture of the project participants. The working culture will range from actual practices, procedures, and behavioural trends of the practitioners. Other constraints of the relationship framework are contract provision governing project work, and uncertainties of the project. When ultimately a contract is conceived the stage is set for a professional relationship, furthermore contracts can define basics of working relationships (Sako, 1992). This relationship framework can be formalized into a conceptual system as demonstrated in Figure 8.2, which is a progression of Jelodar & Yiu (2012b) framework into a system overview for relationship quality.

The system illustrated in Figure 8.2, clearly demonstrates the four main interactive layers of relationship quality framework. This framework also demonstrates the subsystems or other components in correspondence with the core system. For the working and collaborative environment provided by the construction projects, a sequence of events which are process, contract and behaviour related encompassed by uncertainty, may lend to conception of issues imposing relationship changes. These issues can commonly trigger possible conflicts and dispute and at the same time affect the manifestation of the conflicts in the antecedent layer (see Figure 8.1). Ultimately it can determine the type of conflict/dispute resolution approach foreseen in most contractual agreements at the moderation layer. This chain of events as illustrated by the arrows moving towards the inner layers of Figure 8.2 determines the state of relationship quality at the core of the system. On the other hand events from the inner layers will also influence change to the other layers as demonstrated by the outward arrows in Figure 8.2. For instance the deterioration state of relationship quality can
trigger other misunderstandings and issues which ultimately can have more implications on relationships. The deterioration or improvement of relationship quality may also change the settings of actions and behaviour for better or for worse, thus influencing the components conforming to the antecedent and moderation layer as part of a systematic loop. This interpretation is more or less in line with Blanchard & Fabrycky (2011) systems definition mentioned previously and demonstrates that: 1) the properties and behaviours of each component in the set will affect the properties and components of the set as a whole 2) the properties and behaviours of each component of the set depend on the properties and behaviour of at least one other component in the set 3) each possible subset of components meets the two requirements listed above and the components cannot be divided into independent subsets.

Figure 8.4: The relationship quality system overview
Systems are also classified into static and dynamic, in static systems although there are structural components involved but due to absence of operating components, the state does not change. Unlike other physical or conceptual man-made industrial, construction and service providing systems the relationship quality system does not have retirement or phase-out, and positive or negative implications of relationships exists in a static mode. The level of interaction may vary but once the two parties are acquainted and begin work their relationship will begin to form and a quality could be associated with it. In addition a perceived and potential relationship quality exists all the time even when the parties are not interacting. The perceived relationship quality is relevant to experience and could potentially play as a driver or deterrent in future working relationships. Based on this perception relationships could even evolve during the static periods. During this period the influential factor on perception and ultimately the relationship quality will primarily be the party’s reputation because there are no direct interactions. Instead a dynamic system will display behaviour because the change of state takes place through a combination of structural components with operating or flow components. A static system normally serves as a useful component for a dynamic system. Therefore when interaction begins between the parties then the static mode of the relationship quality system changes and becomes dynamic. This is manifested through the interaction of its four main layers ultimately imposing different behavioural changes hence the system is dynamic during project interactions. As illustrated in Figure 8.2 the internal layers are born within the external layers but once the layers are born it does not mean that the previous layer dissolves or perishes. For instance when the antecedent layer and moderation layer are functioning during conflict manifestation and management, other triggers of conflict can initiate new conflicts or escalate the situation and directly change system state and behaviour; according to Jehn and Mannix (2001) conflicts have a dynamic nature.
8.5.2 Model Conception: Relationship Quality Synthesis

General systems theory is the advocate of interdisciplinary amalgamation or synthesis in favour of a greater whole which is the encircling system (Hitchins, 2007). Synthesis could be regarded as a communication and translation mechanism for different areas of science and engineering. Therefore the interactions of a system with other concepts are of great importance. For instance there is evidence that relationships can effect issues such as level of collaboration and communication (Meng, 2010). In Figure 8.2 the core system of relationship quality is shown to have implications on indicators such as productivity, quality, cost, time, safety and also constructability. Relationship variations may influence many factors, however the above-mentioned factors are of significance importance since they more or less define the overall performance of the project in question (Chan and Chan, 2004).

8.7 Discussion

Initially the generic system model was suggested and the adapted models were formulated for different cases and construction relationships according to their cultural, legal and contractual conditions. The logical setting and association of the FTA starts primarily with the fact that for any relationship to deteriorate an adversarial event is required and has the potential to turn into a conflict or dispute incident; in addition the problem must go unresolved. These events are linked and demonstrated in Figure 8.5, via an “and” gate to the top event. Figure 8.5 also shows that conflicts either directly arise from causes or from contract provisions and processes, in addition disputes are linked with conflicts or unaccepted claims. Causes in this section are also split into two new branches of project uncertainty related, also people and behaviour related each of these branches are associate with simple events which have been previously identified as common sources of conflict and dispute (Jelodar and Yiu, 2012a). The conditions of contract will dictate how adversarial event
should be resolved, as demonstrated in Figure 8.5 the two cases have totally different conflict management and dispute resolution strategies.

In case one indicated by Figure 8.3 the focus is basically on more informal and more effective dispute resolution methods whereas in case two illustrated by Figure 8.4, mediation is mentioned; but ultimately the dispute tribunal may get involved which can be devastating for relationships. Another issue with the fault tree model in Figure 8.5 is that some events and especially causes of conflict and dispute are more likely to occur in different conditions. As discussed for case one; late availability of site, limitations in access, time constraints, and poor communication are more probable to occur based on the nature the project. Accordingly the FTA model can illustrates the possible combination of causes and events that may lead to relationship deterioration in construction projects. Furthermore if the probabilities associated with each event of the fault tree are obtained the ultimate probability of system failure; in this case relationship quality deterioration could be obtained. The probability of the top event can be determined using probabilistic and mathematical tools within the fault tree framework. With reference to the FTA analysis performed and illustrated in Figure 8.5, the general relationship of the top event with its consecutive events can be formalized as follows (where X represents the occurrence on the certain event):
Figure 8.5: Fault Tree Analysis of the systematic framework of relationship quality
\[ T_{\text{top event}} = X_{\text{Disput Adversarial Events}} \cap X_{\text{Unresolved Problems}} \] (Equation 8.1)

Where:

\[ X_{\text{Disput adversarial event}} = X_{\text{Conflicts}} \cup X_{\text{Unaccepted Claims}} \] (Equation 8.2)

\[ X_{\text{Unresolved Problems for case 1}} = X_{\text{DAB Failure}} \cup X_{\text{Amicable Settlement Failure}} \cup X_{\text{Arbitration Process}} \] (Equation 8.3)

\[ X_{\text{Unresolved Problems for case 2}} = X_{\text{Engineer Review Failure}} \cup X_{\text{Mediation Failure}} \cup X_{\text{Arbitration Process}} \cup X_{\text{Dispute Tribunal}} \] (Equation 8.4)

The consecutive events of the FTA model (see Figure 8.5) are associated to the top event using the logical gates representing Union (And Gate) where \( A \cup B = \text{def} \{ x \mid x \in A \text{ or } x \in B \} \) or intersection (Or Gate) where \( A \cap B = \text{def} \{ x \mid x \in A \text{ and } x \in B \} \) as exemplified above. According to Figure 8.5 and the trend demonstrating the turn of events above, probabilities of each event can be acquired and allocated to the simplest events established at the bottom of the fault tree. In addition by using Birnbaum’s Measure of Component Importance the weights related to each cause of relationship quality deterioration can be determined (Andrews and Beeson, 2003; Cheung and Yiu, 2006).

8.8 Chapter Summary

Based on previous work and logical deduction a systematic framework for relationship quality has been suggested. It was shown that the current systematic framework is not a generalized structure which could fit all project types. The framework has been adjusted to fit the events occurring during a conflict/dispute incident which are distributed in consecutive layers. The probability for the occurrence of certain causes of conflict and dispute as part of the triggering layer will change due to the project type. It was also demonstrated that the conditions of contract can have a defining effect on the moderation.
layer of the systematic framework by identifying the procedures of conflict management and dispute resolution in their content. Consequently type of project, contracting arrangement and build environment culture determines the systematic framework of relationship quality for different projects.

Fault Tree Analysis of the identified system can shows the possible combinations of components, causes and events which could lead to system failure and relationship deterioration. The probability of failure based on the occurrence of each event could also be calculated. The FTA can also be employed as a monitoring tool for relationship quality in different circumstances. The ability to have such indications about relationship quality may help increase performance alongside stirring sustainable procurement. The basic idea is to find out what possible circumstances and events may lead to relationship failure. The other issue is to make best decision, either to take preventive or amendment actions to keep and maintain relationships, or should the relationship be broken.

In this study relationship quality is seen in a systematic cycle with components included in conflict/dispute incident. Other components with potential influence on relationships have not been included in the scope and require further research. The article is a suggestion for future research in the domain of relationship quality; via the application of general systems theory and system reliability theory. The selected cases were used to identify how different contractual arrangements can influence the system failure model. However further data needs to be collected to empirically test the model.
Chapter 9
Conclusion and Recommendations

9.1 Research overview

This doctoral thesis was written to report an investigation of relationship quality in construction projects. The study of relationship quality is conceived essential for construction projects and the current research and practice are continuously emphasising the significance of contractual relationships on project outcome. The previous trend of research was to focus on the contractual aspects as a relationship source; but relationship quality as a concept is associated with attributes reflective of relationship nature among contractual parties regardless of contracting methodologies. Relationship quality has been used as an informal tool of evaluating relationships in different human interaction, especially in marketing and business studies where the focus is on the buyer-seller dyad. Thus it can deliver valuable indications on how relationships are perceived, judged and managed within construction projects. The study will offer new perspectives and classifications of theories which can be further investigated and contribute to the construction management body of knowledge.

This chapter is dedicated to disseminate and classify the major findings of this study. Initially the achievement of the research objectives listed below has been discussed in the logic presented by the thesis. The research intended to:

1. identify and conceptualize the possible attributes associated with relationship quality in construction projects,
2. evaluate how relationship quality is perceived and judged among construction practitioners based on the identified attributes,

3. identify and compare patterns of relationship quality judgment within industry professional groups.

4. identify the general causes of conflict and their implications on relationship quality in construction contractual setting

5. evaluate how relationship quality and its associated attributes are affected by the causes of conflict

6. determine the consequent effect of conflict sources and conflict type on relationship quality of the contracting parties, and

7. derive recommendations for future research.

The discussions initially identify the links between the findings and how they led to the accomplishment of research objectives. Furthermore two separate sections are included to discuss research contribution to construction management theory and practice; hence emphasizing the key conclusions and findings. In the final section the research limitations are acknowledged.

9.2 Objective development

In achieving Objective 1, a framework is suggested which classifies concepts and factors identified in different construction literature according to their roles in relationship quality development. The framework makes a clear distinction between actions, strategies and attributes of relationship quality. It is found through classified literature that in theory relationship quality is mostly attributed to trust, commitment and teamwork. It is also identified that certain actions and strategies are used to enhance relationship quality. The strength associated with these attributes in a contractual bond or working arrangement is a determinant of relationship status therefore can provide an indication of relationship quality.
Furthermore based on construction professional’s views in actual practice, performance satisfaction is also a considerable attribute of relationship quality. It is found that without satisfaction of the other party’s performance the relationship becomes extremely vulnerable.

However these identified attributes have some fundamental differences; for instance trust cannot be enforced or mandated; instead it requires time and observation to be established. Commitment however is seen within the organisational structure which means it can be enforced through the senior management of different contracting organizations. Individual commitment to the organisation and the working arrangement is also important but since the corporate level holds the real power it can only be mandated through them. Teamwork requires training and synchronisation both at cultural and organisational level; accordingly the different parties in construction projects can learn to work coherently together with a joint initiative or charter. Performance satisfaction is observed throughout the working arrangements and has different tangible indicators. These lag or lead indicators are to some extent measurable; therefore have a rapid and direct influence on relationships.

Consequently different strategies are identified which can assist in relationship development either through enhancing the aforementioned attributes or directly improving relationship quality. The main identified strategies for the framework are (1) Individual and attitude modifications, (2) Procurement strategy, (3) Clarity and joint goal formulation, (4) Joint evaluation, problem solving and continuous improvement, (5) Sharing culture and win-win approach, (6) Education, Training and culture synchronization, and (7) Incentivising and power. Each strategy is achieved through a bundle of planned actions. However in practice such theoretical and coherent structure is not applied because construction professionals and organisations lack awareness of such conceptualisations. Often construction parties will selectively apply some of the identified actions or a remote strategy without identifying what
attribute they are pursuing or what is the ultimate relationship quality that they are aiming to achieve.

Since all attributes are not developed at the start of contractual relationships, some of these actions and strategies can be applied to facilitate their achievement and different levels of relationship quality. The higher levels of relationship quality will require more planning and strategizing, and is achieved by executing a combination of strategies. Therefore it is found that for higher levels of relationship quality more effort is required to orchestrate a series of actions and achieve the intended level. At the same time more flexibility in the contract is required to implement these actions and strategies. At lower levels of relationship quality problem solving is governed by the contract since the relationship does not have the capacity to host collaborative and informal problem solving. It can be concluded that at higher levels of relationship quality flexibility and freedom of actions is required; thus contract provisions and adequacy have a marginal role in governing the relationships. But on the other hand at lower levels of relationship quality contract adequacy becomes important because informal approaches have no place to solve occurring problems.

Based on the proposed framework five levels for relationship quality is recognized and conceptualised namely as transaction level, action level, strategy level, attributes level and relationship level. Each of the levels requires certain amount of effort which is constrained by a degree of contract adequacy. The model demonstrates that as the level of relationship quality ascends from a fully transactional level to a fully relational level, less contract adequacy is required while effort of achievement has to increase.

Ultimately trust, commitment, teamwork, and performance satisfaction were considered as the four main attributes of relationship quality. However in achieving Objective 2 it is found that while all the chosen attributes are important in judgment, more value is
given to performance satisfaction for evaluating relationship quality. Detailed analysis shows that in fact three main diverse perceptions in trade-off and judgment of relationship quality attributes exist among industry participants. None of these perceptions are dominant but in the most popular perception the influential attribute in judgement of relationship quality is performance satisfaction; followed by commitment, teamwork and trust respectively. However a significant and radically different judgement perception exists with trust and teamwork being the main influence on judgement. A third perception was also identified with trust as the main criteria in relationship quality judgment; however performance satisfaction and teamwork were equally important in this perception. It is found that the judgement of relationship quality in construction is not unanimous and different perceptions with diverse decisive attributes exist.

In order to fulfil Objective 3, variations of relationship quality judgement models are observed among industry professional groups. Consequently two underlying dimensions for classifying these judgement models were proposed. Dimension one is named effort of achievement since it is mainly explained by effort consuming attributes such as trust which is also intangible. The second dimension is named tangibility since it is explained mainly by performance satisfaction and teamwork which are tangible in comparison to the others. Based on the findings it is observed that clients are the most demanding group in relationship judgement. They demand both maximum effort and also tangible results when judging their relationships with others. Younger less experience industry participants are more effort driven and use maximum trust in judging relationships. On the contrary practitioners working on large-scale projects such as civil engineering and industrial, tend to judge relationship quality with tangible attributes. Managers however associate similar and more equal values to each attribute.
As mentioned in Chapter 1, many project events will affect relationship quality therefore as part of Objective 4; the effect of conflict events on relationship quality is assessed within a contractual setting. Three common sources of conflict and dispute were recognised and categorised based on the identified causes of conflict in real cases; these sources are respectively named as “project uncertainty”, “contract and process”, and “people and behaviour issues” (see Table 5.1). In addition causes of conflict are classified and associated with each of the sources recognised in the study. These causes are; (1) environmental issues and weather; (2) site conditions, limitations, and access restrictions; (3) technical problems due to complexity of design and construction; (4) availability of resource; (5) delays in payments; (6) time constraints; (7) delays in work, possessions and site equipment; (8) design errors, ambiguities and change orders; (9) contract documents ambiguities; (10) inappropriate risk sharing; (11) quality problems; (12) Opportunistic and adversarial behaviour; (13) Poor communication and misunderstandings; (14) Experience with the type of work performed; and (15) Lack of team spirit.

It is acknowledged that while the identified causes and sources may be the early triggers to conflict and dispute, they are not the ultimate triggers of adverse dispute resolution approaches such as litigation or arbitration which have devastating effects on project relationships. Opportunism and initial handling of conflicts can have major effects on the final conflict outcome and relationship quality. On the other hand contract provisions and contingencies plus evidence and reasoning are all vital determinants of conflict and dispute management; thus their implication, availability, or unavailability can either act as a mean of relationship retention or even as impediments to sustainable relationships. The study identifies a structure for conflict sources and their corresponding causes and conclusions have been made based on industry experience about their effect on relationship quality.
As part of achieving Objective 5, four attributes of trust, performance satisfaction, commitment and teamwork are found to have a statistically significant correspondence with relationship quality. The most significant attribute is teamwork in this study which has a stronger total effect than the other attributes. Moreover certain causes of conflict are positively and negatively associated with each attribute.

The study suggests that the causes of conflict cannot explain all the variations in relationship quality attributes, thus other important factors should be investigated, especially what happens after the emergence of these causes. Causes such as Unavailability of resources; design errors, ambiguities and change orders; site condition limitation; and lack of experience are statistically significant and positively affect relationship quality and its attributes.

On the other hand causes such as contract documents ambiguities; inappropriate risk sharing; opportunistic and adversarial behaviour; poor communication and misunderstandings; and quality problems all have negative influences on relationship quality and its accredited attributes. This seems to be in line with the functional and dysfunctional theory of conflict mentioned in previous literature.

For Objective 6, underlying sources corresponding to causes of conflict are empirically assessed and identified. The sources are named as technical performance, constraints and ambiguities and team behaviour. The study also confirms the presence of functional and dysfunction type of conflict using the available data sets. It was identified that any of three identified sources may lead to the manifestation of functional conflict; however team behaviour is the only significant source associated with dysfunctional conflict. Therefore the sources and causes of conflict are not exclusively functional or dysfunctional in nature; but behaviour related causes have more potential in developing into dysfunctional conflict.
Empirical evidence demonstrates that type of conflict, especially dysfunctional conflict has a stronger association with relationship quality compared with conflict sources. This implies that although the causes of conflict and conflict source are important; but how conflict manifests into different types and how it is handled is of more significance to construction relationships. Dysfunctional conflict has the strongest negative association with relationship quality. On the other hand functional conflict has a positive but much marginal contribution to relationship quality. Team behaviour as a source of conflict can provoke dysfunctional conflict and is the only conflict source with significant negative contribution to relationship quality.

The findings of this study show that relationship quality can be built and evaluated through enhancing different attributes. This creates a different perspective of research and application in construction procurement and management. It is identified that different concepts, events, actions and strategies will influence relationship quality. Some of these events are consecutive and follow a chain of events which can be triggered and regenerated by each other. For instance causes of conflict can provoke conflict which goes through formal or non-formal problem solving actions and strategies. While these events are in process they can have personal and behavioural implications which can generate further dispute and a new cycle of events. These elements all have individual and simultaneous effects on relationship quality in a systematic and potentially dynamic way. Therefore as part of Objective 7 and for the purpose of future research systematic representation of conflict, dispute and relationship quality is proposed. System reliability theories identify the failure model in which relationship quality can deteriorate. Based on this failure model the impact and probability of different root causes of failure can be assessed and determined.

Overall this study has added to the way in which relationships are understood. The study shows that certain approach can be used to enhance the management of construction
projects by refocusing on key attributes associated to relationship quality. The focus is lifted from formalities and contractual structures and is put on the attributes closely linked with nature of project relationships. Distinctions are made between the attributes and how they are achieved through different existing strategies and actions. Accordingly distinct practical and theoretical contributions are derived which are more effective and tangible.

### 9.3 Theoretical Contribution and Recommendation

Certain features of this doctoral thesis have emboldened contributions of theoretical, technical and practical nature. The different methodologies used in this thesis, such as literature review; interviews; surveys and case studies has provided theoretical triangulation and stronger evidence based conclusions. The study has a multidisciplinary approach and merges theoretical frameworks from different disciplines; therefore a basis for importing new concepts and understanding new knowledge areas is founded. During the course of this study different classifications of theories and concepts have been produced. These classifications can create new constructs within the domain of collaborative approaches and also relationship quality which are rather unstructured for construction project interactions. The contributions of the study concerns a range of issues from the human and decision making aspects to the technicalities and process involved in construction projects. A summary of major theoretical contributions of the research is included here:

- Identification of trust, commitment, teamwork, and performance satisfaction as relationship quality attributes in Chapter 2.

- A framework and taxonomy of strategies and actions in achieving relationship quality and its associated attributes (see Figure 2.3).

- Demonstrating the different judgement and trade-off of relationship quality attributes among construction professionals (see Chapter 3)
• Identifying *effort of achievement* and *tangibility* as the underlying dimensions of the judgment within different groups of construction industry professionals (See Figure 4.8).

• Classification of the common sources and causes of conflict and dispute; 15 causes were identified and classified within the three sources of “*project uncertainty*”; “*contract and process*”; and “*people and behaviour issues*” (Table 5.1).

• The combined effect of reasoning, contractual provision and conflict causes on relationship quality is demonstrated (see Chapter 5).

• The association of the identified conflict causes on relationship quality and its attributes is presented via empirical evidence (see Chapter 6).

• The negative and also positive effect of conflict events through their causes is illustrated (see Chapter 6).

• The underlying construct of conflict causes and conflict type is identified. Hence three sources of *technical performance, constraints and ambiguities* and *team behaviour*; in addition to the presence of both *functional* and *dysfunctional* type for conflict has been observed (see Table 7.1 and 7.2).

• The association of conflict sources and type with relationship quality is discussed (see Chapter 7).

In the framework of relationship quality attributes of Chapter 2, a distinction has been made between actions, strategies and attributes which can enhance relationships (Figure 2.3). The framework suggests that parities achieve different attributes through the appropriate application of seven distinct strategies which are supported by specific actions. Accordingly certain relational goals can be engineered and achieved through these strategies by the contracting parties. The study suggests five relationship quality levels based on the amount of
application given to the framework’s components. In theory applying only discrete and unstructured actions identified in the framework will produce a lower level of relationship quality compared to a more structure outcome which is supported by strategies and further relational goals. Hence five levels from transactional to relationship level are created and theoretically more effort has to be incorporated in order to achieve higher levels of relationship quality. On the other hand greater levels of relationship quality will have more informal mechanisms specially in problem solving, thus less formality and contract adequacy is required (see Chapter 2).

This study indicates that there is diversity of opinion about the value of each relationship quality attribute (see Chapter 3). In general performance satisfaction is seen as the most valuable attribute; but there is no absolutely dominant trend of judgement which can represent the industry’s opinion towards relationship quality. For instance a relatively large cluster regard trust as there prime attribute for relationship quality. This adds to the theoretical complexity and how different industry groups trade-off these attribute in making decisions regarding relationship quality. It is also acknowledged that the absence of trust, performance satisfaction and teamwork is more destructive to relationships compared to the enhancing effect of that their presence. The importance index of relationship quality attributes by industry groups demonstrates that different patterns of judgment exists, however the variations of relationship quality judgement model is not as extreme as the variation between the identified clusters (see Chapter 4).

The use of conjoint analysis has generated utility values for all relationship quality attribute levels which could be used as a benchmark judgment model. Consequently the evaluation of any potential relationship scenario using the benchmarks set by these utility values becomes achievable. If appropriate information on the four identified attributes is
acquired a measure of relationship quality could be assigned and scaled within the established judgment model range (see Equation 3.1).

Common sources of conflict and dispute have been classified. However there is a difference between causes which trigger conflict and causes which ultimately lead to dispute (see Chapter 5). Furthermore the underlying factors associated with causes of conflict have been empirically extracted. Thus the professionals could classify their conflict according to technical performance, constraints and ambiguities and team behaviour related factors which are assumed as sources of conflict (see Chapter 7). Time of conflict manifestation and identification is also key to the outcome of conflicts and relationship quality. The earlier occurrence of conflict can make it easier for the parties to reach an agreement or settlement. Accordingly further investigation and identification of time associated with initial triggers to a conflict incident, and time of conflict manifestation could be useful in reducing the impediments to sustainable relationships in construction projects.

By empirical evidence it is illustrated that the causes of conflict do not necessarily have adverse effects on relationship quality. For instance unavailability of resources; design errors, ambiguities and change orders; site condition limitations are statistically significant and positively affect relationship quality and its attributes (see Chapter 6). These causes generally explain a marginal amount of variations in relationship quality therefore other events and circumstances have to be considered in explaining this variation which is also an area for further research.

However causes such as contract documents ambiguities; inappropriate risk sharing; opportunistic and adversarial behaviour; poor communication and misunderstandings; and quality problems all have negative influences on relationship quality and its accredited attributes. These causes are often people and behaviour related or at least element of human control is strongly present in them. As mentioned in Chapter 5 the most negative influence on
relationship quality is associated to people and behaviour issues. The findings are in line with the functional and dysfunctional conflict theory where it is perceived that conflict can inflict both positive and negative effects on project outcomes.

In Chapter 6 it is presented that all four attributes of relationship quality are statistically significant; however teamwork has the strongest statistical connection to relationship quality. Previously in Chapter 3 performance satisfaction had the highest importance index in relationship quality judgment by the contractual parties. Therefore it can be concluded that whilst different parties highly value performance in selecting contractual parties; what actually maintains relationships especially during events such as conflict is teamwork.

The study also confirms the structure and presence of both functional and dysfunctional conflict type (see Chapter 7). It further identifies that all conflict sources and therefore causes can be the origin of functional conflict; however in the case of dysfunctional conflict the significant contribution is from team behaviour sources which is a consistent trend in the whole thesis. Dysfunctional conflict can explain a significant amount of variation in relationship quality indicating its importance to relational outcomes.

The study recognises a systematic framework for conflict, dispute and relationship quality in construction projects. It is also perceived that relationship quality is dynamic in nature and constantly changes with different components and attributes. In chapter 8 systems reliability theories are used to model the effect of conflict events on relationship quality deterioration. The study suggests that such models can be driven for many potential events and concepts. Therefore further research is recommended to initially identify the detail components of the mentioned framework and empirically test them by gathering appropriate data. Secondly the systematic approach should be constructed and evaluated with different
combination of concepts effecting relationship quality to dynamically identify main functions of relational approaches in construction.

9.4 Practical contribution and recommendation

The use of construction expert opinion has provided a measure of validity and also contributed to the practicality of the research. The combination of theory and practice can provide a ground for certain managerial recommendation. In addition examination of actual conflict cases has enriched the study outcomes. The study has amalgamated different strategies and practices, and thus disseminated classified outcomes which can make the knowledge area more accessible to construction professions and create awareness of the discussed issues. A list of potential areas of awareness and further practical implications are created and discussed in the following:

*Over emphasised contractual-based relationship development:*

The construction culture, especially in New Zealand is more concerned to solve issues within the contractual framework and the preference is to develop contractual strategies and provisions for higher relationship quality in different circumstances; entailing a more formal approach to problem solving and relationship development. For these professionals clarity and transparency in work and contract is of ample importance. It can be deduced that although with relational approaches problem solving is less formal and more flexible outside the contract; the necessary skills or competency to execute such mechanisms is not held by the contracting parties. Therefore more emphasis should be given to informal practices; hence adequate teaching and training provided for the parties involved. It could also be suggested that an expert in informal methods of problem solving and relationship management should be involved early on in the project. These experts could be official mediators, negotiators,
arbitrators or experts how have experience in problem solving outside the formal adjudication and litigation processes.

**Strategies for relationship development**

The study has classified specific strategies which practitioners can use in developing relationship quality in their projects. Some examples of these strategies are joint problem solving, benchmarking and continuous improvement. Another issue is moving towards early elimination of conflict which will potentially enhance the relationship quality among contractual parties who value performance satisfaction in relationships. Consistent objectives and mutually agreed goals, risk sharing, incentives, setting regular meeting and communication links can boost relationship quality among contractual parties who value teamwork and commitment. Finally attitude modification, clarity, win-win mind-set and curbing the opportunistic nature of human interactions could increase trust and potentially improve relationship quality. In addition certain actions as components of these strategies have been identified (see Chapter 2). Since different judgement trends exist; different parties should have some knowledge of the other party’s relational tendencies or judgment model. Accordingly by applying the appropriate classified strategies for the identified relationship quality judgement model the chance of success in relationships improves significantly. For instance if some parties value performance satisfaction over other attributes then the chance of building stronger relationships with performance boosting strategies at least for short term is much higher than teamwork or trust building strategies.

**Difference in attribute nature**

The engineering notion of attributes denotes that with planning and effort attributes can be established which can further enhance relationships. However attributes such as teamwork and commitment are easier to mandate in comparison with trust which need more
time and observation. Performance satisfaction is a more tangible attribute compared with trust; since it has measurable lead or lag indicators for time, cost and quality. If construction industry practitioners understand these differences of nature it can empower them in selecting best possible strategies for different circumstances. If the goal is to build long term relationship the main focus should be on trust and much effort should be invested in trust building strategies. However in short-term; teamwork and commitment are much easier to achieve and performance satisfaction is more tangible than trust.

**The different perception of industry professional groups**

In judging and evaluating relationships the clients are the most demanding group. They demand both maximum effort and also tangible results when judging their relationships with others. Younger less experience industry participants are more effort driven and use maximum trust in judging relationships. On the other hand practitioners working on large-scale projects such as civil engineering and industrial tend to judge relationship quality with tangible attributes. Managers however associate similar and more equal values to each attribute (see Chapter 4). This knowledge of different judgment models associated with industry groups can be combined with the knowledge associated to the actions, strategies and relationship quality framework (Figure 2.3) and further provide practical managerial suggestions. For instance if it is known that one party values trust and teamwork over the other attributes in evaluating relationship quality, specific strategies which can strengthen these attributes could be applied to satisfy their relational needs in a more effective and efficient manner.

**Addressing claims and entitlements**

The study suggests that appropriate reasoning can neutralize the cause and solve most entitlement issues therefore prevent further claims in future. Alongside this if contract
provisions and contingencies are present the resolution process can be transparent and less problematic assisting in the restoration of contractual relationship (see Chapter 5).

**Understanding conflict type and avoiding dysfunctional conflict**

As discussed in chapter 7 conflict can be function with potential positive effects or dysfunctional with adverse and negative effects. Dysfunctional conflict has the strongest negative association with relationship quality and a much marginal contribution is observed from functional conflict. Thus preventing dysfunctional manifestation of conflict is much significant in relationship preservation than prospering from the constructive outcomes of functional conflict and critical discussions. Furthermore poor communication and misunderstandings, lack of team spirit, opportunistic and adversarial behaviour can have a strong negative effects on relationship quality of contracting parties.

**Behaviour is key to relationship development**

Team behaviour as a source of conflict can provoke dysfunctional conflict which is the only conflict source with significant negative contribution to relationship quality. While the industry professionals should keep an eye on all causes and sources of conflict and keep tracking them for the whole project period, more effort and training should be inputted into resolving behavioural issues if the goal is to have a more prosperous and healthier working relationship.

**The significance of causes and sources in conflict management**

In chapters 5, 6 and 7 the causes of conflict have been classified by different sources and associated with type of conflict and relationship quality. Through using the identified causes and sources of conflict based on the different classification and structures proposed in the thesis professionals can better predict the relational implications of functional or
dysfunctional conflict type. Therefore they can take more appropriate actions in restoring and enhancing relationships.

9.5 Research limitation

A study of relationships which is the product of human interactions within technicalities, uncertainties, contracts and codes of the construction industry is always challenging and complex. A discussion of possible limitations for this research has been included in the following:

An important limitation is the scope of the research. The study was based in New Zealand and is more or less a small industry under specific cultural influence. There are no available data that potentially can compare different construction cultures effect on relationship quality.

Four main attributes were assigned to relationship quality; this choice is limited based on the findings of literature, expert interviews and constraints of conducting conjoint analysis. However survey and interview respondents may find that other attributes or different constructed derivatives of these attributes should be assigned to relationship quality. The identified attributes are from recognised international sources and are by far the most cited and influential.

The research focuses on conflict in particular since it is inevitable in project interactions and has significant consequences on relationship quality. However other events and factors could also influence relationship quality which needs to be considered for relationships. Issues such as the market competiveness and availability of choices with their potential factors and latent variables could also influence relationship quality. Another issue in human interaction and relationships is the mental and emotional state of the parties. The consideration of such factors will require more social and psychological considerations in an extremely wider scope research between various disciplines.
As part of performing the conjoint analysis full profile approach is used because it allows for the rating of a smaller subset of profile combination, but on the other hand the interaction effects are not fully considered. However the method works well with limited number of attributes and three levels (Orme, 2010); nevertheless for better comprehension of interactions Choice Based Conjoint (CBC) approach would be a better option which needs a bigger scope of research (Janssens et al., 2008). The current conjoint tool may be used to simulate relationship quality status based on qualitative assessments of events in projects, however the simulation of competitive products are linked to rank-orders instead of probabilities of choice which is associated with the CBC approach.

Although in all statistical tests the minimum sample and response rate requirements have been met; the small size of the New Zealand construction industry restricts the number of respondents for different analysis. Due to the exploratory nature and complexity of the research the attributes of relationship quality were directly evaluated. The attributes were assessed during real conflict events to provide maximum validity of response however certain measures could be included or further developed to have more objective measurements. This will significantly add to the complexity and duration therefore was simplified in the current research.
Appendices

Appendix 1: Ethics Approval and Documentation
Appendix 2: Interview Schedule and Questions
Appendix 3: Literature and Citation Analysis for Chapter 2
Appendix 4: The criticality index for Chapter 2
Appendix 5: Conjoint Analysis Questionnaire
Appendix 6: Conflict and Relationship Quality Questionnaire
Appendix 1

Ethics Approval and Documentation

UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE

25-Jan-2013

MEMORANDUM TO:

Dr Tak Wing Yiu
Civil & Environmental Engineer

Re: Application for Ethics Approval (Our Ref. 8461)

The Committee considered your application for ethics approval for your project entitled Turning conflict and dispute into opportunity: enhancing relationship quality in the construction industry.

Ethics approval was given for a period of three years.

The expiry date for this approval is 25-Jan-2016.

If the project changes significantly, you are required to submit a new application to UAHPEC for further consideration.

In order that an up-to-date record can be maintained, you are requested to notify UAHPEC once your project is completed.

The Chair and the members of UAHPEC would be happy to discuss general matters relating to ethics approvals if you wish to do so. Contact should be made through the UAHPEC Ethics Administrators at humanethics@auckland.ac.nz in the first instance.

All communication with the UAHPEC regarding this application should include this reference number: 8461.

(This is a computer generated letter. No signature required.)

UAHPEC Administrators
University of Auckland Human Participants Ethics Committee

c.c. Head of Department / School, Civil & Environmental Engineer
Mr Mostafa Babaianjelodar
Dr John St George
Dr Ashvin Thambyah

Additional information:
1. Do not forget to fill in the 'approval wording' on the Participant Information Sheets and Consent Forms, giving the dates of approval and the reference number, before you send them out to your participants.

2. Should you need to make any changes to the project, write to the UAHPEC Administrators by email (humanethics@auckland.ac.nz) giving full details of the proposed changes including revised documentation.

3. At the end of three years, or if the project is completed before the expiry, please advise UAHPEC of its completion.

4. Should you require an extension, write to UAHPEC by email before the expiry date, giving full details along with revised documentation. An extension can be granted for up to three years, after which a new application must be submitted.
5. If you have obtained funding other than from UniServices, send a copy of this approval letter to the Manager - Funding Processes, UoA Research Office. For UniServices contracts, send a copy of the approval letter to the Contract Manager, UniServices.

6. Please note that UAHPEC may from time to time conduct audits of approved projects to ensure that the research has been carried out according to the approval that was given.
Consent Form (CF) for research participants
(This form will be held for six years)

Title of Project: Turning conflict and dispute into opportunity: enhancing relationship quality in construction industry

Name of researcher: Mostafa Babaian Jelodar
Degree: PhD in Civil Engineering
Department: Civil and Environmental Engineering
Research supervisor: Dr Tak Wing Yiu

I agree to voluntarily take part in this research study undertaken by Mostafa Babaian Jelodar. I have read the Participant Information Sheet (PIS). I understand the nature of the research and the basis on which I have been selected. I have had the opportunity to ask questions and have them answered to my full satisfaction.

- I understand that any participation in the research is voluntary and where my employer’s consent for my participation is required, my employer has provided an assurance that my participation or non-participation will not affect my employment status and relationship in any way.

- I understand that the raw data gathered during the data collection procedure will be kept confidential and stored securely without the access of any other party except the research team members for six years and will subsequently be destroyed by April 2018 by appropriate means.

- I understand the estimated time duration of the interview/survey questionnaire as stated in the PIS.

- I agree/do not agree for the interview to be audio-recorded.

- I understand that I may choose to have the recorder turned off at any time during the interview.
• I understand that any audio-recording or data collection done under my permission will be transcribed by the researcher himself without the involvement of any third party.

• I understand that I may request a copy of the raw data collected during the interview and/or the researcher’s transcription to be reviewed and edited as I wish and provide further feedback to the researcher if necessary.

• I understand the confidentiality of the research and any data collected from any employee and organizational member will not be disclosed to any other party even the organization authorities.

• I wish / do not wish to receive the summary of findings (please provide email if you wish to receive summary of findings).

• I understand that I am free to withdraw participation at any time, and to withdraw any data traceable to me up to two month after the data collection period.

Name ___________________________ Position ___________________________

Email ___________________________ Phone number ___________________________

Signature ___________________________ Date ___________________________

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 25-Jan-2013 FOR (3) YEARS REFERENCE NUMBER 8461
Participant Information Sheet (PIS)

Title of Project: Turning conflict and dispute into opportunity: enhancing relationship quality in construction industry

Name of researcher: Mostafa Babaeian Jelodar
Degree: PhD in Civil Engineering
Department: Civil and Environmental Engineering
Research supervisor: Dr Tak Wing Yiu

You are invited to participate in the above captioned research currently undertaken for a PhD study at the University of Auckland. The current research aims to address the issue of construction relationship quality in conflict and dispute incidents before and after resolution methods have been implemented. This is performed through a series of theoretical and empirical studies sourcing from state of the art body of knowledge and practical experience which ultimately strives to synchronize and integrate various disciplines of construction, engineering and management.

Project Description

The current research endeavours to conceptualize and derive a model for conflict, dispute and relationship quality of the contracting parties within the construction industry. Furthermore it will help clarify the importance of relationship quality between participants involved in construction projects. The study will try to determine the impact conflict handling and dispute resolution methods on the relationships of the parties involved. This will provide a better realization of the conflict, dispute and relationship quality system allowing the industry to strive towards enhanced relationships and better practice of problem resolution measure. In order to achieve this, the fulfilment of the following objectives is of extreme value:

- Identification of critical common causes of conflict and dispute.
- Develop and test a conceptual model of conflict, dispute and construction relationship quality.
- Examine the association of conflict and dispute with the quality of relationship in construction projects.
• To examine the relationship between conflict handling and dispute resolution methods respectively with manifested conflict and disputes in construction.

• To examine the effect of conflict handling and dispute resolution strategies on construction relationship quality.

• To test the framework of the findings with actual cases in industry.

• To disseminate the tested framework in a form of conceptual indices to industry

Your participation and feedback is of extreme value and importance for the achievement of the presented research goals. Your experience, knowledge and insight of the conflict and disputes in construction projects will provide the necessary data for the research to build its analytical approach and draw a conclusion for a relationship quality model, hence based on these merits you have been selected to take part in the current research endeavour.

The possible benefits that you may gain from participating in the current research are as follows:

• Your experience will be valued and satisfaction is achieved by sharing your experience as part of a research endeavour.

• You can discuss your opinion and in addition introduce valuable new ideas in order to change the current conflict management and dispute resolution processes.

• The results and possible models based on your contribution to the study will be classified into the body of knowledge of construction management strategies giving you a sense of pride, recognition and satisfaction.

• You will receive the findings, reports, results and perhaps the final model developed for this study which may assist you in your future construction practices.

• The interaction of you with academia and other industry members will provide you with more insight on your practices and trends of work.

Participation

Participation in the current research is completely voluntary and your employer has assured that your participation or non-participation will not affect your employment status and relationship in any way, in addition a written assurance has been provided by the employer authorizing your participation. Participation in the research requires going through the current Participant Information Sheet (PIS) and also a signed consent which is provided to you prior to the data collection process. The current participant information sheet defines the research process and the rights of participants during the data collection process and is to be read thoroughly by the participants. You may wish to receive a summary of the research findings following your participation in the research, if so contact details such as email and phone number are obtained through the consent form. Some of the questions in the interview deal with the responsibilities and underlying reasons behind conflict, dispute and relationship deterioration which may be sensitive issues to some organizations, however appropriate measures are taken to ensure total confidentiality.
Data collection

The research data collection process will include open-ended interview questions regarding the above mentioned research topic which you will be requested to answer according to your experience and knowledge on the research topic. The interview duration will be approximately between 60 to 90 minutes. I would like to audio-record the interviews with your permission. However you may request for the recording to be stopped at any time if you wish. The selection process for the interviews is generally based on experience and relevance of work to research among well-established New Zealand construction organizations and personnel.

Data Storage/Future Use

The recorded interviews will be stored electronically with no third parties and/or un-authorized access to the data. The recorded material will be transcribed by the researcher in person. The electronic material will be stored in password protected files on the university computer system. The consent forms and hard copies will be stored in a lock cabinet on the universities premises. The raw data will be stored for a maximum of 6 years after which it will be destroyed by the researcher in person by August 2018. Data analysis and discussions will be conducted by the research group (the researcher and the supervisors) in order to achieve research goals and also to provide better understanding of the quality of relationships in conflict and dispute incidents. This information will ultimately be used in the researcher’s final PhD thesis as well as any other research publication that the research team may produce and publish.

Participant Withdrawal

You as the primary participant, who the consent is obtained from, have the right to withdraw your participation at any time during the interviews. In addition you have the right to withdraw your participation even after the interview or survey has taken place, by informing the research team within a period of two months after the data collection.

You may request for a copy of the electronic recording files and/or transcriptions of the audio-recordings and will be given the opportunity to edit the recordings/transcriptions if you wish.

Confidentiality and Data Publication

All the information and data collected will remain confidential and will not be disclosed to any other party except the research team. No names will be mentioned in the final thesis and any other publications produced. In this regards to ensure that no body will be identifiable no corporation, organization or company name will be specified, in addition information such as the case or project’s date, place and title will not be disclosed to anyone. Any other third party named or identified in the data collection process will remain anonymous and will not be mentioned in any reports or publication. Because the employer has been approached for authorization and consent for your participation, the employer is the only person who will know you have participated in the interviews.

The researcher will notify you of the results and conclusions drawn from the collected data as well as any publications produced including information gathered from you based on your request.
Funding

The current research is funded by the University of Auckland’s Postgraduate Research Student Support Accounts (PReSS) in addition the researcher has been awarded the University of Auckland’s Doctoral Scholarship for three years.

Should you have any queries regarding this study you may contact:

Researcher: Mostafa Babaieian Jelodar
Mobile phone: +64 21 0764606
e-mail: mike0100@auranduni.ac.nz

For any queries regarding ethical concerns you may contact:
The Chair,
The University of Auckland Human Participants Ethics Committee,
The University of Auckland,
Office of the Vice Chancellor,
Private Bag 92019,
Auckland 1142.
Telephone: 09 373-7599 extn 83711.

supervisor: Dr Tak Wing Yiu
Mobile phone: +64 9 373 7599 ext: 83851
e-mail: k.viu@auckland.ac.nz

Head of department: Pierre Quenneville
Mobile phone: +64 9 373 7599 ext 87920
e-mail: p.quenneville@auckland.ac.nz

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 25-Jan-2013 FOR (3) YEARS REFERENCE NUMBER 8461.
UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE

15-Jul-2013

MEMORANDUM TO:

Dr Tak Wing Yiu
Civil & Environmental Engineer

Re: Application for Ethics Approval (Our Ref. 9219)

The Committee considered your application for ethics approval for your project entitled Development of a systematic model for relationship quality in the construction industry.

Ethics approval was given for a period of three years.

The expiry date for this approval is 15-Jul-2016.

If the project changes significantly, you are required to submit a new application to UAHPEC for further consideration.

In order that an up-to-date record can be maintained, you are requested to notify UAHPEC once your project is completed.

The Chair and the members of UAHPEC would be happy to discuss general matters relating to ethics approvals if you wish to do so. Contact should be made through the UAHPEC Ethics Administrators at humanethics@auckland.ac.nz in the first instance.

All communication with the UAHPEC regarding this application should include this reference number: 9219.

(This is a computer generated letter. No signature required.)

UAHPEC Administrators
University of Auckland Human Participants Ethics Committee

cc. Head of Department / School, Civil & Environmental Engineer
   Assoc Prof Suzanne Wilkinson
   Mr Mostafa Babaeianjeldar
   Prof Pierre Quennewille
   Dr Ashvin Thambyah

Additional information:
1. Do not forget to fill in the 'approval wording' on the Participant Information Sheets and Consent Forms, giving the dates of approval and the reference number, before you send them out to your participants.

2. Should you need to make any changes to the project, write to the UAHPEC Administrators by email (humanethics@auckland.ac.nz) giving full details of the proposed changes including revised documentation.

3. At the end of three years, or if the project is completed before the expiry, please advise UAHPEC of its completion.

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4. Should you require an extension, write to UAHPEC by email before the expiry date, giving full details along with revised documentation. An extension can be granted for up to three years, after which a new application must be submitted.

5. If you have obtained funding other than from UniServices, send a copy of this approval letter to the Manager - Funding Processes, UoA Research Office. For UniServices contracts, send a copy of the approval letter to the Contract Manager, UniServices.

6. Please note that UAHPEC may from time to time conduct audits of approved projects to ensure that the research has been carried out according to the approval that was given.
Title of Project: Development of a systematic model for relationship quality in the construction industry

Name of researcher: Mostafa Babaeian Jelodar
Degree: PhD in Civil Engineering
Department: Civil and Environmental Engineering
Research supervisor: Dr Tak Wing Yiu

You are invited to participate in the above captioned research currently undertaken for a PhD study at the University of Auckland. The current research via the synchronization of construction, engineering and management disciplines aims to address the issue of construction relationships quality in conflict and dispute incidents before and after resolution methods have been implemented.

Project Description
The current research endeavours to conceptualize and derive a model for the relationship quality of the contracting parties within the construction industry. Furthermore it will help clarify the importance of relationship quality between participants involved in construction projects. The study will try to determine the impact conflict handling and dispute resolution methods on the relationships of the parties involved and derive an empirical statistical model based on an elaborated conceptualization of previous literature. This will provide a better realization of the conflict, dispute and relationship quality system allowing the industry to strive towards enhanced relationships and better practice of problem resolution measure. In order to achieve this, the fulfilment of the following objectives is of extreme value:

- To develop and test a conceptual model of relationship quality
- To examine the association of conflicts and disputes with the quality of relationship in construction projects
- To examine the relationship between conflict handling styles and dispute resolution methods respectively with manifested conflict and disputes in construction
To examine the effect of conflict handling and dispute resolution strategies on construction relationship quality

Participation
Your participation and feedback is of extreme value and importance for the achievement of the presented research goals. Your experience, knowledge and insight of the conflict and disputes in construction projects will provide the necessary data for the current research questionnaire in order to build an analytical approach and draw a conclusion for a relationship quality model.

Participation in the current survey questionnaire is completely voluntary. Participation in the research requires going through the current Participant Information Sheet (PIS). The current participant information sheet defines the research process and the rights of participants during the data collection process and is to be read thoroughly by the participants. Since this is an anonymous online questionnaire there is no separate consent form and participation in this questionnaire is regarded as the consent to take part in the research.

Data collection
The research data collection process will include an online survey questionnaire regarding the above mentioned research topic which you will be requested to answer according to your experience and knowledge on the research topic. The questionnaire will take 10 to 15 minutes to be completed on average. The link to the questionnaire will be sent to you by email and if you choose to participate you can answer the questions. Please note that it will not be possible to later withdraw data as, because the survey is anonymous, individual data will not be identifiable.

Data Storage/Future Use
Personal details of respondents to the online survey are not required. Moreover, online data are encrypted, hence full anonymity of respondents is guaranteed and no withdrawal from the research is possible. The data will be kept completely confidential, with the electronic material stored in password protected files on the university computer system for 5 years after which it will be destroyed by the researcher in person. Data analysis and discussions will be conducted by the research group (the researcher and the supervisors) in order to achieve research goals and also to provide better understanding of the quality of relationships in conflict and dispute incidents. This information will ultimately be used in the researcher’s final PhD thesis as well as any other research publication that the research team may produce and publish.

Funding
The current research is funded by the University of Auckland’s Postgraduate Research Student Support Accounts (PReSS) in addition the researcher has been awarded the University of Auckland’s Doctoral Scholarship for three years.

Should you have any queries regarding this study you may contact:

Researcher: Mostafa Babaieian Jeledar
Mobile phone: +64 21 0764606
e-mail: mie010@aucklanduni.ac.nz
supervisor: Dr Tak Wing Yiu
Mobile phone: +64 9 373 7599 ext: 83851
e-mail: k.yiu@auckland.ac.nz

Head of department: Pierre Quenneville
Mobile phone: +64 9 373 7599 ext 87920
e-mail: p.quenneville@auckland.ac.nz

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09 3737599 extn. 83711. 2.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 15-Jul-2013 for (3) years, Reference Number 9219.
Appendix 2

Interview Schedule and Questions

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Structure and schedule of the interview

The interviews will be conducted in three different sections

- The general interview questions (30 to 40 minutes)
- The case specific interview questions (20 to 30 minutes)

The interviews will be performed in a minimum of 1 hour to a maximum of 1.5 hours.

First section: general interview questions (around 30 minutes)

1. Can you first give a brief background on your experience and the type of work that you have been doing in the construction industry?
2. What do you think defines a good quality working relationship in the construction industry?
3. What do you think generally causes deterioration in quality of working relationships? What are the main outcomes of good and bad quality relationships?
4. How often do you engage in disagreements with the other parties?
5. What is the main and most dominant cause of conflicts, claims and disputes in New Zealand construction?
6. Please explain what may be the roots of these causes of claims, conflict and disputes.
7. Which of the causes you mentioned are the most destructive to relationships?
8. Who do you think is primarily responsible for the occurrence of these causes?
9. If these causes happen how do you address them and if disagreement or conflicting interests arise how do you respond and show this disagreement and conflict normally?
10. How do you think this disagreement or conflict will affect your relationship with the conflicting party?
11. How often have you been in incidents which led to claims being made?
12. If claims are not accepted and disagreements and conflicts arise how do you show your disagreement to the other party?
13. Will you try to resolve the issue informally from the start or will you try the formal approach?
14. If conflicts are not claimed for or if claims are not accepted how would you try to settle the conflict?
15. In implementing the method what are your initial intentions?
16. If you use negotiation what style of negotiation will you try to implement?
17. Do you use mediation or other alternative dispute resolution techniques before trying a more formal or adversarial approach such as arbitration or litigation?
18. What happens if conflicts and claims escalate into disputes?
19. What is your preferred method of dispute resolution?
20. Which of these methods do you think is more relationship sustaining and which has the most adversarial influence on your relationships quality?

Second Section: Case specific questions around (20 to 30 minutes)

➢ Please provide information on one of your previous projects that you were involved (Preferred specifications needed for the each case):
  - Type of contract document (standard, FIDIC, or others)
  - Type of procurement method (traditional, construction management,…..)
  - Negotiation and other ADR methods were used (negotiation, engineer review, mediation)
  - Formal dispute resolution procedures also involved (adjudication, arbitration, litigation)

Timeline of events will be developed: plus the information gathering methods (interview questions + introduced sources)

  - What were the main sources, causes and triggering events of conflicts and disputes? How would you describe the scale of each conflict or dispute case?
  - Please describe the attitude relationship status and level of hostility of the parties involved in the conflict or dispute case?

The following information will be inserted in the developed timeline.

➢ How did you or your organization handle the conflict or resolve the disputed issue?
  - Please describe your initial and immediate response to the problem?
  - Please describe and provide a sequence of the process that you used for dispute resolution?
  - Please state how much each process was effective in resolving the problem.
  - Please describe how each process has affected the attitude and relationships of the parties.
  - Was a final solution derived? If so how was the problem resolved?
  - Please describe the relationship status of the parties after the final resolution.

All the information will be inserted in the developed timeline.
## Appendix 3

### Literature and Citation Analysis for Chapter 2

<table>
<thead>
<tr>
<th>Grouped attributes and Keywords</th>
<th>References</th>
<th>Citation</th>
<th>Unique citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment, Understanding each other’s commitment, Long-term commitments, Uneven commitment</td>
<td>Barlow, 1997; Black et al., 2000; Bresnahan &amp; Marshall, 2000; A. Chen et al., 2003; Cheng &amp; Li, 2001; Davis &amp; Walker, 2009; Kumarawamy, 2005; Ling, Ong, Ke, Wang, &amp; Zou, 2014; Liu &amp; Yang, 2007; Ng et al., 2002; Rahman &amp; Kumarawamy, 2004; Yeung, Chen, &amp; Chen, 2012</td>
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<td>16</td>
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<tr>
<td>Collaboration and teamwork</td>
<td>Bennett et al., 2006; Cheng &amp; Chen, 2007; Kafidors, 2004; Korfinuth &amp; Dikbas, 2002; Larson, 1997; Ling et al., 2014; Pryke, 2009; Rahman &amp; Kumarawamy, 2004; Wilson et al., 1995(Meng et al., 2011)</td>
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<tr>
<td>Communication, Open communication, Transparency and effective communication, Communication via the feedback loop</td>
<td>Bennett et al., 2006; Black et al., 2000; Bower, 2003; A. Chen et al., 2003; A. P. C. Chen et al., 2004; Cheng &amp; Li, 2001; Harper &amp; Bernold, 2005; Korfinuth &amp; Dikbas, 2002; Kumarawamy, 2005; Kumarawamy, 2005; Kumarawamy, 2005; Kumarawamy, 2005; Kumarawamy, 2005; Kumarawamy, 2005; Kumarawamy, 2005; Kumarawamy, 2005; Yeung et al., 2012; Palmeerevan et al., 2003</td>
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<td>Cooperation, Cooperation and communication</td>
<td>Allah, 2008; A. P. C. Chen et al., 2004; Korfinuth &amp; Dikbas, 2002; Palmeerevan et al., 2003; Palmeerevan et al., 2003; Yeung et al., 2012</td>
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<tr>
<td>Joint evaluation</td>
<td>Ng et al., 2002</td>
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<tr>
<td>Problem solving, Dispute resolution system, Conflict management</td>
<td>Bayramporgah, 2000; Bennett et al., 2006; Black et al., 2000; Bower, 2003; A. Chen et al., 2003; A. P. C. Chen et al., 2004; Kafidors, 2004; Larson, 1997; Ling et al., 2014; Meng, 2012; Meng et al., 2011; Nescim, 2003; Ng et al., 2002; Pryke, 2009; Wilson et al., 1995; Yeung et al., 2012</td>
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<tr>
<td>Continuous improvement &amp; benchmarking process</td>
<td>Bayramporgah, 2000; Bennett et al., 2006; Black et al., 2000; A. Chen et al., 2003; Cheng &amp; Li, 2001; Kafidors, 2004; Larson, 1997; Lu &amp; Yan, 2007; Meng et al., 2011; Nescim, 2003; Pryke, 2009</td>
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<td>Incentives, Performance incentives linked with common goals, Incentives and shared culture</td>
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<td>Power, Fairness, Equity and empowerment</td>
<td>Cox &amp; Thompson, 1997; Harper &amp; Bernold, 2005; Korfinuth &amp; Dikbas, 2002; Ling et al., 2014; Ng et al., 2002; Palmeerevan et al., 2003</td>
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<td>Risk allocation and sharing, Unfair risk and reward plan</td>
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<td>Resource sharing, Shared culture</td>
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<td>Win-win approach, Win-loose attitude</td>
<td>Bower, 2003; A. P. C. Chen et al., 2004; Palmeerevan et al., 2003; Yeung et al., 2012</td>
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<td>Flexible Attitude, Flexibility in contract</td>
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<td>Procurement strategy, (competitive tendering), Clear contracts</td>
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<td>Cultural issues, Compatible Organizational culture, cultural inertia</td>
<td>Eriksson, Aden, &amp; Nilsson, 2009; Ke et al., 2011; Kumarawamy, 2005; Luing et al., 2014</td>
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<td>Education and learning, Training, Client competencies and learning</td>
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<td>Experience in relational contracting</td>
<td>Cheng &amp; Li, 2001; Kumarawamy, 2005</td>
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<tr>
<td>Effective coordination</td>
<td>Cheng &amp; Li, 2001</td>
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<tr>
<td>Clear understanding of roles and responsibilities</td>
<td>Black et al., 2000; A. P. C. Chen et al., 2004; Ng et al., 2002</td>
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<tr>
<td>Respect</td>
<td>Korfinuth &amp; Dikbas, 2002</td>
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<tr>
<td>Personal change</td>
<td>Drexler Jr &amp; Larson, 2000</td>
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<tr>
<td>Integrity</td>
<td>Korfinuth &amp; Dikbas, 2002</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### Appendix 4
The Criticality Index for Chapter 2

<table>
<thead>
<tr>
<th>Criticality index (score scheme)</th>
<th>Example of express Language used the presence of attribute and its association to relationships</th>
<th>Example of express Language used lack of the attribute and its association to relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cannot be significantly associated; Not empirically evidential; little impact; may not be sufficient</td>
<td>----------</td>
</tr>
<tr>
<td>2</td>
<td>If occurs, helps avoid problems; A minimum level must exist; It is perceived that it will effect; Favourable to building; positive; Potential benefits</td>
<td>Might adversely affect; Defects; Unenthusiastic mind-set; Will not lead to enhancements</td>
</tr>
<tr>
<td>3</td>
<td>Common elements were; Influence; Lack of the attribute will effect; Would involve having; Is developed; Affect components; Showing and demonstrating the attribute; Leads to better; Will generate; Are based upon; Will help building ; Requires levels of; Contribute to; Improved efficiency; Conciliate; Correspond to; Represented by; More effective; Improved tendency; Benefits; Important advantage; Success in achievement will lead to expansion; Important in facilitating; In order to invoke; Will change the attitude</td>
<td>Negatively affects; Is negatively Associated to; Negative determinant; Lead to adverse effects; Will not develop; Threatens; Discourages; Will not facilitate</td>
</tr>
<tr>
<td>4</td>
<td>Is needed to build up; Characteristics of success in achievement; Is important; If developed leads to formation of; Important success factor; Underpins; Achieve outstanding results; Typically defined by; Important element of success; It is defined by, A powerful force that maintains; Characterized by; Built on a foundation; Can contribute significantly; High levels; Are prerequisites; Critical in initiating; Sound basis for achieving; Essentially provides; There is a need; Depends on</td>
<td>Leads to breakdown, Will potentially destroy; Highly problematic; Impediment to development; Deterring</td>
</tr>
<tr>
<td>5</td>
<td>Critical; Essential; Exclusive to the outcome; Highly important; Vital; Significantly correlated; Key elements of success; Key indicators; Requires as key indicators; Can only be achieved through; The most important elements; Core element, established principles, Defined by; The fundamental principles; Absolute reliance; Ultimately needed</td>
<td>Will significantly reduce, Will not form, Is impossible; Catastrophic effects; The biggest barrier</td>
</tr>
</tbody>
</table>
Appendix 5
Conjoint Analysis Questionnaire

A short questionnaire for judgment of the construction industry participants towards their working relationships* 1. What is your role in the construction industry?

- Client
- Contractor
- Consultant
- Other (please specify)

* 2. how much experience do you have in the construction industry?

- 0-5years
- 5-10years
- 10-20years
- more than 20 years

* 3. Under which sector have you performed the majority of your work?

- Public
- Private
- PPP

* 4. What type of construction work are you dominantly involved in?

- Building and residential
- Industrial
- Commercial
- civil engineering and infrastructure
- Other (please specify)

* 5. What is your profession in the construction industry?
6. According to your previous experience in construction projects, rank the quality of the 13 relationship scenarios with the hypothetical party illustrated below.

Rank the relationship scenarios from 1 to 13 (1 representing what you think is the best quality relationship and 13 representing what you think is the worst quality relationship). You can also drag the boxes into the position fit for your ranking.

- **Party A**: Trust is Unknown, Fairly Satisfied with Performance, Is Fairly committed, Moderate Teamwork
- **Party B**: Fairly trustworthy, Not Satisfied with Performance, Is Extremely committed, Moderate Teamwork
- **Party C**: Fairly trustworthy, Extremely Satisfied with Performance, Is Fairly committed, Poor Teamwork
- **Party D**: Fairly trustworthy, Extremely satisfied with Performance, Is Not committed, Excellent Teamwork
- **Party E**: Extremely trustworthy, Fairly Satisfied with Performance, Is Not committed, Moderate Teamwork
- **Party F**: Extremely trustworthy, Not Satisfied with Performance, Is Fairly committed, Excellent Teamwork
- **Party G**: Trust is Unknown, Not satisfied with Performance, Is Not committed, Poor Teamwork
- **Party H**: Trust is Unknown, Extremely Satisfied with Performance, Is Extremely committed, Excellent Teamwork
Party I: Extremely trustworthy, Fairly Satisfied with Performance, Is Extremely committed, Poor Teamwork

Party J: Trust is Unknown, Not satisfied with Performance, Is Extremely committed, Poor Teamwork

Party K: Trust is Unknown, Fairly Satisfied with Performance, Is Extremely committed, Poor Teamwork

Party L: Fairly trustworthy, Not satisfied with Performance, Is Not committed, Poor Teamwork

Party M: Trust is Unknown, Not satisfied with Performance, Is Not committed, Excellent Teamwork
Appendix 6

Conflict and Relationship Quality Questionnaire

Conflict and dispute formation

Please answer the following questions based on a previous or existing conflict or dispute case which you were or are involved in.

* 1. Please indicate the contribution of the following causes to your conflict or dispute?

<table>
<thead>
<tr>
<th>Cause</th>
<th>No contribution</th>
<th>Low contribution</th>
<th>Moderate contribution</th>
<th>High contribution</th>
<th>Extreme contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental issues and weather conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site conditions; limitations; and access restrictions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical problems due to complexity of design and construction</td>
<td></td>
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<td></td>
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<tr>
<td>Unavailability of resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time constraints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design errors, ambiguities and change orders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract documents ambiguities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inappropriate risk sharing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunistic and adversarial behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor communication and misunderstandings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of experience with the type of work performed</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Lack of team spirit

* 2. Please describe the conflict and dispute situation based on the following statements:

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>The anger between you and the opposing party</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The disagreements over different ideas between you and the opposing party</td>
<td></td>
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<tr>
<td>The personal friction between you and the opposing party</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The personality clash between you and the opposing party</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>The differences about the content of the decision between you and the opposing party</td>
<td></td>
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</tr>
<tr>
<td>The tension between you and the opposing party</td>
<td></td>
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<td></td>
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<tr>
<td>The general differences of opinion between you and the opposing party</td>
<td></td>
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<tr>
<td>The formal claims were made with formal documentation</td>
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<td></td>
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<td></td>
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<tr>
<td>The level of third party intervention</td>
<td></td>
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<tr>
<td>Feeling that the disputed issue could not be resolved onsite</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ability to mitigate the conflicted issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Please answer the following questions based on the status of your relationship immediately after the appearance of conflict or dispute

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Disagree Nor Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The performance of this contracting party is up to your expectations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At this stage I think I can trust this contracting party</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think this contracting party is committed to the work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good communication, collaboration and teamwork is still possible with the opposing party</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The relationship quality with the contracting party is positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Demographic questions**

4. How much experience do you have within the construction industry?

- [ ] Less than 5 years
- [ ] 5 to 10 years
- [ ] 10 to 15 years
- [ ] 15 to 20 years
- [ ] More than 20 years

5. In which sector do you mainly work in?

- [ ] Private sector
- [ ] Public sector
- [ ] Other (please specify)
6. What type of projects are you mainly involved in?

- Building and housing
- Maintenance and renovation
- Civil engineering
- Commercial buildings
- Other (please specify)

7. What is the line of work and role of your organisation in the construction industry?

- Contractor
- Client
- Engineer or Consultant
- Project manager
- Subcontractor
- Other (please specify)
Bibliography


Building Dispute Tribunal. (2014). from
http://www.buildingdisputestribunal.co.nz/
Bygballe, L. E., Jahre, M., & Swärd, A. (2010). Partnering relationships in
collection: A literature review. *Journal of Purchasing and Supply
measuring construction success. *Benchmarking: An International
Chan, A. P. C., Chan, D. W. M., Chiang, Y. H., Tang, B. S., Chan, E. H. W., &
Construction Projects. *Journal of Construction Engineering and
Management, 130*(2), 188-198.
Analytic Approach. *Journal of Business Research, 39*(2), 81-92. doi:
10.1016/s0148-2963(96)00144-0
Chaudhuri, A. (1998). Product class effects on perceived risk: The role of
doi: 10.1016/s0167-8116(97)00039-6
conceptual team integration performance index for alliance projects.


Construction Industry Institute. (1991). *In search of partnering excellence—special publication; 17(1)*


Harmon, K. M. J. (2001). *DRB: The power to cure*: The DRB Forum, 5(2)1-9


Educators Association (AUBEA), The University of New South Wales, Australia.


