

**DEVELOPING A FRAMEWORK TO AVOID DISPUTES
IN CONSTRUCTION PROJECTS:
A PERSPECTIVE OF PROJECT CHARACTERISTICS**

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Thesis submitted in partial fulfilment of the requirements for the degree
of Master of Philosophy

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March 2022

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Abstract

Disputes continue to exist in the construction industry for several decades and affect the cost, time and quality of the projects. Worse still, it results in severe consequences such as abandonment of projects and bankruptcy of contractors. This encouraged the construction industry to step towards dispute prevention with the viewpoint of the causes of disputes. It is evident that the root causes could be well addressed through project characteristics at the early stage of a construction project. Further, disputes are more frequent in project contexts such as large scale, highly complex and traditionally procured. In addition, the dispute avoidance strategies such as allocating fair risk contracts and team building could be related to the procurement method. Therefore, this study aimed at developing a strategic framework to avoid disputes in the Sri Lankan construction projects from the perspective of project characteristics.

A mixed approach was adopted where a questionnaire and projects which experienced disputes were surveyed to collect data. Initially, questionnaires were administered to a sample of 78 experienced professionals including quantity surveyors, project managers, adjudicators and arbitrators who dealt with disputes in construction projects. Subsequently, a total of 44 building projects which experienced disputes and referred to alternative dispute resolution methods of either negotiation or adjudication or arbitration were studied by referring to relevant project documents such as contract documents, project summary reports, arbitration and adjudication referrals, claims documents and other project correspondences. Additionally, semi-structured interviews were conducted among experts who involved in the resolution of disputes of the said projects. The data collected were analysed using descriptive statistics and content analysis.

The questionnaire survey offered 32 causes and 9 project characteristics which significantly contributed to disputes in general. Consistently, both questionnaire survey and detailed investigation into projects revealed that the salient causes of disputes are payment delays, ambiguities in documents, and scope changes while project characteristics that significantly contribute to disputes are the degree of design complexity, time constraints, procurement method, size of the project, type of client, site factors, standard form of contract, source of funding and project cost. In addition, the study revealed that the strategies such as drafting dispute resolution provisions in the contract, practice of negotiation, standing adjudication, proper documentation and early contractor involvement could minimise disputes in construction projects. The survey of projects revealed that payment delays can be influenced by the type of client, cost/size of project and source of funding while ambiguities in the document can be correlated with the standard form of contract. The research further offered that the scope changes are critical in projects where high design complexity, design & build procurement method and large scale are in place. The findings revealed that the dispute avoidance strategies of drafting dispute resolution clauses, practice of negotiation, provision for standing adjudication and proper documentation can be correlated to the use of standard form of contract whereas early contractor involvement and third-party review of design can be correlated to procurement method. Thus, the research recommends the project stakeholders to adopt appropriate avoidance strategies by giving due consideration to project characteristics of the given context.

Key words: Disputes, causes, avoidance strategies, project characteristics, relationships

Acknowledgment

This dissertation has been written at the Department of Building Economics, University of Moratuwa, Sri Lanka under the supervision of Dr. Thanuja Ramachandra. First and foremost, I would like to express my sincere gratitude to Dr. Thanuja for her thoughtful guidance and assistance in completing this research successfully.

I would also like to sincerely thank ChQS. Suranga Jayasena, Head, Department of Building Economics and Prof. Yasangika Sandanayake, Former Head of Department of Building Economics, for her support. Further, I owe my gratitude to Dr. Sachie Gunatilake, Research Coordinator, Faculty of Architecture and other academic and non-academic staff members of the Department of Building Economics who contributed significantly to the completion of this research.

I also would like to thank Prof. Srinath Perera, my Progress Review (PR) specialist. You are a true inspiration and I feel humbled and grateful for all you have taught me. Your interest and honest questioning have made my work better and your constructive feedback have made the journey more valuable.

I would like to further extend my gratitude to all the research participants. I appreciate your kindness in providing time to share your views and experiences. I am so grateful for your input into my research.

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ABBREVIATIONS

ADR- Alternative Dispute Resolution

CIOB - Chartered Institute of Building

CRCCI- Cooperative Research Centre for Construction Innovation

DAB - Dispute Adjudication Board

EOT - Extension of Time

FIDIC - International Federation of Consulting Engineers

RDA- Road Development Authority

SBD - Standard Bidding Document

SPSS - Statistical Package for the Social Science

CHAPTER ONE

Introduction

1.0 Background of the Research

Globally, the construction industry is showing substantial progress with the accomplishment of complex and fast-track projects. On the other hand, several projects have been experiencing conflicts and disputes due to its complex and competitive nature (Cakmak & Cakmak, 2013; El-Sayegh *et al.*, 2020). This is evidenced in the range of studies into disputes. For example, the probability of disputes in a complex and traditionally procured project is nearly 1.00 (Cheung & Yiu, 2006). In terms of causes, Saseendran, *et al.* (2020) has stated that lack of understanding and improper contract administration are the key factors which cause disputes in construction projects.

Disputes in construction projects differ in nature, magnitude, and its complexity. However, these disputes pose similar risks to the construction industry. They are expensive in terms of both cost and time, and they frequently harm the working relationships between construction partners (Farooqui & Azhar, 2014). On a different note, Kheng (2003) indicates that the construction disputes are highly technical and contain legal aspects, which necessitate specialized skills and documents as evidence. Thus, disputes result in lawsuits during the resolution process (Cheung & Yiu, 2006; Kassab *et al.*, 2010). Similarly, Cakmak and Cakmak (2013) state that prevention of disputes leads to the successful completion of projects. Further, Thobakgale *et al.* (2014) add that the client could experience a considerable loss of profit, or worse still, abandonment of the project could happen.

These range of negative effects stress the construction professionals to seek ways for proactive dispute management to prevent disputes at the earliest. McGeorge (2007) suggests that the likelihood of disputes significantly decreases if a pro-active environment is created. Similarly, the Australian Commercial Disputes Centre (2013) explains that the dispute management process which embraces developing

systems, approaches and skills enables to minimise disputes and managing them effectively to resolve them promptly, economically and without undue escalation. Taking the perspective of the causes of disputes, Davis (2007) contends that disputes may be discovered, assessed, and managed in order to either minimise or eliminate them in the future.

According to several researchers, the significant causes of disputes are payment delays, scope changes and incomplete or insufficient information (Cakmak and Cakmak 2013; Saseendran *et al.*, 2018; Illankoon *et al.*, 2019). However, the scope changes and payment problems can be attributed to the type of construction client. For example, most of the times scope changes in the form of design changes happen at the request of the client (Sinha & Wayal, 2013). Public projects which are fully funded by the government, frequently experience payment problems due to the commencement of projects before securing adequate funding (Francis & Ramachandra, 2014).

Further, inappropriate choice of procurement methods and partial risk allocation contribute to disputes from the procurement root of projects (Armes, 2011; Farooqui and Azhar, 2014; Khahro and Hussain Ali, 2014). As stated by Davis (2007), many of the sources of disputes initiate during the procurement process. Thus, the causes that take place at the beginning of a project include; tenders with insufficient information, inadequate design, poorly specified project schedules, unclear and insufficient documentation. The author further explains that these inadequacies are generally due to the insufficient time allocated for the designing and procurement process of a project. This would usually result in poor contract terms and improper documentation which in turn drive to disputes throughout the project.

Cheung and Yiu (2006) argue that disputes are inevitable in complex projects where traditional approach is used to procure the construction projects. Similarly, Mante *et al.* (2012) indicate that projects which procured traditionally experienced more disputes in project cost, payment, performance, time and negligence related issues. Mante *et al.* (2012) further explain that an increasing amount of disputes are raised in the projects which are procured traditionally due to its salient nature such as fragmentation, price competition, low degree of communication and sequential process.

In terms of the design complexity, Motsa (2006) states that in a complex project, more ramifications occur due to the short time allocated for design, numerous addenda take place and then lead to more errors. Considering the cost of the project, Hall (2002) states that large-scale projects involve more people, drawings, thoughts, and ideas thereby more errors could happen and subsequently cause disputes (Motsa, 2006). In line with this, Bassioni *et al.* (2012) mention that claims and disputes are frequent in large projects and can cause budgetary difficulties to employers and loss of liquidity to contractors. In addition, many authors suggest that acceleration due to the unrealistic expectation of clients could lead to disputes (Na Ayuldhya, 2011; Farooqui & Azhar, 2014; Love *et al.*, 2010; Cakmak & Cakmak, 2013). Thus, unrealistic expectations of clients can be attributed to the type of client and time constraints.

The foregoing indicates that disputes become a feature of every construction project. Failure to consider them could create minor issues that can escalate into huge issues that have drastic consequences for both the project and the participants involved. On the other hand, the causes of disputes could be addressed from the viewpoint of project characteristics. Thus, there seems the disputes are possible to manage by addressing its possible causes which contribute to disputes and adopting the dispute avoidance strategies in different project contexts at the initial stage of construction projects where project characteristics are visible.

1.1 Research Problem Statement

As suggested previously, disputes are common in the construction industry due to its complexity and multi-party involvement. Yiu and Cheung (2004) confirm that the growing construction disputes can lead to the disruption of construction schedules, increase project costs, affect relationships between project participants and even lead to project abandonment. Farooqui and Azhar (2014) emphasised that dispute becomes an inherent feature of the construction industry and in turn leads to unsuccessful projects. These situations encourage the construction industry to step towards dispute avoidance as per the proverb “prevention is better than cure” (Cheung & Yiu, 2006). To this note, Gerber (2013) describes that dispute avoidance offers many way to view and respond to the contributing factors of disputes than

previous approaches. Further, dispute avoidance measures such as allocating fair contract risk, team building, including dispute resolution clauses, the provision of a neutral arbitrator, and binding arbitration would enable preventing conflicts from escalating into disputes (Jannadia *et al.*, 2000; Gerber, 2013). In Sri Lankan context, a dispute avoidance model which categorises the dispute avoidance strategies in terms of stages of the project was developed (De Alwis *et al.*, 2016). Having a better understanding among all the project participants will make it possible to reduce and avoid disputes in the industry (Patresia, 2018). Most recently, Zhu and Cheung (2020) have concluded that allocating fair contract risk and teamwork are the most frequent strategies to avoid disputes in construction projects. Though many researchers have investigated ways to avoid disputes in the construction industry, disputes are still prevalent (El-Sayegh *et al.*, 2020).

On the other hand, Jaffar *et al.* (2011) indicate that the sources of disputes differ from one project to another due to the instinctive nature of disputes and characteristics of projects. If a construction project started with high risk, cost difficulties, delayed programmes, and lower quality, it would lead to disputes (Zhu, & Cheung, 2020). Cheung and Yiu (2006) found that the complexity of projects causes disputes in construction projects while the degree of complexity is one of the project characteristics which could directly influence disputes. Similarly, Na Ayuldhya (2011) and Love *et al.* (2010) state that unrealistic time targets lead to disputes, which can be attributed to time constraints. In addition, dispute avoidance strategies such as allocating fair contract risk and team-building could be controllable by the procurement methods. In line with this, De Alwis *et al.* (2016) identify the procurement method as a key factor considered in avoiding disputes. Thus, this seems that the disputes could be mitigated where possible by giving due consideration to project characteristics appropriately. However, there seems that no study has investigated the disputes from the perspective of project characteristics. Therefore, the current study re-investigates the causes of disputes and dispute avoidance strategies from the perspective of project characteristics and thereby avoids disputes in Sri Lankan construction projects.

1.2 Aim and Objectives of the Research

The research aims to develop a strategic framework to avoid disputes in the Sri Lankan construction projects from the perspective of project characteristics. The following outlines the objectives which the current study fulfils:

- 1) To critically review the causes of disputes, dispute avoidance strategies and project characteristics influencing disputes
- 2) To investigate the significant causes of disputes, project characteristics influencing disputes and dispute avoidance strategies practiced in Sri Lanka
- 3) To formulate relationships between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics
- 4) To develop a strategic framework to avoid disputes in the Sri Lankan construction projects from the perspective of project characteristics

To fulfil the aim and objectives of the study, the research has adopted the following methodology.

1.3 Outline of Research Methodology

The current study adopted a mixed-method approach which accommodated quantitative data primarily whereas qualitative to a certain extent. The proposed methodology, therefore, involved three key stages in the collection and analysis of data to address the set objectives.

- The first stage of the study involved a systematic comprehensive literature review to get an understanding of the theoretical background related to the subject area and to identify knowledge gaps. The literature review covered two main areas: the nature of disputes in the construction industry and project characteristics.
 - The review related to disputes included causes and effects of disputes, practices of dispute avoidance within the construction industry. The review has further focused on the project characteristics and its influence on disputes. Thus, the review identified the research gap and thereby established the aim and objectives of the research. The synthesis of the

review was enabled developing a conceptual framework to avoid disputes in construction projects from the perspective of project characteristics.

- In the second stage, the research carried out a questionnaire survey which targets to collect data from industry practitioners including legal professionals such as arbitrators and adjudicators, project managers and quantity surveyors who have experience in construction contracts and disputes.
 - Using this analysis, the research identified the significant causes which lead to disputes, dispute avoidance strategies practiced in the Sri Lankan construction projects and the significant project characteristics which influence disputes.
- In the third stage, a survey was carried out to collect project information/characteristics of the projects which experienced disputes.
 - Based on the survey data, the research investigated the causes of disputes and dispute avoidance strategies used in construction projects in Sri Lanka. Accordingly, the project characteristics attributed to those causes and strategies were also investigated to formulate the relationships. Finally, the research developed a strategic framework to avoid disputes in Sri Lanka from the perspective of project characteristics. The developed framework showcases the relationship between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics.

1.4 Scope and Limitations

The research focused on investigating the sources of disputes and dispute avoidance strategies from the perspective of project characteristics and thereby avoids disputes in the Sri Lankan construction projects. The data for the current study was collected through questionnaires administered among the professionals involved managing disputes in Sri Lankan construction projects; and a detailed investigation into Sri Lankan building projects which experienced disputes and referred to ADR methods. Both private and public projects which were completed during the period 2010-2019 were considered in the study. In terms of the cost of projects, small scale (<100Mn)

to large scale (>500Mn) were involved. Documentary review and semi-structured interviews were conducted to collect data from the selected projects.

1.5 Chapter Breakdown

Seven chapters comprised the body of this report. The first chapter contains an introduction to the research, which includes an explanation of the background, research topic, aim and objectives, research technique, and scope and limitations of the research.

The second chapter presents the results of a comprehensive literature review conducted in the study. The review presents the areas: project characteristics and disputes. The review of disputes includes causes and effects of disputes, practices of dispute avoidance strategies practiced within the construction industry. The review further focuses on the project characteristics and its influence on disputes.

The research design of the study is discussed in the third chapter, and the findings of the questionnaire survey and survey of projects are discussed in the fourth and fifth chapters, respectively. A discussion of the findings of the literature review, questionnaire survey, and survey of projects is presented in the following section: Discussion Chapter 6. The final chapter presents the conclusions and recommendations that have emerged from the study.

1.6 Summary

This chapter provided an introduction to the overall research project. The background information for the research was described first, and then the problem statement was presented. Then, this presented the aim and objectives of the research together with the proposed methodology which was adopted to achieve the said aim and objectives. Moreover, the scope and limitations of the research and chapter breakdown were also incorporated in this chapter.

CHAPTER TWO

Literature Review

2.0 Introduction

Following the introduction of the research described in chapter one, this chapter presents the review of literature under five major sections: disputes in construction industry; causes of disputes; effects of disputes; management of disputes; the relationships between disputes and project characteristics. The first section of the current chapter describes the overview of disputes which prevail in the construction industry. The next section primarily reviews the causes of disputes in term of different perspectives such as frequency of causes, project participants & project phases and project characteristics. The review on the effects of disputes and dispute management strategies are presented in the following sections. The end of the chapter establishes a strong background to formulate a conceptual relationship between disputes and project characteristics. Thus, the chapter finally presents a conceptual framework of dispute avoidance which establishes the possible links between causes of disputes, dispute avoidance strategies and the project characteristics.

2.1 Disputes in Construction Industry – An Overview

The dispute is recognised as a prevalent feature in a complex and competitive construction environment (Davis, 2007). Zhou *et al.* (2011) further explain that the construction industry encompasses a diverse range of jobs, talents, skills, and work surroundings that distinguish it from other businesses such as manufacturing, agriculture, transportation, and telecommunications and alike. This includes many distinctive features, uncertainties and conditions. Thus, unclear and complex challenges are regular events of the construction industry. Frequent claims, conflicts and disputes are major issues faced by the construction industry (LaBarre & El-adaway, 2014). Disputes arise when the conflicts are not resolved properly. It is difficult to construction professionals to differentiate between claim, conflict and

dispute. Certain construction claims are inevitable and required to contractually accommodate unforeseeable modifications due to project conditions or due to the client's requests. While such claims may be addressed amicably, the preceding existence of unhealthy conflict can spark degeneration into unwanted disputes and in certain situations, the rejecting such claims develops into disputes (Kumaraswamy, 1997).

Conflicts can be managed before manifested into disputes. Prevalence of disputes could lead to unsuccessful projects in the end (Cakmak & Cakmak, 2013). Further, Kumaraswamy (1997) explained the formulation of disputes in a construction project that claims are built up from conflicted and non-conflicted issues. However, not all claims could turn into disputes. Disputes take place only when a claim is being requested by one party and disagreed by the other party. Cheung and Pang (2014) developed the conceptualisation of construction disputes as depicted in the below Figure 2.1.

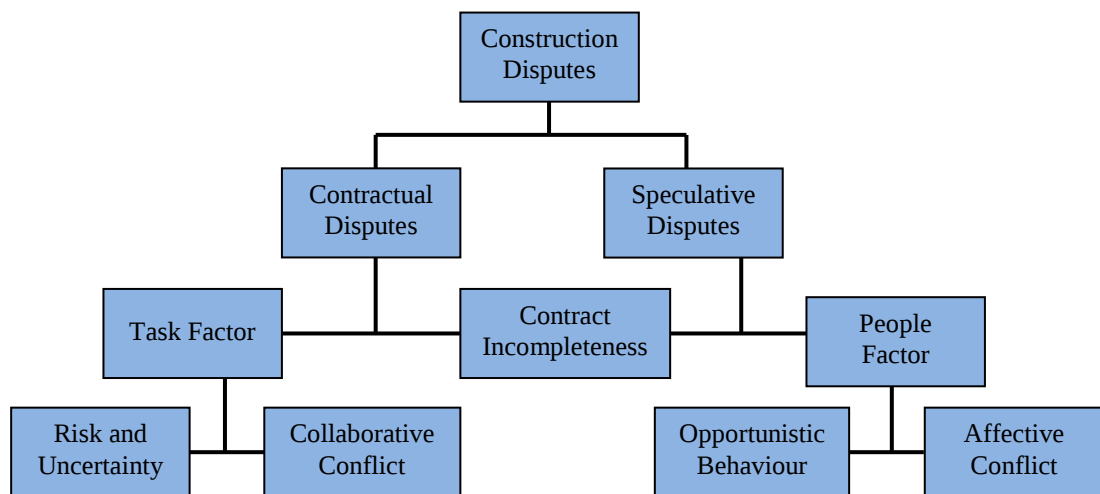


Figure 2.1: Conceptualising construction dispute

(Source: Cheung & Pang, 2014)

As per Figure 2.1, disputes can be classified as contractual or speculative in nature. Contractual and speculative disputes are frequently characterized by an incomplete contract as a common cause. In addition to the task and people elements, there are other contributions to contractual and speculative disputes accordingly. Contractual disputes in the construction industry might be triggered by risks and uncertainties, as

well as collaborative disagreements. Opportunistic behaviour of contracting parties, as well as emotional conflict among project team members, would also foster speculative disputes.

Cheung and Pang (2014) continued to clarify that contract agreements contain entitlements in terms of time and money owing to natural catastrophes, unanticipated environmental difficulties (i.e. risk and uncertainty), as well as delays and disruptions in the delivery of services (i.e. collaborative conflict). As a result, task elements such as risk and uncertainty, as well as collaborative conflict, are responsible for the occurrence of contractual conflicts in a construction project. Construction conflicts are structured in such a way that non-contractual disputes are taken by people factors that entirely indicate the drivers of speculation. Aspects of human interest-seeking behaviour, such as opportunistic behaviour and personal emotions, contribute to the occurrence of speculative disagreements. Furthermore, an incomplete contract prevents proper control over the contract and increases the likelihood of speculative conflicts arising between them.

According to Wathne and Heide (2000), behaviours such as untruthful, thieving, and dishonest are practiced by opportunistic individuals. In construction projects, the contracting parties may act opportunistically, which will lead to an increase in cost or reduction in revenue of another party. For example, Lee *et al.* (2009) stated that the contractor might take undue advantage of unforeseen situations and adjust their corresponding item. Sinha and Wayal (2007) further describe that it is possible for opportunism to occur when a specific provision does not take into account an unexpected event or when it is interpreted to suit the specific conditions that have risen. In addition, opportunism in construction projects frequently contains aspects such as speculative pricing blatant of consultants, unreasonable contractor's requests for more money and/or time and unreasonable refusal of contractors' claims (Yates 2003).

As evidenced before, construction disputes take place due to various reasons. The causation of disputes was investigated by several authors over decades. On the other hand, Farooqui and Azhar (2014) offered that disputes could be avoided by addressing the causes thereby carefully managing them to attain a proper flow of

construction projects as prevention of disputes is better than manage the effects. Thus, the following section presents a review of the causes of disputes.

2.2 Causes of Disputes

The causes of disputes have been the focus of several researchers over the decades. Thus, various researchers have investigated the contributing factors of disputes from different perspectives across nations over decades. According to Davis (2007), various factors can contribute to disputes during the procurement stage of a project. Some of these include the procurement of non-essential supplies, poor planning, and inadequate documentation. In addition, the author notes that these inadequacies are usually caused by the lack of time allocated for the procurement and design phases of a project. This can result in poor contract documents and improper documentation. This could also cause disputes throughout the project.

According to Carmichael (2002) and Steen (2002), the three major categories of disputes are contractual disputes, organisational disputes, and technical disputes. Increased project complexity has been viewed as the cause of organisational disputes, which has resulted in varied contract forms, each with a different set of interfaces where misunderstandings might develop, resulting in litigation. Contractual disputes can be triggered by a variety of factors such as the extension of time, workmanship, material selection, variations, loss and expense, payment, late giving of site, unfavourable weather and liquidated damages whereas technical disputes are triggered by design issues.

Mitropoulos and Howell (2001) discuss the reasons for disputes in terms of ambiguity, contractual difficulties, and opportunistic behaviour. When there is a lot of ambiguity, initial designs and specifications will almost always alter, and the project team will have to work together to figure out how to handle the issues. When a contract contains a specific phrase that refers to an unforeseen event, and that clause can be read to offer a beneficial result for one party while not providing a favourable result for the other, there is the possibility of opportunism. On a different note, Love *et al.* (2008) mention that unfair risk allocation and poor risk management are the main contributors to disputes. Adding further, imbalanced risk

distribution through disclaimer clauses in contracts is a key contributor to the rise in total construction costs. This issue occurs due to the use of exculpatory clauses in contracts. These clauses usually include uncertainties of work conditions, delays, liquidated damages, and inaccuracy (Zaghoul & Hartman, 2003).

Sometimes, issues related to interpretation or misunderstanding of contract terms can happen. As a result, there may be arguments between the parties regarding their respective rights and responsibilities under the agreement (Yih Chong *et al.*, 2011). According to Chan and Suen (2005), even if standard forms of contracts such as the FIDIC are commonly utilized, conflicting interpretations of the contract may result in misunderstandings between parties. This could also result in disagreements. A misunderstanding of contractual duties, according to Armes (2011), can frequently be due to the interpretation of a contract or the documentation that has not been drafted properly. It is common for issues relating to progress and quality of work to occur, and these issues may arise as a result of the divergent interests of the parties to the contract.

When there is no contractor engaged during the design stage, and the scope of the project is not correctly defined, the chance of scope changes increases, which may result in increased costs and project duration, as well as arise of claims and disputes (Love *et al.*, 2008). It has been shown that having a contractor in the design phase helps to increase design constructability and decrease the possibility of design revisions. In another instance, scope changes and rework can result in accelerated working and the claim for reduced productivity (Love *et al.*, 2008). Further authors indicated that accelerating works can lead to increased working hours. This could lead to increased stress then translate into absenteeism and reductions in productivity. Once changes to scope are implemented, there may be ambiguous and as a result disagreement among stakeholders could occur (Love *et al.*, 2008).

Literature suggests that architects do not have proper procedures in place to control the design process and this could result in drawings comprising of errors and omissions, which frequently end up with claims and disputes. Love *et al.* (2008) further argue that improper documentation can contribute to rework and delays, and it can also cause claims for loss and expense from the contractor. Also, a lack of

professional conduct by design professionals can result in the production of inadequate documents (Kumaraswamy, 1997).

Failure to adequately define the requirements of the employers might result in late and excessive revisions to design during the contract time when the employers realize that they are not getting what they expected. This is a common concern in the construction industry that the client expects the contractor to accommodate changes in the design as well as the programme (Davis, 2007). Bramble and Cipollini (1995) in their research identified that design error is a common source of disputes. A 38% of disputes are caused by design related issues such as faulty plans, risky methods, inadequate specifications, and inadequate underground or surface infrastructures.

Generally, the client provides the soil boring test details to the contractor then the contractor can get an idea of the excavation process knowing the type of rock or soil that exists and price accordingly. When the construction is ongoing, unforeseen factors such as the subsurface conditions can affect the project's schedule. This causes the contractor to ask for additional money (Cushman *et al.*, 2001). Faulty plans are often taken place in the construction industry. These issues can result in costly disputes. Usually, the architect who is involved in design is responsible for such mistakes (Bramble & Cipollini, 1995). On the other hand, the designer prepares the specifications and the methods that are used to reach the specific output. Sometimes, the contractor may not follow the designer's instructions and end up with a different result than expected (Tarar, 2015).

To identify the causes of disputes, Kumaraswamy (1997) focused on the root and proxy causes that contribute to disputes. The following are some of the root causes: unequal risk allocation, unreasonable time and financial limitations, and an aggressive industry culture and alike. Proximate causes include inappropriate contract form, inappropriate payment mortality, inappropriate contractor selection, inadequate design documentation, inadequate tender information, estimation errors port communication, estimation errors, exaggerated claims and inadequate brief. According to Silver and Furlong (2004), the complexity of interrelationships and dependencies of projects can create various problems for both parties and brings

about delays and payment problems, which become two main sources of construction disputes.

Global Head of Contracts Solutions in 2013 investigate the causation of disputes across different nations. In United States of America, the critical cause is errors and omissions in the contract document; in Asia, issues related to extensions of time; in Middle East, it is failing to appropriately administer the contract; in the United Kingdom, parties like Client/Contractor/Subcontractor failing to recognise and fulfill their contractual obligations while in Europe, it is due to differing site conditions (Allen, 2014). Thus, the study confirms that the contributing agent to disputes differs according to the nature of the construction industry of each country.

Levy (2007) in his study identified the contributing factors which causes disputes in the United States of America. The causes include the followings: drawings and specifications that contain errors, or that improper coordination, as well as additional work or changes in the order of work; insufficient finance of the client/contractor/subcontractor; breach of contract by parties; unpredictable surface conditions; the failure of the parties to perform their duties under the terms of the contract; differing site conditions; disruption, delay or rushing to the work that generates any deviation from the initial programme; incomplete responses to queries to one party to other party; inadequate administrations; change orders; uncovering of existing conditions that are not specified in the contract drawings.

According to Hall (2002), the most common cause of construction disputes is inefficient communication. This is due to the inability of one party to properly communicate with another on design flaws, compensation, and payment issues. According to Weddikkara and Abeynayake (2007), disputes are frequently caused by a variety of factors which include contract breaches, poor administrations, errors and ambiguities in documents and cost increases due to unexpected economic policy changes and unexpected tax changes in the Sri Lankan construction industry.

Thus, several researchers from different countries have analysed the causes of disputes over decades in different perspectives. Therefore, the next section of the research reinvestigates the causes of disputes in terms of the frequency of previous researches to reach a collective idea.

2.2.1 Frequency of Causes of disputes

This section of the research provides the factors which contribute to disputes along with the frequency count of previous studies during the last two decades merely from the year 1997 to 2019. Thus, a total of twenty (20) key research papers which investigate the causes of disputes have been employed in this systematic review. Table 2.1 shows the causes of disputes along with the frequency count and the respective sources.

Table 2.1: Frequency of causes of disputes

Causes of Disputes	Sources																				
	Illankoon <i>et al.</i> (2019)	Saseendran <i>et al.</i> (2018)	Cakmak (2016)	Ariffin <i>et al.</i> (2016)	Yildizel <i>et al.</i> (2016)	Thusharika and Abeynavake (2016)	Cheung and Pang (2014)	Farooqui and Azhar (2014)	Khahro and Hussain Ali (2014)	Cakmak and Cakmak (2013)	Na Ayudhya (2011)	Armes (2011)	Mitropoulos and Howell (2011)	Love <i>et al</i> (2010)	Yiu and Cheung (2007)	Acharya and Lee (2006)	Cheung and Yiu (2006)	Waldron (2006)	Odeh and Battaineh (2002)	Kumaraswamy (1997)	<i>Frequency count</i>
Scope changes [1]		√	√		√				√	√	√		√	√	√	√	√	√	√	√	14
Payment delays [2]		√	√		√				√	√	√		√	√	√	√	√	√	√	√	14
Inadequate/incomplete specification and drawing [3]	√			√					√	√	√		√	√	√	√	√	√	√	√	13
Unclear and unfair risk allocation [4]	√			√				√	√	√	√	√		√		√	√	√		√	12
Poor communication [5]	√					√		√	√	√	√	√	√			√	√	√		√	12
Design errors [6]	√	√		√		√			√	√				√		√		√		√	10
Ambiguities in contract document [7]				√		√	√	√		√	√		√			√				√	9
Unrealistic requirements (eg.time) [8]				√	√			√		√	√		√	√			√				8
Differing ground conditions [9]									√	√	√			√		√		√		√	7
Poor quality of work [10]										√	√	√		√		√	√				6

Causes of Disputes	Sources																				
	Illankoon <i>et al.</i> (2019)	Saseendran <i>et al.</i> (2018)	Cakmak (2016)	Ariffin <i>et al.</i> (2016)	Yildizel <i>et al.</i> (2016)	Thusharika and Abeynavake (2016)	Cheung and Pang (2014)	Farooqui and Azhar (2014)	Khahro and Hussain Ali (2014)	Cakmak and Cakmak (2013)	Na Ayudhya (2011)	Armes (2011)	Mitropoulos and Howell (2011)	Love <i>et al</i> (2010)	Yiu and Cheung (2007)	Acharya and Lee (2006)	Cheung and Yiu (2006)	Waldron (2006)	Odeh and Battaineh (2002)	Kumaraswamy (1997)	<i>Frequency count</i>
Inappropriate selection of contractor (financial difficulties of contractor, technical inadequacy of contractor) [11]	✓		✓								✓					✓	✓		✓		6
Discrepancies in contract provisions [12]								✓	✓	✓		✓		✓				✓			6
Improper planning and scheduling [13]								✓			✓			✓				✓	✓		5
Negligence/lack of professionalism [14]								✓	✓					✓		✓	✓				5
Inadequate contract administration [15]								✓	✓		✓					✓				✓	5
Unavailability of information [16]									✓	✓		✓		✓				✓			5
Inappropriate selection of procurement method [17]								✓	✓			✓	✓	✓							5
Legal and economic factors [18]								✓		✓	✓	✓				✓					5
Unstable financial status of client [19]								✓	✓							✓			✓		4
Inadequate brief [20]							✓		✓							✓		✓			4
Delay in progress of work [21]		✓	✓		✓	✓															4
Weather Changes [22]	✓									✓	✓									✓	4
Time overrun [23]			✓			✓															2

Causes of Disputes	Sources																				
	Illankoon <i>et al.</i> (2019)	Saseendran <i>et al.</i> (2018)	Cakmak (2016)	Ariffin <i>et al.</i> (2016)	Yildizel <i>et al.</i> (2016)	Thusharika and Abeynayake (2016)	Cheung and Pang (2014)	Farooqui and Azhar (2014)	Khahro and Hussain Ali (2014)	Cakmak and Cakmak (2013)	Na Ayudhya (2011)	Armes (2011)	Mitropoulos and Howell (2011)	Love <i>et al</i> (2010)	Yiu and Cheung (2007)	Acharya and Lee (2006)	Cheung and Yiu (2006)	Waldron (2006)	Odeh and Battaineh (2002)	Kumaraswamy (1997)	<i>Frequency count</i>
Client-slow response to decision making [24]											✓									✓	2
Adversarial / controversial culture [25]	✓									✓											2
Delayed drawings [26]										✓				✓							2
Poor supervision [27]								✓			✓										2
Inflation [28]								✓			✓										2
Complexity of project [29]																	✓				1
Fragmentation of the system [30]				✓																	1
Inadequate/errors in soil investigation [31]																				✓	1
Delayed instructions [32]											✓										1
Incomplete source of fund [33]								✓													1
Extension of time [34]										✓											1
Poor documentation of contractor [35]														✓							1
Delay in evaluation of completed works [36]											✓										1
Unrealistic tender price [37]								✓													1
Inadequate site investigation [38]																				✓	1

Causes of Disputes	Sources														Frequency count
	Illankoon <i>et al.</i> (2019)	Saseendran <i>et al.</i> (2018)	Cakmak (2016)	Ariffin <i>et al.</i> (2016)	Yildizel <i>et al.</i> (2016)	Thusharika and Abeynayake (2016)	Cheung and Pang (2014)	Farooqui and Azhar (2014)	Khahro and Hussain Ali (2014)	Cakmak and Cakmak (2013)	Na Ayudhya (2011)	Armes (2011)	Mitropoulos and Howell (2011)	Love <i>et al.</i> (2010)	
Unjust and untimely presentation of claims [39]								√							1
Delay in approvals [40]										√					1
Error in estimation (over or under) [41]										√					1
Opportunistic behaviour [42]													√		1
Lack of team spirit [43]									√						1
Inappropriate contract type [44]															√ 1
Acceleration of work [45]									√						1
No contractor involvement in design stage [46]													√		1
Different interests of project parties [47]													√		1
Lack of risk management [48]							√								1
Competitive tendering and price competition [49]													√		1
Excessive and exaggerated claims [50]								√							1
Unclear milestones [51]													√		1
Poor labour productivity [52]													√		1
Material shortage[53]										√					1

Causes of Disputes	Sources																				
	Illankoon <i>et al.</i> (2019)	Saseendran <i>et al.</i> (2018)	Cakmak (2016)	Ariffin <i>et al.</i> (2016)	Yildizel <i>et al.</i> (2016)	Thusharika and Abeynayake (2016)	Cheung and Pang (2014)	Farooqui and Azhar (2014)	Khahro and Hussain Ali (2014)	Cakmak and Cakmak (2013)	Na Ayudhya (2011)	Armes (2011)	Mitropoulos and Howell (2011)	Love <i>et al</i> (2010)	Yiu and Cheung (2007)	Acharya and Lee (2006)	Cheung and Yiu (2006)	Waldron (2006)	Odeh and Battaineh (2002)	Kumaraswamy (1997)	<i>Frequency count</i>
Major Accidents [54]											✓										1
Unexpected Social Event [55]											✓										1
Environmental Pollution [56]											✓										1

As depicted in Table 2.2, a total of fifty-six (56) causes have been identified from twenty (20) previous studies. Among them, variation introduced by the owner, changes in the scope, and delays in making payment are the factors that significantly influence disputes with a frequency count of 14 (out of 20). According to Love *et al.* (2010), frequent scope modifications result in cost and time overruns, and thereafter disputes among parties. The majority of variation orders are requested by the employer. These requests are often design modifications. Sinha and Wayal (2013) mention that in addition to the client's request, changes to scope could occur due to the needs of the stakeholders, physical location and economic conditions.

As per Table 2.2, several of the researchers have found that payment delays cause disputes in construction projects. For example, Na Ayuldhya (2011) discovered that payment delay is one of the critical contributing factors which cause disputes in Thailand's domestic projects. In addition, Conlin *et al.* (1996) examined the causes of disputes in the construction sector in the United Kingdom and concluded that the payment problem is a key contributor to disputes. Extra work, an unrealistic budget, the basic costs, additional fees, retention money issues, liquidated damages demanded by the client, time and cost extensions, non-payment to the subcontractor, non-payment of the interim payment to contractor, and a variation claim by the contractor are the primary reasons for the payment problem. Furthermore, Chan and

Suen (2005) pointed out that payment difficulties would result in disputes and, ultimately, suspension of work at the site. Even in the worst-case situation, the project would be terminated. Payment-related disputes are very common in the construction industry. In construction projects, disputes over the value of variations and final accounts, as well as non-compliance with payment requirements, are the most difficult areas that necessitate the need for future adjudication actions (Sheridan, 2003).

The findings revealed that another four causes including inadequate or incomplete specification and drawing; ambiguous risk allocation; lack of communication, and errors in the design for disputes in more than 50% of the sources. Many of the authors point out that the specification and drawing are either inadequate or insufficient or improper design can result in delays and increased expenditures, which might lead to litigation. Inadequate design information, which has a negative influence on the progress of work and, in the long run, has a negative impact on the quality of the product. Moreover, mistakes in drawings and specifications can arise in projects as a consequence of inadequate knowledge, negligence, and ignorance on the part of consultants, according to Love *et al.* (2006). An insufficient amount of education, training, and experience is frequently the outcome of insufficient knowledge. Many design firms do not conduct design audits, verifications, or inspections prior to tendering stage. This raises the likelihood of design errors occurring during the design process.

Love *et al.* (2010) mention that unfair risk allocation is a key reason for disputes. Kumaraswamy (1997) is also in line with this finding. Further, the authors indicated that the exculpatory clauses related to liquidated damages, the uncertainty of work conditions, ambiguous contract documents, delaying events and indemnification, are leading to unfair risk allocation among parties to the construction contracts. As seen in Table 2.2, poor communication is identified as a key cause with a frequency of '12'. According to Mante *et al.* (2012), poor communication is one of the most prominent characteristics of conventionally procured projects, which increases the likelihood of disputes arising. A design fault is then detected with a frequency of occurrence of 10. The issues of misinterpretation, misunderstanding of contract

terms, and ambiguities in contract documents could take place during the execution of projects. Even though standard bidding documents are employed, certain mistakes or misinterpretations occur in the documentation. The consultant is in charge of all these document-related issues in the contract documents.

Thus, the foregoing indicates that several researches have been investigated the causes of disputes from different perspectives. The following section further reviews the identified causes from the perspectives of project participants and stages of the project.

2.2.2 Project Participants and Phases Responsible for Disputes

The causes of disputes which are identified in the previous section are taken into further analysis. Thus, this section clusters the fifty-six (56) causes in terms of parties responsible and stages of the construction project, presented in Table 2.2. The content of below Table 2.2 is classified based on the researcher's understanding of the relevant literature. In addition, these findings are verified with few experienced professionals via informal discussion.

Table 2.2: Causes of disputes in terms of project participants and phases

Preparation	Design	Tendering	Construction
Due to Client			
Scope changes [1]	Scope changes [1]	Scope changes [1]	Scope changes [1]
Poor communication [5]	Poor communication [5]	Poor communication [5]	Payment delays [2]
Client-slow response to decision making [24]	Client-slow response to decision making [24]	Client-slow response to decision making [24]	Poor communication [5]
Delay in approvals [40]	Delay in approvals [40]	Delay in approvals [40]	Unrealistic requirements (eg.time) [8]
Lack of team spirit [43]	Lack of team spirit [43]	Lack of team spirit [43]	Unstable financial status of client [19]
Different interests of project parties [47]	No contractor involvement in design stage [46]	Different interests of project parties [47]	Client-slow response to decision making [24]
Inadequate brief [20]	Different interests of project parties [47]	Competitive tendering and price competition [49]	Incomplete source of fund [33]

Preparation	Design	Tendering	Construction
			Delay in approvals [40]
			Lack of team spirit [43]
			Different interests of project parties [47]
Due to Consultant			
Unclear and unfair risk allocation [4]	Poor communication [5]	Inadequate/incomplete specification and drawing [3]	Inadequate/incomplete specification and drawing [3]
Poor communication [5]	Design errors [6]	Poor communication [5]	Poor communication [5]
Negligence/lack of professionalism [14]	Negligence/lack of professionalism [14]	Design errors [6]	Design errors [6]
Inappropriate selection of procurement method [17]	Lack of team spirit [43]	Ambiguities in contract document [7]	Negligence/lack of professionalism [14]
Inadequate brief [20]	No contractor involvement in design stage [46]	Inappropriate selection of contractor (financial difficulties of contractor, technical inadequacy of contractor) [11]	Unclear milestones [51]
Lack of team spirit [43]	Different interests of project parties [47]	Discrepancies in contract provisions [12]	Unavailability of information [16]
Inappropriate contract type [44]	Delay in approvals [40]	Negligence/lack of professionalism [14]	Time overrun [23]
Different interests of project parties [47]	Inadequate/incomplete specification and drawing [3]	Unavailability of information [16]	Delayed drawings [26]
Delay in approvals [40]		Inadequate/errors in soil investigation [31]	Late instructions [32]
		Error in estimation (over or under) [41]	Extension of time [34]
		Lack of team spirit [43]	Delay in evaluation of completed works [36]
		Different interests of project parties [47]	Delay in approvals [40]
		Delay in approvals [40]	Lack of team spirit [43]
		Competitive tendering and price competition [49]	Different interests of project parties [47]

Preparation	Design	Tendering	Construction
			Delay in approvals [40]
Due to Contractor			
		Poor communication [5]	Poor communication [5]
		Poor quality of work [10]	Poor quality of work [10]
		Negligence/lack of professionalism [14]	Negligence/lack of professionalism [14]
		Inadequate contract administration [15]	Inadequate contract administration [15]
		Inadequate/errors in soil investigation [31]	Delay in progress of work [21]
			Time overrun [23]
		Poor documentation of contractor [35]	Poor supervision [27]
		Unrealistic tender price [37]	Extension of time [34]
		Inadequate site investigation [38]	Poor documentation of contractor [35]
		Opportunistic behaviour [42]	Unjust and untimely presentation of claims [39]
		Lack of team spirit [43]	Opportunistic behaviour [42]
		Different interests of project parties [47]	Lack of team spirit [43]
		Lack of risk management [48]	Acceleration of work [45]
			Different interests of project parties [47]
			Lack of risk management [48]
			Excessive and exaggerated claims [50]
			Poor labour productivity [52]
Due to External Factor			
Legal and economic factors [18]	Legal and economic factors [18]	Legal and economic factors [18]	Differing site conditions [9]
Adversarial / controversial culture [25]	Adversarial / controversial culture [25]	Adversarial / controversial culture [25]	Legal and economic factors [18]
Fragmentation of the system [30]	Fragmentation of the system [30]	Fragmentation of the system [30]	Weather Changes [22]

Preparation	Design	Tendering	Construction
			Adversarial / controversial culture [25]
			Inflation [28]
			Fragmentation of the system [30]
			Unpredictable site/ground conditions [41]
			Material shortage [53]
			Major Accidents [54]
			Unexpected Social Event [55]
			Environmental Pollution [56]

Table 2.3 classified the causes of disputes considering the projects procured under the traditional procurement method. As depicted, all three parties namely; the contractor, the client and the consultant are contributing to disputes in different stages of the project such as preparation, design, preconstruction and construction. Other than these three project participants, certain factors such as weather, differing site condition, inflation, unexpected social events and alike are attributed by external factors as shown above. In terms of phases of the project, few of the causes that prevail from the beginning to end of the project, are indicated under ‘throughout the project’. On this note, the causes such as different interests of project parties, poor communication, opportunistic behaviour, negligence and less team spirit are recognized as responsible by all three parties and can occur throughout the project.

Because the consultant is involved in the project from the beginning stages of preparation, the consultant can contribute to disputes in numerous ways. For example, during the preparation stage: the consultant is responsible for the causes of inadequate brief, poor selection of procurement method, inappropriate selection of contract type, and unfair risk distribution; during design stage: design errors and poor quality design; during the preconstruction stage: errors and incompleteness in documents prepared, ambiguities in contract documents, contradictory with specification and drawings, estimating errors and inappropriate selection of contractor /subcontractor; during construction stage: late instructions, delayed design information, unclearness in milestones, delay in evaluation of completed works are

identified as the causes contributed by the consultant in different stages of projects. According to traditional procurement, contractor involvement starts from the tendering stage only and thereby contractor contributes to disputes from their onwards. Most importantly, contractor contributes to disputes in many ways in the construction stage. For example, this includes the causes of delays in work progress, the financial and technical inadequacy of the contractor, poor planning and scheduling, inefficient risk management, excessive and exaggerated claims, poor supervision, poor documentation, unjust and untimely presentation of claims, and poor labour productivity. As the client is considered as a layman to the construction project, his involvement to the project is less. Scope changes, poor communication, late giving of possession of site, payment delays, unstable financial status, unrealistic requirements, slow response to decision making and delay in approvals are the causes attributed by the client during the construction stage.

Thus, the foregoing investigated the causes of disputes in terms of frequency of previous studies, responsible parties like client, contract and consultant; and in terms of stages of construction projects. However, there are no attempts found in exiting literature interpreting the causes from the viewpoint of project characteristics. Therefore, the next section of the research reviews the causes of disputes from the perspective of project characteristics.

2.2.3 Causes of Disputes from the Perspective of Project Characteristics

Project success is the intended aim of both clients and contractors. Cho *et al.* (2009) analyse the elements that determine the success of a project in the construction industry. Taking this into consideration, several researchers have discovered that project parameters like project size, project type, and construction method can all have an impact on the overall effectiveness of a project (Turner, 1990; Love *et al.*, 1998). Each construction project has its own set of qualities that distinguish it from the others. The result is that every initiative is distinct from the others. Luu and colleagues (2003) identified seven project characteristics that determine the setting in which a project is carried out. Type of project, cost of project, construction method, location, risk and site-specific elements, and use of cutting-edge technology are some of these considerations. On a different note, Alhazmi and McCaffer (2000)

discovered that the major project characteristics were the type of project, the cost of the project, the time constraints, payment method, degree of flexibility, degree of complexity, integration of design and construction, and funding mechanism.

Ortega and Bisgaard (2000) state that construction projects are likely to expand in size and complexity; project owners expect faster deliveries and higher quality; the high cost of capital and lack of project time forces projects to move more quickly; the amount of work that is being performed off-site is increasing as a result of technological advancement; and computer-aided design and manufacturing are becoming more widely used throughout the industry. Despite continued technological advancements, construction mishaps continue to occur at an alarmingly high rate. On the other hand, unrealistic time requirements, acceleration of work, complexity of project and unsuccessful projects are leading to disputes in the construction industry. (Na Ayuldhya, 2011; Farooqui & Azhar (2014); Love *et al.*, 2010; Cakmak & Cakmak, 2013)

According to Ojo (2012), the characteristics of the project have been recognized as the most significant reasons of erroneous cash flow forecasting, which exposes the project to greater risk and creates severe impacts on to projects which could turn into disputes in later stages. On this note, Alhazmi and McCaffer, (2000); Luu *et al.*, (2003) mention that project characteristics should be carefully taken into consideration in every stage of a project. On this note, few of the researchers have investigated the disputes from the viewpoint of certain project characteristics. For example, a study found that the relationship between procurement selection and the attitudes of the stakeholders are the major factors in the occurrence which lead to disputes. Then again, a study conducted in Niger State revealed that project complexity, project size, duration of project, project funding and project type are the characteristics that mostly influence the likelihood of claims and disputes (Bajere *et al.*, 2017). A study carried out to investigate the factors influencing dispute in construction projects revealed that the projects procured under 'design and build' contribute to 8 percent more disputes than traditional procurement; 'lump-sum' payments indicated with 9 percent more disputes than 'unit-price'; industrial projects contribute more to disputes; government projects contribute 9 percent more than private projects (Ilter & Dikbas, 2009). These evidenced that there could be a

relationship exist between project characteristics and disputes. Thus, the research further reviews the key project characteristics in detail with the focus of establishing the possible links between disputes and project characteristics in terms of causes of disputes, avoidance techniques and frequency of disputes in the following subsections. Thus, the project characteristics such as type of project, type of client, scope of project, size of project, type of contract, duration of project, cost of project, degree of complexity, time constraint, payment method of the project, project location and site factors, construction method and innovative technology and procurement methods are described in the subsections.

2.2.3.1 Type of project

Residential, industrial, commercial, recreational, social, and large infrastructure projects are just a few examples of the many various types of projects that may be recognized. According to Gamage (2005), the needs for technology, contract administration, regulatory requirements, health and safety rules, quality assurance procedures, industrial relations, and other factors might differ depending on the kind of project. On this note, Dharshana (2010) suggested that infrastructure development such as roads and bridges requires many special scientific resources due to the complexity and the risk associated with those constructions. In Sri Lanka, a huge amount of money is invested in road development. On the other hand, hotel buildings have various aspects that are integrated into their designs to maintain their uniqueness, which includes aesthetic appearance, the quality of their facilities, inclusion of numerous facilities, free from fire threats; acoustic, the right flow of their users (Erica & James, 2000). However, professionals are mainly worried about size, cost, early commencement and completion, complexity and return on investment when there seems demand for hotel buildings (Thilakarathne, 1993). This seems that the project characteristics of size, cost, degree of complexity, and duration become significant in the hotel sector. As the hotel building is expected to be large and complex, the involvement of the professional, designs, documents and other resources are at a high level and thus this causes more errors in projects. On the other hand, errors in the document is found to be a significant source of disputes (Cakmak & Cakmak 2013). Therefore, this indicates that type of projects could have an influence on disputes.

According to Cakmak & Cakmak (2013), contractor related causes such as delays in progress of work, extension of time, financial instability of the contractor, technical inadequacies of the contractor and poor quality of work are strongly leading to disputes in Turkey's residential building projects while the contract related causes such as ambiguous in the contract document, different interpretation of contract provisions, risk allocation, and other contract problems are highly contributing to disputes compared to owner related, contractor related, design related, human behaviour related, project related and external factor related causes in Pakistan road construction projects (Malik & Ali 2019). This shows that the causes of disputes differ as per the type of projects.

2.2.3.2 Type of client

The type of client is described as whether or not the parties engaged in projects are owned publicly or privately by their respective governments or corporations. In the event that one of the parties engaged in the contract was owned by the government, the project was labelled as public, and when public money was used to any extent, the project was designated as public (Semple *et al.*, 1994). The owners of public projects, according to Cho *et al.* (2009), are developing a variety of delivery methods that take into account the various project characteristics that influence the success of construction projects, as well as making an effort to select the most appropriate contractor for each project. During the planning and construction phases of projects such as recreational facilities and huge civil engineering projects, it is common for modifications to occur as the design may not be finalised at the time of awarding the contract. The reason for this is that such projects could not be fully developed at the early stage, and even the basic design development would have to wait until the construction stage to take place. Accordingly, this results in subsequent changes in the construction phase (Gamage, 2005). On the other hand, frequent changes in design cause disputes (Cakmak & Cakmak, 2013). However, this can be managed by selecting a better procurement method to suit the context. For example, the design and build procurement method facilitates changes into design thus reduces disputes.

In terms of source of funds, Dada (2013) indicated that contractual disputes are one of the key factors affecting the wealth of public projects in Taiwan. On a different

note, Na Ayuldhya (2011) found that disputes arise due to insufficient working drawing details in the Thailand public-funded projects. Another study researched disputed cases in public sector projects and concluded that determining the scope of unit price is the frequent cause in Turkish. In Sri Lanka, public projects fully funded by the government face more payment problems compared to other projects. This is because the government commences the project before sourcing the complete budget (Francis & Ramachandra, 2014). On a different note, Na Ayuldhya (2011) identified payment delays as a leading cause of disputes. This confirms that funding method, type of client and nature of the construction industry are influencing the likelihood of dispute occurrence.

2.2.3.3 Scope of the project

The scope is a measurable concept, has been considered as either a criterion or factor. The achievement of a construction project vastly relies on a well-defined project scope with clear goals (Pankaj & Bhangale, 2013). Thus, an exact scope could be beneficial to meet the owner's needs and thus achieve the success. Therefore, Pankaj and Bhangale (2013) emphasize that the preparation of a detailed project scope statement in the form of a client brief is critical to the project success.

Changes to scope directly influence project planning, and thereby it affects the duration of the project (Pankaj & Bhangale, 2013). Sinha and Wayal (2007) suggest that scope changes occur due to various factors such as the client's inexperience, unclear requirements, other stakeholder needs, site factors and the prevailing economic conditions. In such causes, scope changes could happen in the form of additions, deletions, omissions, or changes. As explained earlier, most of the change orders take place as per the request of the employer and usually as design changes.

According to Cox *et al.* (1999), though the projects are managed efficiently, the cost of design revisions initiated by employers ranges between 5 percent to 8 percent of the contract price. Love (2002) explains that design modifications initiated by employers account for nearly 79 percent of all rework expenses in a project. This evidenced that changes to scope differ according to the procurement method. On the other hand, Na Ayuldhya (2011) states that frequent changes to scope could lead to

disputes. Thus, this seems that the scope of the project, procurement method, and dispute are influencing each other.

2.2.3.4 Size of the project

The size of the project is indicated as a component of the project scope definition. The cost and size of construction projects vary greatly from one another in terms of scale and scope. Projects of modest scale, according to Ashworth (1996), wouldn't suit to the more sophisticated form of contractual agreements as they are not cost-effective for the project client. Therefore, small-scale projects choose the traditional and well-established methods. The medium- to large-scale projects can make use of any of the alternatives that are accessible. In the case of extremely large-scale projects, a hybrid arrangement may be necessary in order to accommodate the project as a whole. Ashworth (1996) went on to say that large projects have more design constraints, more complicated building services, and a greater number of parties. This could increase the possibility of errors (Hall, 2002). As mentioned earlier, disputes may occur due to errors in design, documents, etc. Therefore, these emphasise that the project size could have an impact on dispute.

2.2.3.5 Type of contract

A very large range of parties is involved in construction projects. More specifically, a construction contract represents an assurance by one party to another to complete a project for the said payment. Consequently, disagreements or disputes can arise regarding contractual obligations or expectations. Moreover, many of the researchers indicated that ambiguities in documents could lead to numerous disputes throughout the project (Farooqui & Azhar, 2014; Cakmak & Cakmak, 2013; Na Ayuldhya, 2011; Kumaraswamy, 1997). Construction contracts also define the contract documents which describe the relationship between various parties and their responsibilities. They are often long and complex documents that often have complex contractual terms. Ilter and Dikbas (2009) added that disputes are frequent in projects where the standard form of contract like the FIDIC contract, is not adopted. In terms of the type of contract, the construction projects adopt different contracts such as lump sum, measure and pay, cost reimbursement and schedule of rates (Rowlinson, 1999). Ilter and Dikbas (2009) found that likelihood of dispute is

high in lump sum contracts compared to measure and pay. Therefore, these emphasise that the type of contract could have an impact on dispute.

2.2.3.6 Duration of the project

"Time" is viewed in two forms: as a date when a project is most likely to end and as criteria; a controllable component considered as a factor (Pankaj & Bhangale, 2013). "Time" is a criterion to assess the success of a project. Valipour *et al.* (2011) state that delay is a situation in which a project could not be finished within the contractual and agreed period, due to irrespective of causes who is responsible for. These delay conditions are complex since numerous delays can happen simultaneously and as delay situations might be created by more than one party, or by a third party. One delay could contribute to the production of multiple delays (Arditi & Pattanakitchamroon, 2006). Contractors frequently assert their rights to get more time by requesting an extension of time when a project is running behind schedule, which is a common practice in the industry. In the event that a claim for a delay has been made, the client and the contractor may be able to come to an agreement on the fundamental reasons; otherwise, disputes may emerge (Ren *et al.*, 2003).

2.2.3.7 Project Cost

Projects can be referred to as the total costs incurred. Alhazmi and McCaffer (2000) state that some projects can be small in the scope or the gross floor area and require minimal work while others can be high and require a large amount of work, but the cost of the project can be very high than average project costs. Further, Alhazmi and McCaffer (2000) stated that in any case clients may generally expect a minimum cost and a definite cost for a project.

Every project is dependent on its budget and cost. The importance of having a proper cost estimate and intellectual budget plan is often indicated as a success factor in various studies (Mahamid, 2012; Pankaj & Bhangale, 2013). At the macro level, cost and time overrun will lead to a reduction in productivity thereby negatively impact of economic growth and monetary loss (Enshassi *et al.*, 2008; Lo *et al.*, 2006). At the micro-level, cost and time overruns might result in lawsuits, arbitration, and even the complete cancellation of a project (Rahman *et al.*, 2008; Enshassi *et al.*, 2008).

2.2.3.8 Degree of complexity

The complexity of the project is determined by a variety of elements, including the presence of unique and varying ground conditions, the specific technological needs, the number of stages, and the kind and breadth of various resource requirements. Considering the level of complexity in the design and construction is important when determining the procurement technique since a simple project may be procured in one manner, but a complicated project in terms of design and construction will be procured in a different manner (Hashim *et al.*, 2006). Projects such as hospitals and other technological complex structures are undertaken when the need for sophisticated technology and services is felt.

The complexity of a project is simply defined as the number of interacting parts that form a project. Some of these include the people who are responsible for the project, its budget, and its time and cost, design of projects, planning and coordination of activities, project resources and personal management. Here the problem is determining who is responsible for the fault when a failure occurs. According to Chen *et al.* (2001), the complexity of a project was described from the perspective of the number of work packages included. An increase in complexity results in an increase in work packages of 16-20 percent over a typical project. Projects with a low level of complexity are those in which fewer than 9.2 percent of the additional work packages are involved. When a project is complex, it's recommended clients and contractors be involved in the design process.

2.2.3.9 Time Constraint

Constraints are generally categorized into two groups: the constraints with lesser and greater impact (Mcmullen, 1998). The author further explained that every situation has its own greater impact constraints. These are identified as the root causes of any given situation. Some projects are handled by a tight schedule. This can affect the timing of activities and the ability to complete the project within the stipulated time frame (Kelly *et al.*, 2002). The factors that affect the project duration include the expectations of the clients, unexpected weather conditions, and the time constraints imposed by the client. Acceleration of work due to these constraints can also lead to disputes (Na Ayuldhya, 2011; Farooqui & Azhar, 2014; Love *et al.*, 2010; Cakmak

& Cakmak, 2013). On a different note, Yates (2002) stated that the constraints in a multi-party working arrangement can be led to conflicts and disputes, which thereby can affect the cost of the project.

2.2.3.10 Payment method

The importance of payment in the construction industry is widely considered because it is vital to the smooth running of projects and the reduction of costs (Ameer, 2005). Hasmori *et al.* (2012) indicate that there are some projects; that cannot apply to various payment methods. Instead, some projects require the payment of a particular type of modality. This type of payment method can be as simple as paying, lump sum, or cost reimbursement. Several aspects such as type of project, nature of the project, level of complication in designs and other required information, and duration of the project will be considered in selecting the payment method for a project. In practice, the contract document also has set to best-fit the selected payment methodology. A study carried out to investigate the factors influencing disputes in construction projects revealed that the projects procured under 'lump-sum' payments indicated with 9 percent more disputes than 'unit-price' (Ilter & Dikbas, 2009). Thus, this shows that there could be a relationship exists between payment methods and disputes.

2.2.3.11 Project location and site factors

Project location refers to where the site is located or distances to the project site. Location influences on project cost and also weather patterns may change due to the location of site. Several site risks can be found in a project such as ground condition, limited access to services of water supply, electricity, and telephone etc. Luu *et al.* (2003) identified site risks as the most critical threat to the project's success. Farooqui and Azhar (2014) identified differing site conditions as one of the causes of disputes. Thus, disputes could be addressed from the perspective of project location and site factors.

2.2.3.12 Construction method and innovative technology

The method of construction is an important consideration in the design of a project. However, there are some instances in which it may be used for a specialized project

that are out of the ordinary in most cases. The traditional construction approach is often used for the majority of the project's duration. Special considerations can be made for a specific project in some situations, such as prefabricated structures, which are discussed in more detail below. According to Luu *et al.* (2003), the building technique has an impact on the progress of a construction project and, as a result, enhances the performance of the project.

Choice of the types of innovative technologies differs according to the type of project and its requirements. Some of the technologies are best suited for the construction of massive infrastructure projects while some are suitable for the construction of buildings for commercial and industrial processes (Gamage, 2005). In addition, for industrial and commercial processes, high-tech buildings may require sophisticated environmental services, such as air infiltration control, humidity control, and electrical standards (Tuner, 1990). Luu *et al.* (2003) stated that usage of pioneering technology as first instance could be a risk for the project and its success.

The foregoing indicates that construction method and innovation technology influence on project success. On a different note, Sivasothy (2013) found that an unsuitable construction method could cause cost and time overruns of projects. As mentioned by Cakmak & Cakmak (2013), cost and time overruns lead to disputes. Therefore, construction methods and technologies used in construction projects could have an impact on dispute directly or indirectly.

2.2.3.13 Procurement Methods

The construction industry is a project-based industry, recognised for its unique features and involvement of several parties throughout its project lifetime (Hodgson & Cicmil, 2008). Therefore, the interaction among parties needs to be maintained in a systematic way that turns as procurement. Procurement referred to the way to get things done. Construction procurement, according to Love *et al.* (1998), is an organizational structure used by the customer to manage the design and construction of a building project. Construction procurement has a broad reach as it requires bringing together and organizing a varied set of individuals, firms, and enterprises to design, manage, and build construction projects (Rashid *et al.*, 2006). Brandon (1992) said that the procurement system is a critical component in achieving project

objectives, establishing project participants' roles and relationships, and forming the project organization.

Construction projects are usually unique, and risks originate from a range of sources (Pheng & Chuan, 2006). Construction projects are generally complex and dynamic, with various feedback mechanisms (Uher & Loosemore, 2004). As a result, the procurement system was identified as essential for the project's success. Each project has its own set of criteria and features that are exclusive to it. Different procurement procedures are therefore employed for diverse projects as a result of this phenomenon (Rameezdeen, & Rathnasabapathy, 2006). Figure 2.2 depicts the procurement systems used in the construction industry.

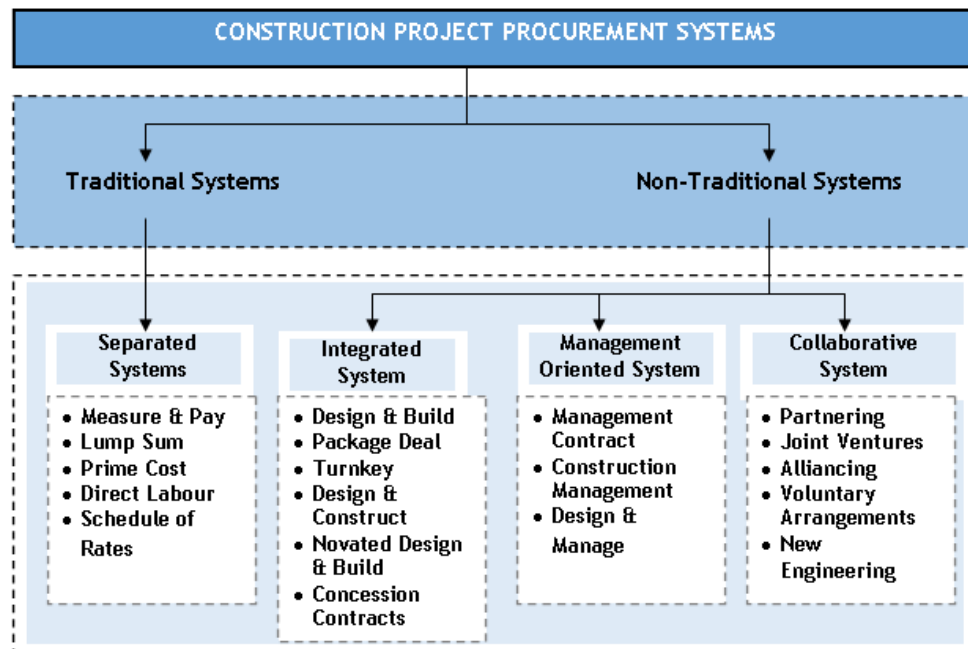


Figure 2.2-Categories of construction project procurement systems

(Source: Alhazmi & McCaffer, 2000)

According to Mante *et al.* (2012), projects that used the traditional procurement procedure had more disagreements than others. Budget, payment, performance, delays, time and negligence related issues are common issues that traditionally procured projects encounter. According to Mante *et al.* (2012), this is due to the key characteristics such as fragmentation, price competition, inadequate communication, and a sequential process that causes delays. When a project is delayed, it results in disagreements and then turns into disputes. Procurement strategies such as partnering

and alliancing, on the other hand, are less likely to result in disputes. On this point, the current study goes on to look at the characteristics of procurement folds and how they affect disputes, as indicated in Table 2.3.

Table 2.3: Features of procurement methods and its influence on disputes

	Traditional procurement method	Design and build procurement method	Management contracting	Collaborative (Partnering/alliancing)
Involvement of the parties	Involvement of contractor after the design completion (Rahmani <i>et al.</i> , 2017).	Contractor responsible for both design and construction (Teon, 2014).	The entire project will be managed by the contracted consultant and give advice to client (Ruparathna & Hewage, 2015; Rashid, <i>et al.</i> , 2006).	Collaboration between client and project team (Mante <i>et al.</i> , 2012).
Early contractor	x	✓	✓	✓
Causes of disputes	Frequent variations (Elhag <i>et al.</i> , 2020) Poor of communication (Mante <i>et al.</i> , 2012) Price competition (Mante <i>et al.</i> , 2012) Fragmentation (Mante <i>et al.</i> , 2012)	The dissatisfaction of the client with the quality and design of the finished work, Abortive work, Incompleteness of client's brief, Conflicts between the brief and contractor's proposal (Mante <i>et al.</i> , 2012). Client changes to project scope can be expensive (Love <i>et al.</i> 2008)	The absence of single point responsibility for design and construction (CIOB, 2010).	

	Traditional procurement method	Design and build procurement method	Management contracting	Collaborative (Partnering/alliancing)
Frequency of disputes	Higher (Yusof <i>et al.</i> , 2011). Due to the separation of design and construction process generates more disputes (CIOB, 2010).	Less (Mante <i>et al.</i> , 2012).	Less (Yusof <i>et al.</i> , 2011)	Less (Mante <i>et al.</i> , 2012; Kumaraswamy,1997)

(Source: Adapted from Senerath & Francis, 2021)

Table 2.3, explains the involvement of parties, the possibility of early contractor involvement, factors contributing to disputes and frequency of disputes under different procurement methods such as traditional, design and build, management contracting and collaborative procurement method. In terms of involvement of parties, all the procurement methods facilitate early contractor involvement except traditional method. On the other hand, Love *et al.* (2008) suggested early contractor involvement as a strategy to avoid disputes. According to the findings, certain features of the procurement methods are identified as causes of disputes. For example, the causes such as frequent contract variations (Elhag *et al.*, 2020), lack of communication (Mante *et al.*, 2012), price competition (Mante *et al.*, 2012) and fragmentation (Mante *et al.*, 2012) are found in traditionally procured projects; in design and build projects, the client's disappointment with the quality and design of the final product, failed work, inaccuracies in the client's brief, difference between the brief and the contractor's proposal, valuation of variations (Mante *et al.*, 2012), and client changes to project scope can be costly (Love *et al.* 2008) are identified; in management contracting, the multi-point responsibility for design and construction (CIOB, 2010) is seen. There is, however, no evidence of specific causes of disputes for projects procured using partnering and alliancing techniques. Due to its distinguishing characteristics, the frequency of disputes is higher in conventionally procured projects and lower in others (Mante *et al.*, 2012; Yusof *et al.*, 2011; CIOB, 2010; Kumaraswamy,1997).

The foregoing reviews the literature regarding project characteristics such as type of project, type of client, degree of complexity, scope of the project, project cost, size of the project, type of contract, payment method, duration of the project, time constraints, project location/site factors, construction method/innovative technology and procurement methods from the viewpoint of disputes wherever possible. The next section of the study offers a review on the effects of disputes.

2.3 Effects of Disputes

Construction conflicts vary in shape, scale, and complexity, but they always have one thing in common: they are time and money-consuming, and they frequently result in the damage of individual working relationships (Farooqui & Azhar, 2014). Conflicts and disagreements in construction projects have an impact on the performance of all stakeholders, including owners, consultants, contractors, and subcontractors. In turn, the construction industry involves a lot of big players, and their actions might lead to conflicts and disagreements (Kumaraswamy, 1997).

According to Kheng (2003), building disputes are extremely technical in nature and entail legal concerns that are highly specialized and require evidence documentation. Furthermore, the above author noted that all of these issues may be related to money and time. A construction dispute is technically challenging, time-consuming in its analysis of the facts, and can cost a lot of money (Bekele, 2005). Unknown disagreements have a number of consequences for the construction business; disputants waste time and money without appropriate evidence, and the causes of disputes are unknown (Carter *et al.*, 2001).

Disputes that are failed to handle on time, according to Farooqui and Azhar (2014), become exceptionally costly in terms of manpower, time, and opportunity costs. As stated by the authors (Farooqui and Azhar (2014), the visible expenses of legal advisers, expert witnesses, and the dispute resolution process are considerably significant. The importance of intangible costs, such as the harm done to company relationships and the potential value lost as a result of poor conflict resolution, should not be overlooked. The cost involved in the lawsuits arising out of disputes in US design and construction projects, according to Ng *et al.* (2007), is estimated to be around \$5 billion per year. Although it is unknown how much money has been lost

directly as a result of construction litigation in Nigeria, still disputes take place in projects and experiencing lawsuits, project withdrawal, and to the worse case project failure (Dada, 2013; Olateju, 1997).

Cheung and Yiu (2006) and Kassab *et al.* (2010) again confirm that disputes continue to be a problem in the construction industry with the possibility for unsuccessful project, litigation, and even project abandonment. Furthermore, the industry's interactions are adversarial and combative, and there is a culture with a strong preference for utilizing litigation to resolve problems. Disputes, according to Dada (2013), are the key issues affecting the success of public projects in Taiwan.

These aforementioned negative effects of disputes, promote the construction professionals to look for mechanisms to minimise the effects of disputes and to avoid them wherever possible. Thus next section of the research explains the literature related to dispute management.

2.4 Management of Disputes

The construction industry appears to have finally realized that avoidance is better than treatment. In the construction sector, there is a growing recognition that proactive rather than reactive tactics are the way to go (Gerber, 2003). As a result, the concept of dispute avoidance has gained popularity. Developing systems, procedures, and abilities to reduce the likelihood of conflicts occurring and efficiently managing disputes that do occur to resolve them quickly, cheaply, and without unnecessary escalation is the goal of dispute management (Australian Commercial Disputes Centre [ACDC], 2013). The key to getting a successful outcome is to manage disagreements (Aiprd Organization, 2011). Early intervention can also help prevent recurrences of the same problem later on in the construction. A more effective strategy is to address the problem while it is still within a controllable time frame, identify the source of the dispute, and rectify the problem (American Bar Association, 2015).

Dispute management tends to mitigate risk through good project planning and selection of an acceptable procurement method at the project's commencement. In a word, dispute management avoids conflicts from arising, which may unintentionally

necessitate the use of a dispute resolution process (Andoh, 2010). According to the research, disputes can be discovered, quantified, and managed to reduce or eliminate them. Similarly, the goal of dispute management is to manage and control in order to avoid the causes of disagreements (Davis, 2007). As a result, three key areas of dispute management can be examined: dispute avoidance, dispute mitigation, and dispute resolution. However, the current study is limited to a review of the literature on dispute avoidance and the available strategies.

2.4.1 Dispute avoidance

Dispute avoidance has become more popular in construction project in recent years. As a result, in order to prevent disputes, the construction sector prefers to shift from adversarial to friendly environment. According to a survey conducted in the Australian construction sector, the majority of industry practitioners are dissatisfied with the current dispute resolution techniques since they are ineffective in terms of cost, time, outcome, and process (Australian Constructors Association, 2006). Adems (1996) argued that the majority of disputes are unpredictable and the outcomes of dispute resolution methods are undesirable. In this case, the concern emerges for more efficient techniques for preventing disputes. According to McGeorge (2007), the core idea of dispute avoidance is that if a proactive atmosphere can be developed in which change management is a recognised technique, the likelihood of disputes will be considerably decreased.

The construction sector has consistently led and been encouraged to incorporate modern construction management techniques on dispute avoidance, according to CRCCI (2009). Dispute resolution approaches foster teamwork and harmony, reducing the likelihood of conflict. Furthermore, to maintain long-term relationships between contractual parties, preventative tactics should be required (Cheung, 1999). These are collaborating and aligning, with a focus on involving key stakeholders in the project early in the decision-making process, such as clients, contractors, and consultants. The current increase and rapid demand in alliancing is evidence of a trend toward the formation of dispute relationships (CRCCI, 2009).

Many of the causes of disputes can be identified, assessed, and managed in order to reduce or eliminate them completely. The objective is to identify and control the

risks that lead to issues and disagreements as soon as possible. Risks are then identified as management issues, which may be dealt with in the same way. An effective risk management method must be developed in advance to ensure that it can be used effectively during the construction period (Davis, 2007).

As a result, the building industry appears to have finally grasped the concept of prevention being preferable than treatment. Researchers have noticed increasing attentiveness in the construction industry that proactive rather than reactive tactics are the way to go, as well as a willingness to use dispute avoidance strategies as a result. Dispute avoidance strategies are giving the construction industry with novel systems for avoiding conflicts from growing into disputes, which inevitably arise in construction projects. The study further furnishes literature regarding certain dispute avoidance strategies practiced within the construction industry.

According to Jannadia *et al.* (2000), a reasonable contract is the first step toward establishing collaboration and coordination among project participants. It has also served as a solid foundation for resolving unavoidable issues before they escalate into conflicting claims that could endanger the building schedule and expense. In addition, a contract agreement should include provisions for resolving disputes and claims. This comprises clauses including clear provisions and directions for each party involved in the project to address issues as they arise (Thomas *et al.*, 1990). Clauses in the commercial agreement should include explicit provisions and instructions for parties to rectify interest mismatches as soon as they exist (Steen, 1994). Professional groups and other organizations are active in the development of standard contract forms with the goal of creating contracts that are identifiable, equitable, and adaptable (McGeorge, 2007). A well-drafted dispute resolution clause can give confidence by specifying the process prior to a dispute, if the process is not pre-defined, it becomes more difficult. The American Arbitration Association recommends that a drafter utilize a checklist to create these clauses (2013).

Jannadia *et al.* (2000) stated that if negotiations fail, a neutral third party might be brought in to examine the situation and offer remedies. It's a significant step toward reducing the problems produced by disputes. During the construction process, a pre-defined independent 'neutral' third party serves as an observer, fact-finder, and

dispute resolver for the project's interested parties. In an ideal world, a neutral party is chosen at the start of the project to respond quickly in the event of a conflict. McGeorge (2007) claimed that Dispute Adjudication Boards initially seemed in the 1995 FIDIC contract form for design and build contracts, which included a DAB as a contract alternative (McGeorge, 2007). The DAB's decisions are immediately enforceable and DAB procedure are more organised.

Team building could also include alliancing as a strategy of dispute avoidance. It is recognized that there is no assurance that all parties to the partnership will win. Because there is no assurance of winning, alliancing contracting has grown in popularity (McGeorge, 2007). Alliancing contracting is a type of contracting that can be described as "partnership based on economic rationalism." By forming a virtual corporation with an autonomous management structure and board of directors, Alliancing adheres to the basic principle of partnering while also aiming to ensure a win-win outcome for all stakeholders (Woods, 1997).

An early contractor engagement system is a unique type of contract delivery method. It requires dedicating more resources to the critical initial stage to maximize the advantages and cost reductions that may be realized during construction. One of the major advantages of partnering is that contractors are involved early in the design process. Designers create a comprehensive design that is placed out to bidding for a suitable contractor in a typical type of contract. Issues found during the building stage often result in substantial delays and expenses while plans are revised, increasing the likelihood of a dispute. ECI ensures that the design is built to be as buildable as possible (Love *et al.*, 2008). Establishing and creating stronger relationships with owners and contractors, which leads to a high reputation and fewer disagreements, are major advantages for designers (Rahmani *et al.*, 2013). As a result, ECI was recognized as a strategy for resolving disputes (Love *et al.*, 2008).

In addition to the above techniques, there are several techniques practiced to avoid disputes in construction projects. The following Figure 2.3 shows the dispute avoidance strategies and clusters under design management, procurement management, contract management and stakeholder management.

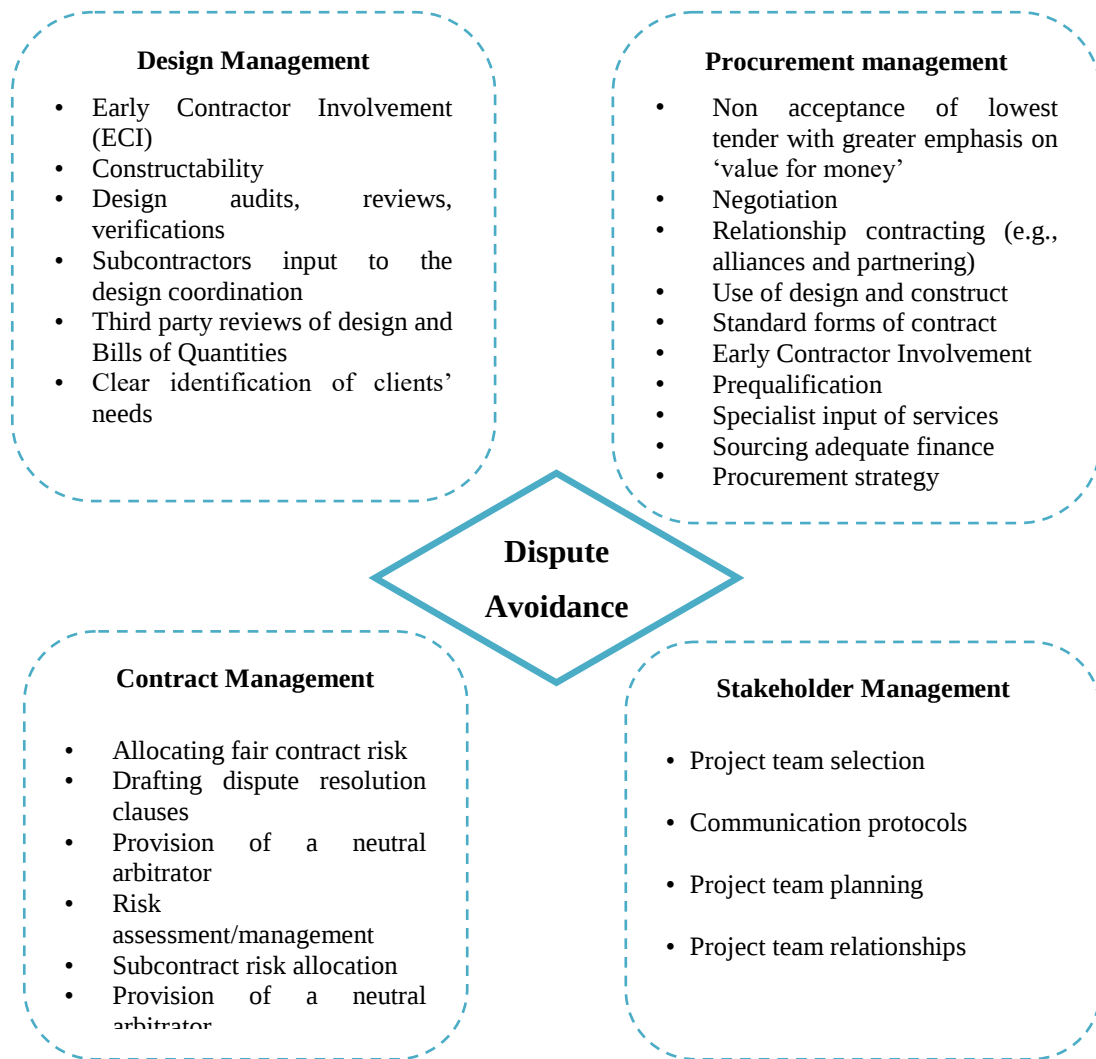


Figure 2.3: Dispute avoidance strategies

Source: (CRCCI, 2009; Love *et al.*, 2008)

As per Figure 2.3, dispute avoidance techniques can be identified in different areas. Design management is considered as the initial stage where disputes can be avoided in terms of; Early Contractor Involvement (ECI), constructability of design, design audits, reviews and verifications, subcontractors input to the design coordination, third party reviews of design and Bills of Quantities, clear identification of clients' needs. Figure 2 reveals that there are ten (10) dispute avoidance techniques identified under procurement management. Under contract management, disputes could be avoided through the techniques; allocating fair contract risk, drafting dispute resolution clauses, provision of a neutral arbitrator, risk assessment/management, subcontract risk allocation and provision of a neutral arbitrator. In addition,

stakeholder management includes the techniques of project team selection, communication protocols, project team planning, and project team relationships.

The main contractor will demand communication protocols or procedures that encourage open communication and expedite problem-solving processes. It will contain a formal, active problem-solving system aimed at quickly identifying and resolving conflicts. The development of conflicts that cannot be addressed through contract negotiations to the lowest feasible level of off-contract negotiation and settlement (Cheung & Yiu, 2006). Clients, consultants, and contractors have a responsibility to play in avoiding disputes. It is increasingly necessary for the primary contractor to establish team connections with consultants and subcontractors, as well as the client's representatives, once selected.

Thus, the aforementioned literature described a range of dispute avoidance strategies that are being practiced in global contexts. The next section further reviews the dispute avoidance strategies from the perspective of the frequency of previous studies.

2.4.2 Frequency of Dispute Avoidance Strategies

This section of the research provides the dispute avoidance strategies with the frequency count of previous researches that taken place during the last two decades merely from the year 2000 to 2020. Thus, a total of twenty (20) key research papers which have investigated the avoidance of disputes are selected for this review. Table 2.5 shows the dispute avoidance strategies along with the frequency count and the respective sources.

Table 2.4: Frequency of dispute avoidance strategies

Dispute avoidance strategies	Sources																			Frequency count	
	Jannadia <i>et al.</i> , (2000)	Gerber (2001)	Mustaffa and Bowles (2004)	Gebken & Gibson (2006)	Connerty (2006)	Jones (2006)	McGeorge <i>et al.</i> (2007)	Love <i>et al.</i> (2008)	CRCCL (2009)	He (2010)	Ong and Gerber (2010)	Abeynayake & Weddikara (2013)	Cheung (2014);	De Alwis <i>et al.</i> (2016)	Mohd Danuri <i>et al.</i> (2016)	Thusharika and Abeynayake (2016)	Mosey (2019);	Elhag <i>et al.</i> (2020)	Hardjomuljadi (2020)		Zhu & Cheung (2020)
Provision of a neutral arbitrator [1]	1	1		1		1		1	1	1	1	1			1		1		1		12
Appoint adjudicator from the beginning of the project [2]	1	1		1		1		1	1	1	1	1			1		1		1		12
Allocating fair contract risk [3]	1			1	1			1	1				1	1		1				1	9
Team work [4]	1							1	1					1			1	1		1	7
Use of Relationship contracting (i.e. alliances and partnering) [5]			1	1			1	1	1									1			6
Proper documentation (i.e. contract document, drawing, spec.....) [6]								1	1				1	1		1					5
Proper procurement strategy [7]								1	1					1		1					4
Early Contractor Involvement (Contractor's input to design) [8]							1	1	1								1				4
Practice of negotiation [9]					1			1	1							1					4
Provision for dispute resolution [10]	1							1	1												3
Constructability of design [11]							1	1	1												3
Integrated project team [12]								1	1												2

Dispute avoidance strategies	Sources																			Frequency count	
	Jannadia <i>et al.</i> , (2000)	Gerber (2001)	Mustaffa and Bowles (2004)	Gebken & Gibson (2006)	Connerty (2006)	Jones (2006)	McGeorge <i>et al.</i> (2007)	Love <i>et al.</i> (2008)	CRCCI (2009)	He (2010)	Ong and Gerber (2010)	Abeynayake & Weddikkara (2013)	Cheung (2014);	De Alwis <i>et al.</i> (2016)	Mohd Danuri <i>et al.</i> (2016)	Thusharika and Abeynayake (2016)	Mosey (2019);	Elhag <i>et al.</i> (2020)	Hardjomuljadi (2020)		Zhu & Cheung (2020)
Non acceptance of lowest tender [13]								1	1												2
Use of prequalification [14]								1	1												2
Clear identification of clients' needs [15]								1	1												2
Use of Standard forms of contract [16]								1	1												2
Third party reviews of design and BOQ [17]								1	1												2
Proper communication among parties [18]								1	1												2
Project planning and management [19]								1	1												2
Proper risk management practice [20]								1	1												2
Design audits, reviews, verifications [21]								1	1												2

A total of twenty-one (21) dispute avoidance strategies are identified along with the resources in the Table 2.5. As depicted in the above table, provision of a neutral arbitrator, appoint adjudicator from the beginning of the project, allocating fair contract risk, team work and use of relationship contracting are the most frequent strategies. The next section of the study explains the possible relationships between disputes and project characteristics.

2.5 Conceptual Framework: Relationship between Project Characteristics and Disputes

The foregoing sections have discussed the key aspects of projects characteristics and its applications, and disputes and the related issues. The main focus of this research is to develop a strategic framework to avoid disputes in Sri Lankan construction projects from the perspective of project characteristics. Therefore, this section explains and recalls the previous discussion to formulate the possible theoretical relationship between project characteristics and disputes. Once the relationships are established, a conceptual framework is developed to formulate the relationship between causes of disputes, dispute avoidance strategies and project characteristics.

The project features of project complexity, duration, and total managerial activities, according to Chan *et al.* (2004), are contributory aspects for the project's success. Successful projects are those that are less complex, have a lesser duration, and are completed by a private and knowledgeable client who is capable of drafting a brief and making decisions. Projects conducted in a stable environment with matured technology, a suitable organizational structure, and having a professional and experienced team head are also listed as success criteria by Chan *et al.* (2004).

When it comes to complex projects, Motsa (2006) claims that when a modification is made, it will have greater repercussions. Furthermore, the author asserted that complex projects need more design time than standard ones. Because the time allotted for planning a typical project is insufficient for a complicated project, a large number of addenda are required, and project mistakes are common. As a result, a shorter design time may lead to building project disagreements. In a similar vein, Hall (2002) asserted that a huge project entails more people, drawings, ideas, and thoughts. As a result, large scale projects are more possibility to have errors. According to studies, design errors in construction projects lead to disputes (Love *et al.*, 2010; Cakmak & Cakmak, 2013; Kumaraswamy, 1997). Cakmak and Cakmak (2013) found that design-related mistakes such as design flaws, insufficient specifications, poor design quality, information scarcity, and ambiguity in documents cause conflicts. As a result, it's reasonable to assume that complicated and huge projects are more prone to disputes.

Many researchers have concluded that payment delays lead to contract disputes (Na Ayuldhya, 2011; Farooqui & Azhar, 2014; Love *et al.*, 2010; Cakmak & Cakmak, 2013). Payment delays, for example, are the one of the most common sources of conflicts in Thailand's domestically financed projects, according to Na Ayuldhya (2011). Similarly, Francis and Ramachandra (2014) revealed that in Sri Lanka, delayed payments are often prevalent in projects that are solely funded by the local government, primarily because the government obtains funding prior to the beginning of the project and as a result of the government's time-consuming procedures, which are a result of the government's failure to secure funding prior to the start of the project. Payment difficulties are rare with foreign-funded projects as the funds are generally available before the project is signed to a specific contractor, and corporate clients are generally regarded as good payers because they have a dedicated finance department to handle financial matters on their behalf. The amount of time it takes for a client to make a payment varies based on the time of day and the individual client's payment history. The initial phases of a project are completed on time; however, payment delays arise later on when individual clients undertake projects without first collecting the entire budget before starting the project. Because of this, when comparing government-funded projects to private and foreign-funded ones, payment issue causes disputes.

Involvement high-risk is another element that contributes to disputes (Na Ayuldhya, 2011). Scope modifications, bad weather, inflation, unanticipated site conditions, and severe accidents are among project risks. According to Ojo (2012), project factors such as the kind of customer, the type of project, the procurement method, the duration, and the cost of the project have been highlighted as key drivers of erroneous cash flow forecast to the client, exposing it to more risk. As a result, it's reasonable to assume that project characteristics have an impact on conflicts.

Large projects are prone to time and expense overruns in general (Ashworth, 1996). When there are time and expense overruns, a contractor claims his entitlement by requesting a time extension and additional costs spent, according to Ren, Anumba, and Ugwu (2003). Following the presentation of a claim, the client and contractor can either agree on the claim and produce a variation order or do amendments or they might disagree, resulting in disputes.

Many of the reasons for disputes, according to Davis (2007), arise during the procurement process. Tenders with insufficient information, poor design, ill-defined project timetables, and confusing and insufficient documentation are all sources of conflicts at the project's early stages. Davis (2007) goes on to say that these deficiencies are usually the result of not allowing enough time for a project's design and procurement process. This would result in inadequate contract terms and paperwork, which would lead to project-wide disagreements.

Langford *et al.* (1996) mentioned that the procurement technique utilised in projects and the frequency of disputes are correlated. On the basis of this, Cheung and Yiu (2006) came to the conclusion that disputes are unavoidable in complicated construction projects when the traditional technique of procuring the structure is employed. Mante *et al.* (2012) further support that an increasing number of disputes are occurring in traditionally procured projects as a result of its salient characteristics such as fragmentation, price competition, poor communication, and a sequential process, which results in delays in the project's completion. Furthermore, according to Love *et al.* (2008), unjust risk distribution and inadequate risk management practices also contributes to disagreements. Farooqui and Azhar (2014) identified that inappropriate selection of procurement method and contract type contributes to disputes frequently in Pakistan. Further, according to Love *et al.* (2008), when the scope is ambiguous and no contractor engagement during the design stage, the chance of scope modifications increases, which may increase project cost and time. Early contractor engagement, on the other hand, is one of the conflict avoidance methods that are used in building projects to avoid disputes.

As evidenced procurement methods influence on dispute occurrence, the procurement method could be used to avoid disputes in the early stage of project. Cheung (1999) asserts that the practice of partnering and alliancing fosters team development and unity, therefore reducing the likelihood of disagreements. Both partnership and alliancing place a strong focus on the early involvement of important stakeholders, such as clients, contractors, and consultants, in the decision-making processes. On a similar note, Morledge *et al.* (2006) indicate that partnering and alliancing attempt to establish excellent working relationships among stakeholders and create an environment where trust and teamwork could be built upon. Alliancing

facilitates the disputes-averse relationship while partnering enhances cooperation in contract management and thereby reduces stress, disputes, litigation and cost (Cooperative Research Centre for Construction Innovation, 2009; Mante *et al.*, 2012). These features together have contributed to a rapid movement towards the use of partnering and alliancing to minimise disputes. Thus, this concludes that the procurement methods could be adopted as a way to avoid or minimise disputes.

Thus, the foregoing presented the literature finding of the relationship between project characteristics and disputes. It is concluded that project characteristics such as type of project, type of client, complexity, size and risk factor influence on disputes in construction projects. It is evidenced that the causes of disputes and dispute avoidance strategies could be attributed to project characteristics.

Following Figure 2.4 furnishes the finding of literature review and presented as a conceptual framework to avoid disputes in the construction industry with specific emphasis to project characteristics.

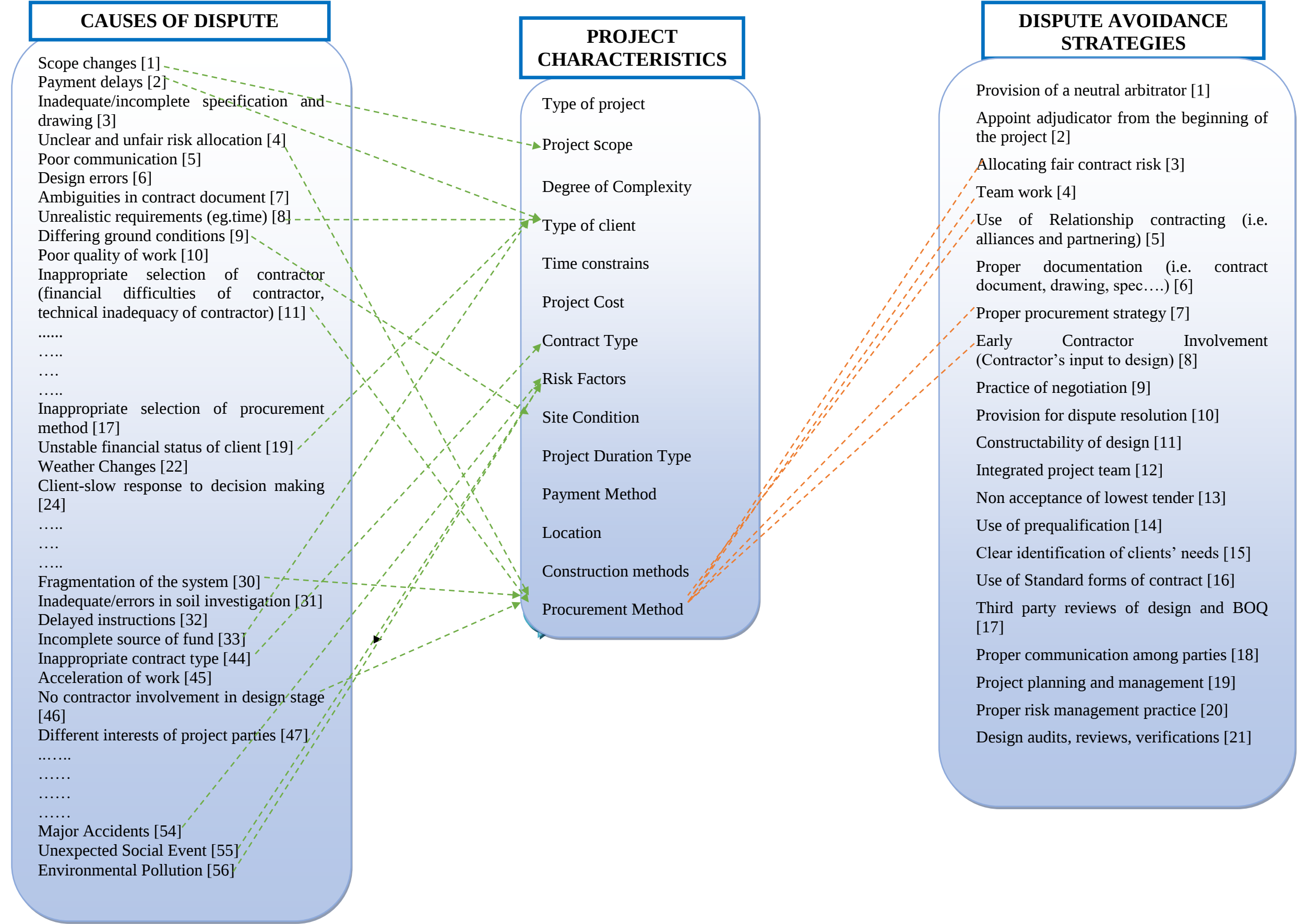


Figure 2.4: Conceptual Framework of Dispute Avoidance in Construction Projects from the Perspective of Project characteristics

As seen in the Figure 2.4, the conceptual framework includes the literature findings of causes of disputes, dispute avoidance strategies and project characteristics. The figure indicates that the disputes can be avoided through eliminating the causes of disputes. In a situation where there are disputes in projects, the effects of disputes need to be minimised through dispute mitigation strategies and resolved in terms of dispute resolution methods.

As depicted in Figure 2.4, certain causes of disputes can be addressed from the perspective of project characteristics. These possible relationships between project characteristics and causes of disputes are shown in green coloured dotted lines. For example, the complexity of the project can be linked to degree of complexity whereas unrealistic time targets can be addressed by type of client. In addition, scope changes can be directly related to the scope of the project. A few of the causes such as weather changes, unexpected social event, major accident and environmental pollution can be related to risk factors. Similarly, the causes of unfair and unclear risk allocation, fragmentation of system and inappropriate selection of procurement methods can be related to procurement methods. Thus, the framework establishes the theoretical relationship between project characteristics and disputes. viewing from the project characteristics perspective, procurement method could be related to several causes such as unfair and unclear risk allocation, fragmentation of the system, inappropriate selection of procurement method and no contractor involvement in design phase whereas the type of client could be attributed to the causes such as scope changes, payment delays, the unstable financial status of client and incomplete source of funding.

The Figure 2.4 depicts the possible relationship between project characteristics and dispute avoidance strategies in orange coloured dotted line. For example, the procurement method could create a relationship with several strategies such as allocating fair contract risk, relationship contracting, teamwork, proper procurement strategy and early contractor involvement. Thereby, the conceptual framework suggests that the disputes could be minimised by addressing the causes of disputes at the early stage of project by placing the project characteristics and utilising the respective dispute avoidance strategies.

2.6 Summary

This chapter has primarily presented the review of two major areas; key project characteristics and disputes and the related issues. The review of project characteristics covered the important aspects of project characteristics that influence on disputes. The review identified that the project characteristics of client type, project type, size, complexity, risk factors and procurement method influence on disputes. For example, projects with large size or high complexity or funded by government or high-risk involvement are more likely to experience disputes. Particularly, the projects procured traditionally experience higher disputes while partnering and alliancing are less favour in terms of dispute occurrence.

The review of disputes covered the areas of causes of disputes, effects of disputes, practices of dispute avoidance in the construction industry. The study presented the causes of disputes in terms of frequency count, parties responsible and the stages of project. Scope changes, payment delays, inadequate/incomplete specification and drawing are few of the most frequent causes contributing to disputes. The causes of opportunistic behaviour, lack of team spirit, poor communication and different interest of parties are identified as responsible by all three parties: contractor, consultant and client throughout the project. The review further provided the dispute avoidance strategies in terms of design management, procurement management, contract management and stakeholder management. Allocating fair risk allocation, use of relationship contracting, design and construct and Early Contractor Involvement are identified as procurement method-related techniques which minimise disputes. In addition, the dispute avoidance strategies are analysed using the frequency count of previous studies and found that provision of a neutral arbitrator, appoint adjudicator from the beginning of the project and allocating fair contract risk are few of the frequently utilised strategies in construction projects to avoid disputes. Further, the literature synthesis revealed that there could be a relationship exist between project characteristics and disputes. Thereby, the study could conclude that the project characteristics could be used as a strategy for dispute avoidance.

CHAPTER THREE

Research Methodology

3.0 Introduction

This chapter aims to outline the research framework adopted to achieve the aim and objectives of the current study. This explains the key elements of the research process under the subsections: research paradigms, research approaches, research strategies, data collection methods, data analysis methods, validity and credibility of research findings and write-up. The subsections begin with the introduction to the particular research element and then it discusses the justification of the selected methods for the current study. Particularly, this chapter presents the researcher's understandings and stunts in terms of each key element of the research process.

The research was conducted in three phases. Phase I involved a systematic review of the literature to identify the research problem, to define and refine the aim and objectives then, to develop a conceptual framework. Thus, the study primarily reviewed the literature related to causes of disputes and dispute avoidance strategies with special emphasis to project characteristics and finally developed a conceptual framework to avoid disputes with the focus of project characteristics. Phase II adopted the survey research method and collected data using questionnaires from the professionals who have involved in the dispute management process in Sri Lankan construction projects. Phase III employed a survey of construction projects which experienced disputes within its lifetime. The data was primarily collected through documentary review of project correspondence such as contract documents, arbitration and adjudication referrals, project summary reports, claims reports and other documents related to disputes. The collected data were further confirmed and missing information was gathered using semi-structured interviews conducted among the professionals who were involved in the selected projects. Finally, the research developed a strategic framework to avoid disputes in the Sri Lankan

construction projects focusing on the relationships among causes of disputes, project characteristics and dispute avoidance strategies.

3.1 Research Process Adopted for the Study

The research process is made up of several interconnected stages that appear to be structured linearly (Kothari, 2004). The exact number of steps varies depending on the research, however, they often include developing a topic, surveying the literature, designing the study to reach the desired aim and objectives, collecting data, analysing the findings, and producing a write-up of the report. The research process used in this work is depicted in Figure 3.1.

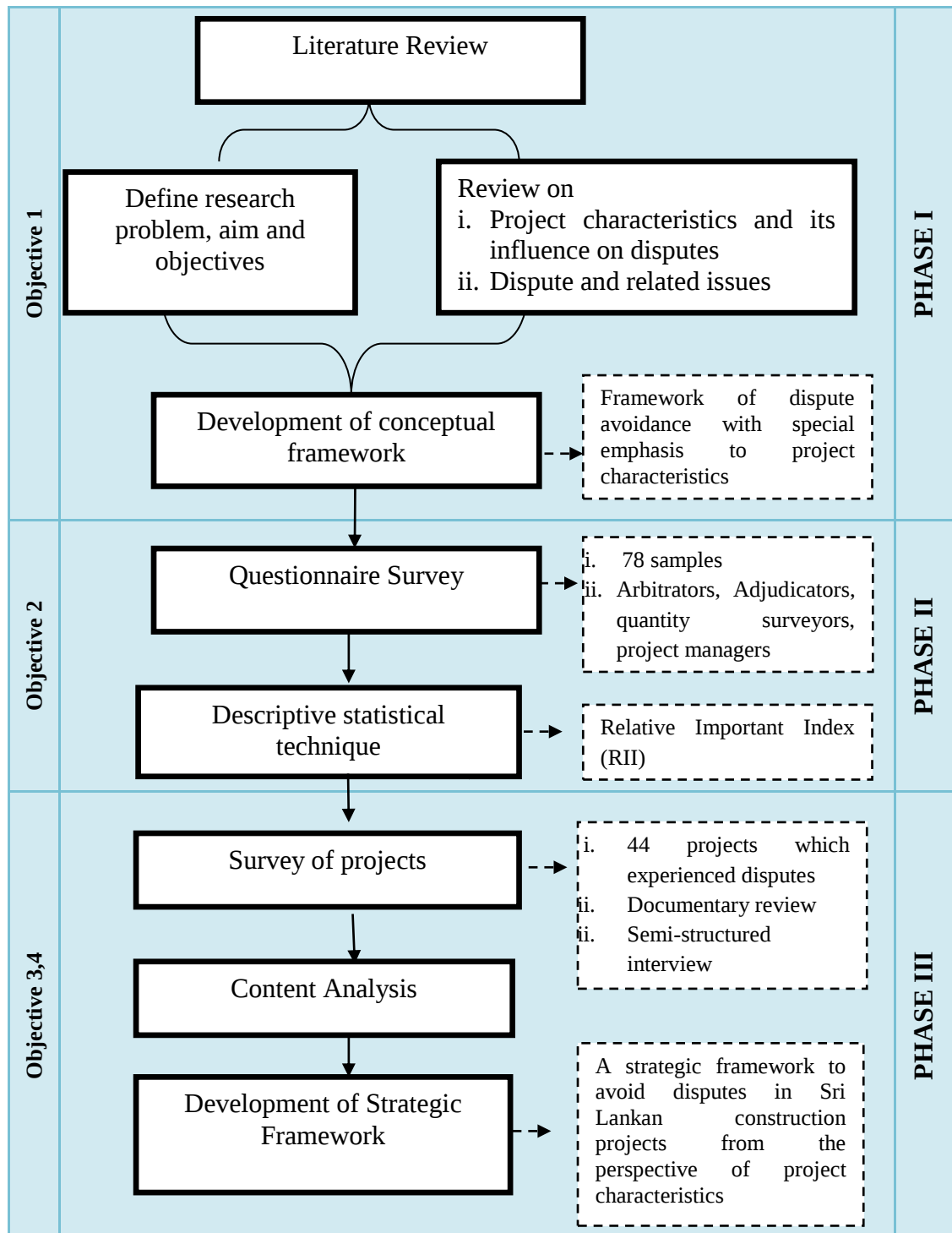


Figure 3.1: Research process adopted for the study

Figure 3.1 depicts the research process adopted in the current study. Accordingly, the research was divided into three Phases. Phase I consisted of reviewing literature related to disputes and project characteristics. Thus, this review enabled in achieving objective 01 completely. Phase II involved a survey approach using questionnaires,

targeted to employ experienced professionals in the field of dispute management. A total of seventy-eight questionnaires from the professionals such as arbitrators, adjudicators, quantity surveyors and project managers were employed in the survey. This found the significant cases of disputes, project characteristics which influence on disputes and dispute avoidance strategies practiced in the Sri Lankan construction industry. Thus, objective 02 was achieved. Thereafter Phase III targeted to survey the completed building projects which experienced disputes. As indicated in Figure 3.1, a total of forty-four projects were considered in the current study and data was collected through documentary review and semi-structured interviews. This enabled to formulate the relationships among causes of disputes and project characteristics; dispute avoidance strategies and project characteristics. Finally, the current study developed a strategic framework to avoid disputes in the Sri Lankan construction projects from the perspective of project characteristics. Thus, the research archived objectives 3 and 4 completely.

3.2 Research Design

The research question is transformed into a research project through research design (Robson, 2002). According to Saunders *et al.* (2012), research design will be the overall strategy for how the research will answer the research question(s) while taking into consideration defined objectives, methods, findings, specifying the sources from which data to be collected, and considering the constraints that will certainly take place, as well as describing ethical issues. Thus, the design of research defines the purpose, strategies, methods, and time horizons related to the research. According to Yin (2002), research design includes five components such as; research question(s), its propositions, unit of analysis, the logical connection to the data and to the propositions and the measures for describing the findings. There are two models available to explain the research design of a research project. They are ‘nested research model’ and ‘research onion’. Following Figure 3.2 shows the ‘nested research model’.

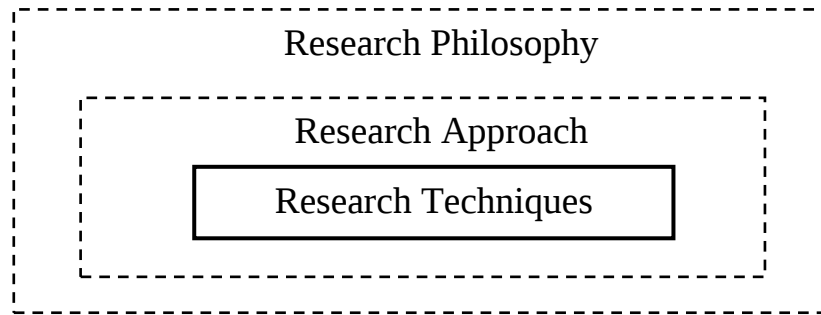


Figure 3.2: Nested research model

Source: (Kagioglou *et al.*, 2000)

The 'nested research model,' as defined by Kagioglou *et al.* (2000), is explained in Figure 3.2. This nests the research philosophies, approaches, and techniques, along with the outer ring "guiding and energizing the core research approaches and techniques" (Kagioglou *et al.*, 2000). The authors went on to explain that adhering to the layered model guaranteed that the research philosophy, approach, and methodologies are chosen, consistent with one another and that the study's requirements are met as a whole. This model, on the other hand, is unable to demonstrate the connections between research paradigms, methods and procedures. The research strategies, on the other hand, are not represented in this model.

Each layer of the onion in Saunders's research onion represents a more thorough step of the research process (Saunders *et al.*, 2019). Philosophies, approaches, choices, strategies, time horizons, and techniques are all covered by the layers. The research onion is a useful tool for developing a research technique since it shows the steps that must be taken. Its value rests in the fact that it can be adapted to nearly any sort of research methodology and may be applied in several circumstances (Bryman, 2012).

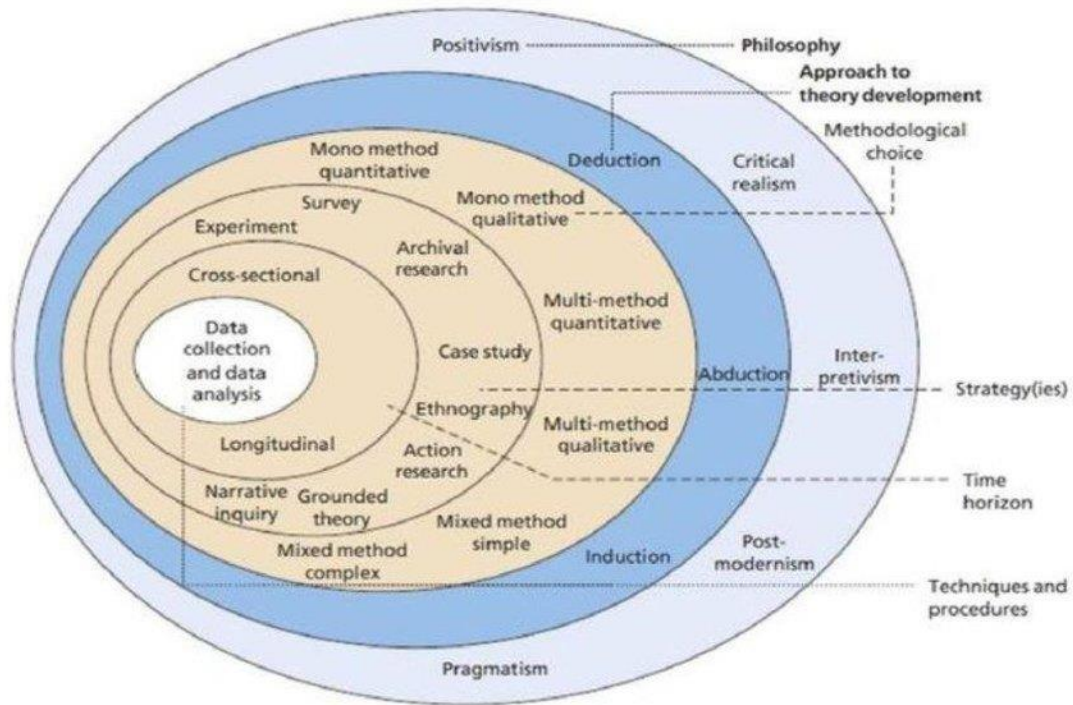


Figure 3.3: Research Onion

Source: (Saunders *et al.*, 2019)

Among these two research models, the current study adopts the research onion. This is because compared to other approaches this provides a clear guideline and sequence to follow the next upcoming research stages in detail. This also permits to keep up better control over the research and to accomplish the goals of the research. Thus, the following sections commence with an explanation of the purpose of the research indicating the clear research questions. Subsequently, the research identifies the philosophical stance and the possible research strategies. Followed by defining the approach adopted to study, a variety of methods offered to combine one or more data collection techniques and analysis methods are discussed after the definitions of quantitative and qualitative data are established. Then it further examines the time horizons that can be applied to the research and the issues of research credibility. Finally, the data collection and analysis, centre of the research onion is explained.

3.3 Research Questions (RQs)

As research methods are dependent on the aim of the research, the design of a research study is obtained by considering the purpose of the study and its RQs. The major RQ is ‘what is the strategic framework to avoid disputes in the Sri Lankan

construction projects from the perspective of project characteristics?’. To answer the primary research question the study tends to investigate the answer for four (04) RQs based on the objectives, are presented as follows;

- RQ1. What are the causes of disputes, dispute avoidance strategies, project characteristics which influence disputes?
- RQ2. What are the significant causes of disputes; significant project characteristics influencing disputes; dispute avoidance strategies practiced in Sri Lanka?
- RQ3. What type of relationships exists between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics?
- RQ4. How the disputes in Sri Lankan construction projects can be avoided through project characteristics?

Saunders *et al.* (2019) suggested that the research is recognised in three (03) categories as; descriptive, exploratory, and explanatory research based on the research questions. Performing an exploratory study is an excellent method to learn about what is occurring in a new situation, to get new information, and to analyse various occurrences in novel ways (Robson 2002). Saunders *et al.* (2019) indicated that conducting exploratory research provides room to change the direction as a result of new data or new insight. Descriptive studies portray an accurate situation or phenomenon (Robson, 2002). Saunders *et al.* (2019) indicated that it is essential to get a perfect understanding of the phenomena and the data collection methods. Explanatory studies formulate the relationship between variables while studying the research problem. This enables the use of statistical tests, such as correlation, to gain a more complete understanding of the connection. Alternatively, qualitative data may be gathered to help explain the link between two variables in greater detail (Saunders *et al.*, 2019).

The current study aims to develop a strategic framework to avoid disputes from the perspective of project characteristics. Therefore, the major research question is based on establishing relationships between variables such as project characteristics, causes

of disputes, and dispute avoidance strategies. The literature review evidenced that there could be a relationship between causes of disputes and project characteristics. Thus, a conceptual framework was developed highlighting the possible relationships. This study has further analysed the projects which experienced disputes to establish strong relationships between project characteristics, causes of disputes, and dispute avoidance strategies. In addition, the causes of disputes have been analysed by various researchers in many ways such as due parties responsible; root and proxy causes; direct and indirect causes. The current research has investigated the causes of disputes differently from the perspective of project characteristics. Thus, the current research merely served on explanatory research.

3.4 Research Paradigms and Philosophy

3.4.1 Research paradigms and philosophy in general

Research philosophy refers to a set of beliefs about how data on a phenomenon should be acquired, analysed, and applied (Galliers, 1991). According to Ormston *et al.* (2014), research philosophy answers the questions ‘what?’, ‘how?’ and ‘why?’ in terms of the research process itself. Thus, the philosophical stance of research will influence the way or the process to answer the research questions. In order to provide a clear understanding of the philosophical positioning of the research, Saunders *et al.* (2019) propose ‘research onion’ as depicted in Figure 3.2. The most external layer of ‘research onion’ specifies the philosophy of research, which could be falling into one of the philosophical positions such as positivism, realism, interpretivism and pragmatism. The different philosophies are created, as of different interpretations on the three basic assumptions; ontology, epistemology and axiology.

When it comes to reality, ontology is concerned with the nature of what is present. This is all about the world and how it works and the level of commitment people have to specific points of view. Objectivism and subjectivism are the two elements of ontology that are considered. Objective thinking represents the viewpoint that social entities exist in actuality independent of the social players who are concerned with their existence. Second, subjectivism believes that social phenomena are formed as a result of the perceptions and subsequent acts of the social actors who are

concerned with their existence (Saunders *et al.*, 2019). In a given field of study, epistemology is concerned with what constitutes acceptable knowledge (Saunders *et al.*, 2012) whereas ‘axiology’ considers judgments about value (Heron, 1996). According to Saunders *et al.* (2019), axiology studies the researchers’ influence on the knowledge which stands under two extremes; value-free and value bias. For example, according to the findings of an interview study, the researcher places higher importance on human connection with respondents than on their opinions stated through an anonymous questionnaire.

Saunders *et al.* (2012) suggest that depending on the assumptions of ontology, epistemology, and axiology, the research could be positioned into positivism, realism, interpretivism or pragmatism. Following Table 3.1 shows how the philosophical positioning changes according to the change of assumptions.

Table 3.1: Research paradigms and philosophies

	Ontology	Epistemology	Axiology
Positivism	External, objective and independent of social actors	Only observable phenomena can provide credible data, facts	Value-free
Realism	Objective	Observable phenomena provide credible data, facts	Value-laden
Interpretivism	Socially constructed, subjective, may change, multiple	Subjective meanings and social phenomena	Value-bound
Pragmatism	External, multiple, view chosen to best enable answering of research questions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research questions	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view

(Source: Adapted from Saunders *et al.*, 2012)

As defined by Levin (1988), positivism is the idea that reality is stable and that it can be observed and described objectively without interfering with the phenomena under inquiry. Rather than taking occurrences together, they think that results must be repeatable to be valuable. To find regularities in and make connections between some of the constituent pieces of the social environment, which is a typical goal in

social science, it is common practice to manipulate reality with variations in only a single independent variable at a time. Positivism emphasizes the importance of quantitative rather than qualitative approaches (Saunders *et al.*, 2019).

Interpretivists believe that only by subjective interpretation of and intervention, in reality, can be fully comprehended and comprehended in its entirety. The interpretivism philosophy is based on the observation of phenomena in their natural context, as well as the recognition that scientists cannot escape having an impact on the phenomena they research. They acknowledge that there could be a variety of explanations of reality, however, they claim that all these interpretations are in and of themselves a part of the scientific information they are attempting to acquire.

According to the philosophy of realism, there seems to be a reality that is completely independent of the human mind. The view that just the mind and its thoughts exist is known as idealism, and in this sense, realism is opposed to it. A branch of epistemology that is similar to positivism in that it takes a scientific approach to the advancement of knowledge is known as realism. Using this premise as a foundation, both the collecting of data and the interpretation of that data are possible (Saunders *et al.*, 2019).

Pragmatism relies on the basis that knowledge and social reality are based on beliefs and habits which are socially constructed by the process of institutionalization, legitimation and socialisation (Pansiri, 2005). On the theoretical level, pragmatic researchers acknowledge the significance of values in doing research and interpreting results, and they contend that reality is external and that researchers must accept external reality while selecting interpretations that best achieve desired outcomes (Rallis & Rossman, 2003). As previously stated, pragmatic reasoning has been praised as the most effective paradigm for justifying the use of mixed methods research (Teddlie & Tashakkori, 2003). Pragmatism holds that the research question is more essential than either the method used or the paradigm that underlies the method (Teddlie & Tashakkori, 2003). As a result, pragmatism allows for the proper use of any of the methodologies, strategies, and processes that are traditionally associated with quantitative or qualitative research. Furthermore, pragmatism

recognizes the limitations of any technique, allowing for the option of functioning with a variety of ways that are complementary to one another.

3.4.2 Research paradigms and philosophy specific to this research

As discussed in the previous section, different paradigms have different beliefs and concepts considering its philosophical assumptions on the nature of knowledge, way of acquiring the knowledge and the value judgment. It's difficult to define clearly which type of research stands on which particular stunt. Therefore, it's important to establish the best paradigm that suits the current research considering its objectives based on assumptions. Thus, Table 3.2 presents each of the research objectives concerning the ontology, epistemology and axiology components.

Table 3.2: Justification of philosophical stand for each objective

Research objectives	Ontology	Epistemology	Axiology
1. To critically review the causes of disputes, dispute avoidance strategies and project characteristics influencing disputes	The researcher considers reality to be independent of his knowledge, thus, the objective can be resolved using existing literature.	Review is conducted only through literature thus knowledge created through objectivism	Value-laden since the researcher's experience will influence the interpretation of literature findings.
2. To investigate the significant causes of disputes, project characteristics influencing disputes and significant dispute avoidance techniques practiced in Sri Lanka	Knowledge is external as the research adopts questionnaire survey and involves experienced professionals	A large amount of data are extracted and results are reached through reason logically	Value-free since no bias is required in analysing the quantitative data using descriptive statistics
3. To formulate relationship between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics.	This adopts the subjective stance of ontology as the relationships are built based on professional views.	Knowledge is reached through reason and interprets the results abstractly and logically	Value bound since relationships have emerged with the possible interpretation of the researcher

Research objectives	Ontology	Epistemology	Axiology
4. To develop a strategic framework to avoid disputes in Sri Lankan construction projects from the perspective of project characteristics	This adopts the mix of subjective and objective stance of ontology as the framework is developed by integrating above three objective findings.	Knowledge is reached through reason and interprets the results abstractly and logically	Value bound since relationships are emerged with the possible interpretation of the researcher

The research has taken a pragmatic stance, as illustrated through Table 3.2 to achieve the research aim of the study. As indicated in the above Table, the objectives needed both qualitative data and quantitative data to proceed with. Hence, both quantitative and qualitative research methodologies were combined together to carry out the research study. The pragmatic stance of the research could allow using different methods that appear best suited to the research problem, avoiding the philosophical debates of one true philosophy for all instances as depicted in Table 3.1. Furthermore, pragmatic research generally includes prolonged engagement and triangulation, which enables the researcher to undertake their own concerns while also capturing the voice of other research participants. Thus, the current study adopted the triangulation of data where a questionnaire survey, a documentary review, and a semi-structured interview were carried. Considering the above, this research takes a pragmatic philosophical stance in the process of achieving its aim and objectives.

3.5 Research Approach

As per methods Saunders *et al.* (2012) and Creswell (2003), the research approaches can be defined in two methods. Saunders *et al.* (2012) distinguished between two types of research approaches: the deductive method and the inductive approach. In a deductive method, a theory or hypothesis is developed, and then a research plan is developed in order to test the theory or hypothesis. The inductive technique collects information and uses it to create a hypothesis using the data analysis. When it comes to epistemological foundations, the deductive method is more founded on positivism, whereas the inductive approach is more based on interpretivism (Omotayo & Kulatunga, 2015). In the deductive approach, literature helps to identify theories and

ideas that will be then tested using data. In such research, the developed theoretical or conceptual framework will be subsequently tested using the empirical data while in the inductive approach, the research will explore the data and develop theories and subsequently relate to the literature (Saunders *et al.*, 2012).

According to Creswell (2003), research approaches are mainly three; qualitative, quantitative and mixed approach. Rather than utilizing probability, qualitative researchers frequently examine a particular setting or a limited number of persons or locations by employing theoretical or intentional sampling (Maxwell, 2005). It is possible that by employing this method, the researcher will be able to determine people's beliefs, understandings, opinions, and perspectives (Fellows & Liu, 2003). When it comes to quantitative research, post-positivism is commonly associated with it. Post positivism is a deterministic ideology that holds that causes almost always determine effects or results (Creswell, 2003). As a result, post positivists investigate issues in order to seek and acquire factual data, examine linkages between facts, and determine whether or not they are consistent with theories and the conclusions of any prior research (Kraemer, 2002). In quantitative studies, researchers advance the link between variables by posing questions or hypotheses about the relationship between variables (Creswell, 2003). Creswell (2003) further explained that qualitative research methods include ethnographies, grounded theory, case studies, phenomenological research and narrative research whereas surveys and experiments are considered as quantitative research methods.

As Creswell (2009) further verifies that, both qualitative and quantitative research methods can be incorporated together as mixed research methods. The researcher elaborates on or expands on the findings of one method with on the method called 'Sequential mixed method' while in the 'concurrent mixed' method, the researcher collects both qualitative and quantitative data at the same time and integrate into interpretations of overall results to analyse different type of questions. This technique is referred to as the parallel/simultaneous mixed design by Tashakkori and Teddlie (1998). Unlike sequential strategies, in which the researcher begins with one strategy (quantitative or qualitative) and then moves on to another, sequential methods allow the researcher to start with one approach and go on to another

(quantitative or qualitative). In the transformative mixed research method, the researcher uses a theoretical lens containing both qualitative and quantitative data. According to the previous researches of research methodologies reviewed above, many research strategies can be identified as case study, grounded theory, narrative research, ethnography (qualitative approaches), experiment, survey (quantitative approaches) and sequential, concurrent, transformative method (mixed approaches).

The current study developed a conceptual framework to avoid disputes in construction projects from the perspective of project characteristics using the existing literature. The conceptual framework is then tested and developed as a strategic framework to avoid disputes in Sri Lankan construction projects using the data from projects which experienced disputes. Thus, the research undertakes a deductive approach as per Saunders *et al* 's classification of research approach. In terms of Creswell's definition, the research adopted a survey research method and collects quantitative data through questionnaires in Phase II, this stands by the side of the quantitative approach. In addition, Phase III of the current research targets survey of projects which experienced disputes and collects both qualitative and quantitative data. Therefore, the current study employs a mixed approach which primarily adopts quantitative strategies and qualitative to a certain extent to investigate the projects which experienced disputes in a detailed manner.

3.6 Research Strategies

The research strategy directs the techniques that will be used in a research design in specified ways (Creswell, 2009). The following Table 3.3 shows the available research strategies under the three research approaches.

Table 3.3: Research strategies

Quantitative	Qualitative	Mixed
Experiments	Narrative research	Sequential
Survey	Ethnography	Concurrent
	Grounded theory	Transformative
	Action research	
	Case study	

Sources: (Yin, 2003; Creswell, 2009)

As evidenced in Table 3.3, quantitative techniques generally include surveys and experiments, whereas qualitative approaches include case study research, ethnography, action research, narrative research, and grounded theory. Moreover, a mixed-methods approach that includes both qualitative and quantitative methodologies can be used in a sequential, concurrent, or transformational manner in the same study.

An experiment intends to investigate causal relationships, specifically if a change in one independent variable results in a change in a subsequent dependent variable (Hakim 2000 cited Saunders *et al.*, 2012). When it comes to behavioural events in research, Kraemer (2002, quoted by Priyadarshani, 2010) notes that experiments entail the investigation of the phenomena in an experimental control environment, whereas case studies do not require such control on behavioural events in research. The use of survey research to offer a quantitative or numeric depiction of population trends, attitudes, or views is accomplished by examining a representative sample of the population (Creswell, 2009, p. 12).

Individual life stories are collected through narrative research, which is a type of qualitative method to analyse the lives of individuals and invites one or more of those persons to share tales about their lives (Creswell, 2009). In ethnographic research, which is conducted using a qualitative research technique, the researcher observes and interviews members of an intact cultural group in a natural environment over an extended period of time (Creswell, 2009). According to Saunders *et al.* (2012), grounded theory is an inductive research technique to develop a broad, abstract theory of a process, action, or interaction that is based on the perspectives of those who have participated in the study. Developing grounded theory requires many rounds of data collection, refining of data categories, and the interaction of data categories (Creswell, 2009). Action research involves the researcher as part of the organisation to be investigated and it is the outcome of the contribution of the participants of an organization with relation to a subject that is of genuine importance to them (Coghlan & Brannick, 2014). A case study technique, according to Yin (2009), may be used to better comprehend a complicated topic or item, and it can also be used to expand experience or strengthen to what has already been discovered via prior research, among other things. In addition, the researcher

looks into the details of a program, occasion, activity, process, or one or more persons in-depth (Creswell, 2009).

3.7 Survey as a Research Strategy

The survey is a popular and typical method in management research that is used in both exploratory and descriptive studies. Surveys are commonly used to answer questions such as who, what, where, how much, and how many people are involved in the research (Saunders *et al.*, 2012). When it comes to gathering information on a community, surveys are a relatively rapid and effective means of doing so (Kelley *et al.*, 2003). This type of information might be quantitative or qualitative in nature. Instead than delving into the details of a single instance, the goal of a survey is to capture the most important features of the population at any one moment or to track trends over time (Kraemer, 2002). The author further has added that the survey strategy often involves examining the relationships among variables. In addition, it is subjective as the data required for survey research are collected from people. Surveys enable the collection of a huge amount of information from a big number of people in a cost-effective and timely manner.

Management studies are most commonly utilized to provide answers to queries such as who, what, where, how much, and how many. This means that it is most commonly employed for exploratory and descriptive research. In addition, the survey approach is seen as authoritative by the general public, and it is both very simple to interpret and explain by the general public.

The reasons behind the selection of survey strategy as follows,

- It is feasible to utilize data gathered through a survey method to offer possible explanations for specific correlations between variables and to develop models of these interactions (Saunders *et al.*, 2012). The current research develops relationships between causes of disputes, project characteristics and dispute avoidance strategies. Thus, a survey strategy is well suited to achieve the aim of the study.

- Further, Yin (2003) and Kraemer (2002) offered that the survey strategy should be concerned when the study tends to answer ‘who, what, where, how many and how much’ questions whereas a case study would not be an advantageous strategy in this situation. It is because of the case study research focused on how and why questions. As explained in section 3.3, many of the research questions of the current study start with ‘what’. Therefore, this justifies the selection of survey strategy.
- The survey strategy incorporates large samples into the research to generalize the findings of survey to the population. The phase I of current research is required to gather the opinion of professionals to identify the significant causes of disputes, project characteristics and dispute avoidance strategies in Sri Lanka. In addition, the research accommodates a considerably higher number of projects which experienced disputes to establish the relationships. Thus, this justifies the selection of a survey method for the current study.

By considering all the above reasons, the survey approach under the quantitative and qualitative phenomenon is selected as the most appropriate research strategy to conduct this study. Thus, the current study involved survey method in two folds such as a questionnaire survey as an initial investigation thereafter the research employed surveying of construction projects which experienced disputes to carry out a detailed investigation.

3.7.1 Questionnaire survey

After the critical review of literature, the research adopted survey strategy using questionnaires to collect views from the professional who managed disputes in construction projects. The survey targeted the professionals such as project managers, quantity surveyors, adjudicators, and arbitrators who are directly involved in the dispute management process in construction projects. The survey aims to investigate three major aspects; the significant causes of disputes, significant project characteristics which influence disputes and the dispute avoidance strategies practiced in Sri Lanka. Thus, this achieved objective 2 completely.

3.7.1.1 Sample Selection

Sampling is a method for picking a set of units out of a larger population with the goal of gathering information about those units in order to make conclusions about the larger population as a whole. There are two forms of sampling: probability sampling, also known as representative sampling, and non-probability sampling, also known as judgment sampling (Saunders *et al.*, 2012). Further research by Saunders and colleagues (Saunders *et al.* 2012) found that using probability sampling the likelihood, or probability, of each instance being picked from the population is known and is typically equal for all cases. Research by the Ministry of Industry (2010), on the other hand, found that probability sampling is a type of sampling that permits inferences about the population to be drawn based on observations from a sample of observations. As a result, probability sampling is frequently used in conjunction with survey and experimental research techniques in academia. Nonprobability sampling is a technique for picking units from a population that is not based on chance (i.e., it is not random) (Ministry of Industry, 2010). The likelihood of each instance being picked from the whole population is not known for non-probability samples, making it difficult to answer research questions or achieve the objectives in this situation.

The required sample for the questionnaire survey was drawn using snowballing which is a non-probability sampling technique, as it is difficult to quantify the targeted population to adopt probability sampling. The experienced professionals who are involving in dispute management are difficult to quantify and they are limited in number. In addition, the targeted group of respondents is similar in nature. Thus, a snowballing technique is well-suit in drawing the samples to the questionnaire survey. The use of snowballing enables starting the survey with few participants and then extending it to a larger sample with the help of previously identified samples. Further, this method of sampling is most applicable in small populations that are difficult to access due to their closed nature (Breweton and Millward, 2001). Stutely (2003 cited Saunders *et al.*, 2012) further specified that a minimum of 30 for statistical studies provides a suitable rule of thumb for the smallest number in each category within the overall sample. However, the larger sample's size the lower the likely error in generalizing to the population (Saunders *et*

al., 2012). As the least sample of 30 and the importance of having a large sample to generalize the survey findings to the entire population, the research was expected to collect about 30 samples from each group of professionals such as arbitrators/adjudicators, project managers, quantity surveyors. Thus, the research targeted to accommodate 90 samples the current study. However, respectively, numbers of 12, 32, and 34 were engaged in the current research. It was approachable only 12 arbitrators/adjudicators due to lack of practicing group. Thus the research finally employed a total of seventy-eight (78) questionnaires to the survey.

3.7.1.2 Data collection technique

A questionnaire is well utilized in survey strategies to collect data in an easy and quick way. According to Saunders *et al.* (2012), questionnaires are most appropriate for studies in which the majority of the questions are standardized and the researcher is certain that the questions are read in the same manner by all of the respondents. Within the literature review, a clear theoretical background on the causes of disputes, dispute avoidance strategies and project characteristics is established. With that, a questionnaire survey is well-suit for the initial investigation of the current study to identify the significant causes of disputes, dispute avoidance strategies practiced in Sri Lanka and project characteristics that influence disputes.

Questionnaire development

The formulation of a questionnaire is not an easy task, especially when it comes to ensuring the validity and reliability of the information obtained. According to Saunders *et al.* (2009, p.371), the internal validity and reliability of the data you gather, as well as the response rate you get, are highly dependent on the design of your questions, the structure of your questionnaire, and the rigor with which your pilot testing was conducted. A valid questionnaire will allow for the collection of correct data, and a trustworthy questionnaire will ensure that this data is obtained constantly. Considering the above, the questionnaire was developed primarily including closed-ended questions relating to the quantitative outcome of the research. The questionnaire consists of three main questions on causes of disputes; project characteristics; dispute avoidance strategies. The five-point Likert rating scale was used in which the respondent is asked to rate the given factors under each

question (refer Appendix 1 for the questionnaire developed for the questionnaire survey).

Distribution of questionnaires

The questionnaires were distributed electronically via email using and directly delivered (manually) to the participants considering the confirmed response of respondents. The research targets to involve 30 participants of each in project manager, quantity survey and arbitrator/adjudicator. Therefore, 40 questionnaires were issued to each type of professional except to arbitrators/adjudicators to achieve the expected sample. However, a total of seventy-eight were received. Below Table 3.4 depicts the response rate in terms of each group.

Table 3.4: Response rate

Professionals by designation	Number of questionnaires distributed	Number of questionnaires received	Response rate
Project manager	40	32	80%
Quantity Surveyor	40	34	85%
Arbitrator/adjudicators	25	12	48%
Total	105	78	74%

As planned, the research reached a minimum sample of 30 in the groups project managers and quantity surveyors. However, the research was managed to identify only 25 number of arbitrator/adjudicators and amongst twelve were responded to the questionnaire survey. As seen in Table 3.4, the response rate is 74%, where Richardson (2005 cited Nulty, 2008) suggested that 50% is regarded as an acceptable response rate in social research surveys.

3.7.1.3 Data analysis technique

The questionnaire required the respondents to record their opinion using a 5 point Likert scale where the scale of 1 to 5 refers to very low, low, moderate, high and very high respectively.

Doloi (2013) stated that reliability of mean and standard deviation are inadequate to the overall ranking. Therefore, Relative Importance Index (RII) was computed with

using below equation to rank the significant project characteristics and causes of disputes. SPSS v20 software was used to conduct this statistical analysis.

$$\text{Relative Important Index (RII)} = \frac{\sum w}{A \times N}$$

Where ‘w’ refers to the weighting given to each factors by each respondent, ‘A’- Highest weight and ‘N’- Total number of respondents.

According to Equere *et al.* (2020), five important levels are transformed from RI values: high (H) ($0.8 \leq \text{RI} \leq 1$); high medium (H-M); ($0.6 \leq \text{RI} \leq 0.8$); medium (M) ($0.4 \leq \text{RI} \leq 0.6$); medium-low (M-L); ($0.2 \leq \text{RI} \leq 0.4$) and low (L) ($0 \leq \text{RI} \leq 0.2$).

3.7.2 Survey of projects

Following the questionnaire survey, the research further required a detailed study into the construction projects, which experienced disputes to investigate the causes of disputes and dispute avoidance strategies in different project contexts and thereby formulate the relationships between causes, dispute avoidance strategies and project characteristics. Therefore, the research adopted a survey research method to collect data from real projects in Sri Lanka. As a first step, the research approached the professionals who involved in managing disputes. For example, the quantity surveyors and project managers of contracting organisations, directors and quantity surveyors of consultant organisations and arbitrators who involved in private practices, were approached at the first instance. Through these professionals, the research reached the projects which experienced disputes. Primarily, the documentary review was conducted and subsequently, semi-structured interviews were carried out among those professionals. The documentary review and semi-structured interviews assisted to collect data related to disputes and project characteristics.

3.7.2.1 Sample Selection

Survey of projects targeted to reach the construction projects which experienced disputes. The population was quite large and unknown. Therefore, a non-probability sampling technique is possible to be adopted. As per Saunders *et al.* (2012), non-probability sampling includes a variety of techniques such as quota, purposive,

snowball, self-selection and convenience. Amongst, the snowballing technique is adopted to identify the research participants thereby reaching the construction projects to the current study. Snowball sampling enables to obtain the subsequent respondents from information provided by initial respondents.

First, the process was started with two experienced professionals who involved in managing disputes. Those two identified further contacts and the new identified further new contacts and so on. Finally, the process was stopped when the desired number of samples was reached. The research participants provided access to collect data from the construction projects which experienced disputes. Every project is unique and the nature of the construction project differs according to the characteristics of the project which varies from project to project. This needs a systematic way of selecting the projects to the research. According to the questionnaire survey findings, project characteristics such as degree of design complexity, time constraint, procurement methods, types of client, size/cost of project, site conditions, type of contract and source of funding were found to be significantly contributing to disputes. Amongst, the project characteristics of the type of client, cost/size of project and procurement method are kept in similar proportions in the selection of project in order to generalize the research findings to different contexts. Other project characteristics were not taken for the systematic due to the time constraints. The following tree diagram (Figure 3.2) illustrates the selection of projects for the current study.

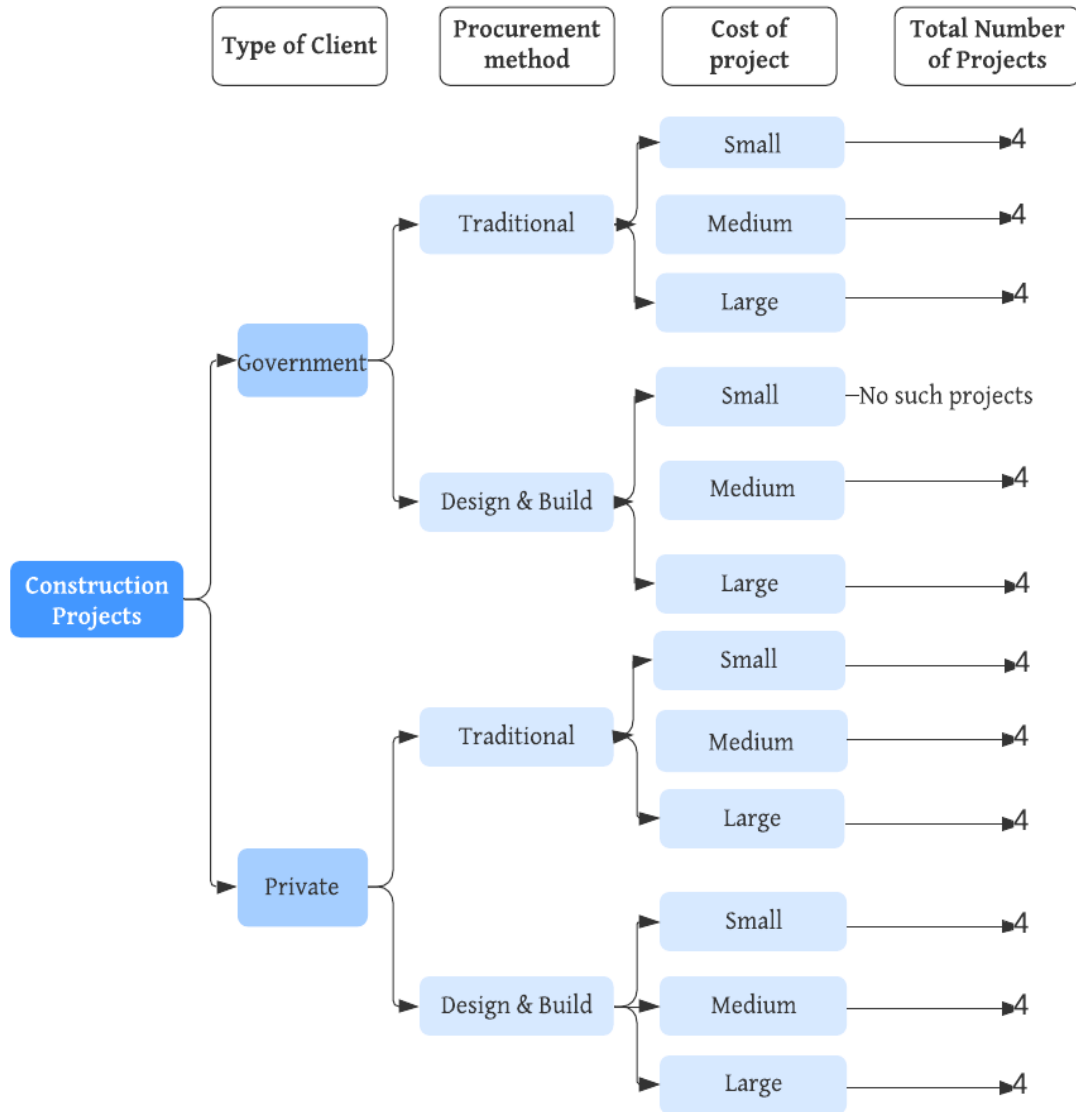


Figure 3.2: Sample selection of projects

As seen in Figure 3.2, altogether a total of 12 combinations were derived. Almost, it's rare to find small size government projects which procured using the design and build method. Therefore, one combination was eliminated and the eleven (11) combinations were taken for the selection of projects. As indicated in Figure 3.2, for a particular combination four projects were selected. Thus, a total of forty-four ($11 \times 4 = 44$) projects were accommodated in the current study.

3.7.2.2 Data collection techniques

Documentary review

Secondary data is data that has already been gathered for another reason and has been reanalyzed for another purpose (Saunders *et al.*, 2012). Barnes (2001) mentioned that documentary review is possible where records exist and that can be accessed by the researcher. Further, the author highlighted the advantages of using documentary review such as strategy may be traced back to their origins, plans and activities can be documented, and data triangulation can be facilitated by using many sources. Letters, agendas, memoranda, announcements, minutes of meetings, and other written reports, administrative documents, such as government documents, proposals, annual reports, progress review reports, and other internal records; newspaper articles; and newsletters are examples of the types of documents that exist.

Accordingly, the research reviewed the documents such as contract documents, monthly progress reports, adjudication and arbitration referrals, project summary reports, claim documents and other project correspondences. Mainly contract documents enabled to collect data related to project characteristics such as type, scope, size, procurement method, cost, duration, etc. Monthly progress contains the details of weather changes, site conditions and another contemporary record of the project. Adjudication and arbitration reports revealed the data related to disputes such as causes, effects, resolution method and number of disputes taken place and alike.

When it comes to managing documentary materials, Scott (1990) has developed a set of quality control standards. Authenticity, trustworthiness, representativeness, and meaning are the characteristics to look for. If the evidence is authentic and comes from an unquestionable source, it is credible. If the evidence is typical of its sort, it is representational. If the evidence is clear and intelligible, it is meaningful. Thus, the documents employed in this study satisfy the above quality control criteria as contract documents, and reports related to arbitration are legally binding, monthly progress report is prepared using daily updates by a quantity surveyor and signed by a site engineer who is responsible for all site activities, the adjudication report is

prepared by an adjudicator who is recognized by Dispute Adjudication Board, Sri Lanka, thereby authenticity is achieved.

Semi structured interview

Using interviews to obtain accurate and trustworthy data that is related to your research question(s) and objectives may be extremely beneficial to your study. Interviews can be very formalized and organized, with standardized questions for each study participant (or they might be casual and unstructured talks with a variety of participants). Depending on the formality and format of the interview, it may be divided into three categories: structured, semi-structured, and unstructured, as well as in-depth interviews. A list of themes and questions to be covered in semi-structured interviews will be provided by the researcher in advance of the interview, however, this list may differ from interview to interview. The sequence in which the questions are asked can also be changed based on the pace of the discussion. Furthermore, a semi-structured interview allows for the asking of extra questions in order to further investigate the study topic and goals (Saunders *et al.*, 2012). Furthermore, the authors said that in explanatory research, semi-structured interviews may be employed in order to better understand the connections between variables. Therefore, the current research being explanatory in nature, employed semi-structured interviews to collect views of participants who were involved in disputed projects. The purpose of the semi-structured interview in this study is to confirm the data collected in the documentary review and to collect the missing information. For example, the causes of disputes are confirmed and when it was not available the interviewees explained in detail. In addition, interviewees explained on the dispute avoidance strategies practiced as the details did not mention in any documents.

3.7.2.3 Data analysis technique

The content analysis method was used to analyze the data gathered through documentary review and semi-structured interviews. Content analysis is a reductive method of analyzing vast amounts of data. When it comes to content analysis, it is the process of categorizing qualitative information into pre-defined categories in order to identify patterns in the presentation and reporting of data (Kumar, 2011).

Both quantitative content analysis (Silverman, 2001) and qualitative content analysis (Krippendorff, 2004) are widely used in researches according to the nature of empirical data.

The quantitative content analysis involves counting the frequency of words in the text, prominence of words. The underlying assumption is the words mentioned most indicate the important concerns. In the current study, the data on project characteristics collected through the documentary was mainly analysed through quantitative content analysis. The data collected through semi-structured interviews are analysed using qualitative content analysis. This consists of several steps such as familiarizing with the data set, searching for themes, initial coding, assigning the codes, reviewing themes, the classification of responses under main themes, and the incorporation of themes and responses into the body of the report. Thus, the qualitative and quantitative data collected through the detailed investigation of projects were analysed using content analysis.

3.8 Write up

Writing-up of the thesis is gradually done throughout the study process rather than confined to the latter portion of the project when the data analysis is done. The write-up has been initiated in a descriptive style in the early stage and is narrowed in the latter phases. The next section explains the validity and reliability of the research.

3.9 Research Validity and Reliability

The validity of research is concerned with the overall quality of the study. Several tests have been identified to measure the quality of any empirical social research, according to the United States General Accounting Office (1999, cited by Yin, 2003). These tests provide an avenue for researchers to assess the trustworthiness, credibility, conformability, and data dependability of their research. These tests are referred to as 'construct validity,' 'internal validity,' 'external validity,' and reliability,' among other things (Yin 2003). Harris and Brown (2010) suggested use of more than one data collection technique could help to achieve data triangulation thereby confirming the construct, internal and external validity.

3.9.1 Construct validity

Construct validity is concerned with the establishment of appropriate operational measurements for the ideas under investigation (Yin, 2003). According to Yin (2003), this may be accomplished through the use of various sources of information, the establishment of a chain of evidence, and the participation of key informants in the assessment of the draft report. Through the course of this investigation, the aforementioned construct validity was attained through the use of the techniques listed below:

- The study employed a questionnaire survey and a detailed investigation to survey the construction projects which experienced disputes. Under these, three data collection techniques were involved; survey using questionnaires, survey of project using documentary review and semi-structured interviews. This leads to proper data triangulation thus, increasing the construct validity.
- Conducting semi-structured interviews improve the construct validity of the study since it provides the researcher with the chance to obtain clarifications on the concerns raised throughout the interviewing process. As this research initially collected data through documentary reviews and interviews were carried out additionally to verify the data collected through documentary review and to collect missing information, further confirms the construct validity of the research.

3.9.2 Internal validity

A causal link is established when some situations are shown to cause other conditions, which is what is termed internal validity. This is mostly accomplished through data analysis (Yin, 2003). Development of proper theoretical propositions prior to the data collection where the questions of questionnaire and interview guideline were properly aligned to those theoretical propositions increased the internal validity of the research. Further, proper pattern matching also carried out to improve the validity of the research. A conceptual framework was developed at the end of the literature review to explore the conceptual relationship between variables and after the data analysis, a strategic framework was developed to avoid disputes in

the Sri Lankan construction projects focusing the relationships between causes of disputes, dispute avoidance strategies and project characteristics.

3.9.3 External validity

The capacity to generalize the findings outside of the local field research is referred to as external validity. External validity is known as generalisability, is the extent to which the findings of a study can apply to other settings. This might be accomplished mostly through the research design process (Yin, 2003). The current research adopted the below process in order to improve the generalisability of research findings:

- A total of seventy-eight (78) questionnaires were employed in the questionnaire survey. The major professionals such as quantity surveyors, project managers and adjudicators/arbitrators, who were engaged in the dispute management activities in Sri Lankan construction projects were involved.
- The significant causes of disputes and dispute avoidance strategies practiced in Sri Lanka found through questionnaire survey were again tested and validated through the survey of projects which experienced disputes.
- A total of forty-four (44) projects that experienced disputes were employed in the detailed investigation. In the selection of projects, different project contexts were considered. Out of eight project characteristics taken for detailed analysis, type of client, size of project and procurement method were considered for the systematic selection of projects. Thus, a total of 44 projects were analysed in a detailed manner. As these projects comprise different project characteristics, the research findings can be applied to any project context in the Sri Lankan construction industry. Thus, this confirms the generalisability of research findings.

3.9.4 Reliability

The aim of proving reliability in a study is to demonstrate that the operations of the study, such as data collecting techniques, can be repeated and provide the same

findings (Yin, 2003). The following measures were followed in this study in order to accomplish this goal:

- The questionnaires were first verified with the experienced professionals initially and comments are incorporated. Thereafter the updated questionnaires were distributed among professionals to respond to the questionnaire survey.
- Documentary reviews and interviews were conducted based on the same interview guideline.
- Developed interview transcripts using the recordings of interviews thereby ensuring all relevant data were captured and no data were missed.

3.10 Summary

This chapter has covered the methodology that was used in the present study, as well as a summary of each technique in general, and how it was applied to the current research. Accordingly, the research philosophy, research approach, and research strategy used in the current research study are discussed. In addition, the methodologies for data collecting and analysis utilized in the study, as well as the steps taken to ensure the validity and reliability of the research, are described. The research was positioned in the pragmatic stance where a mixed approach was followed using the questionnaire survey in the initial study and documentary review and semi-structured interview in the detailed investigation into projects. Finally, the current study developed a strategic framework to avoid disputes in construction projects. The next chapter presents the results of the questionnaire survey carried out to identify the significant causes of disputes, project characteristics which influence disputes and dispute avoidance strategies practiced in Sri Lanka.

CHAPTER FOUR

Data Analysis and Findings – Questionnaire Survey

4.0 Introduction

Following the methodology chapter, this chapter presents the results of the investigation carried out to explore the project characteristics which influence on disputes, causes of disputes and dispute avoidance strategies practiced in Sri Lanka. Thus, a survey research strategy was adopted and questionnaires were distributed among the experienced professionals who were involved in dispute management in Sri Lankan construction projects. A total of seventy-eight (78) professionals which includes 32 project managers; 34 quantity surveyors; 12 legal professionals like arbitrators & adjudicators were involved in the questionnaire survey.

Firstly, the profile of information of survey participants is given. The data then analysed using descriptive statistical techniques. The analysis is presented under the four subthemes in the subsequent four sections which include significant project characteristics that influence on disputes, significant causes of disputes, and dispute avoidance strategies practiced in Sri Lankan construction projects. Finally, a summary of the current chapter is provided.

4.1 Profile of Survey Participants

The first part of the questionnaire collected the background information of research participants in order to ensure the reliability of the survey findings. Accordingly, the participants were required to indicate their designation, years of experience and the nature of work involved. Thus, Figure 4.1 depicts the profile of research participants.

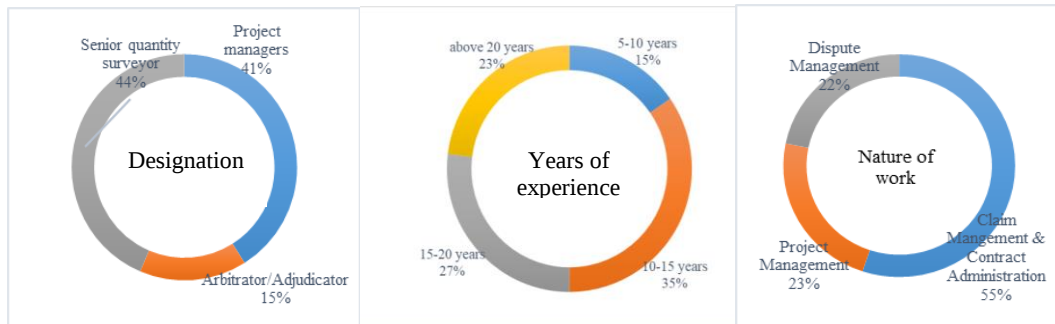


Figure 4.1: Distribution of profile information

As observed from Figure 4.1, in terms of designation, 44% (34 out of 78) of the participants worked in the capacity of senior quantity surveyors while a percentage of 41% (32 out of 78) worked as project managers. Another 15% of them worked as arbitrators and adjudicators. Though the research targeted to reach a total 30 participants of arbitrators and adjudicators, due to their unavailability, it was able to involve only 12 of them in this current research. In terms of experience, 23% (18 out of 78) of the participants have more than 20 years of experience, while 27% of them were with 15-20 years of experience in the relevant field. Another 35% of them have 10-15 years and a small percentage (15%) is with 5-10 years of experience. According to the nature of work involved, a considerable number of respondents (43 out of 78) have been involved in claim management and contract administration and 22% of them are handling dispute resolution activities. The remaining respondents here are involved in project management activities. These respondents' information profile together affirms the reliability and validity of the research findings.

4.2 Causes of Disputes

This section presents an analysis on the causes of disputes in Sri Lankan construction projects. The list of causes of dispute identified through literature review was presented to the research participants and requested to indicate the level of contribution of those causes to disputes in Sri Lankan construction projects. The level of contribution was recorded on a scale of 1-5 where '1' represents 'very low' while '5' represents 'very high'. Based on the responses, the RII values were calculated. As mentioned in methodology section, the significance level is identified as; high (H) ($0.8 < RI \leq 1$), high medium (H - M) ($0.6 < RI \leq 0.8$), medium (M) ($0.4 < RI \leq 0.6$), medium-low (M-L) ($0.2 < RI \leq 0.4$) and low (L) ($0 < RI \leq 0.2$).

Accordingly, Table 4.1 presents the causes of disputes, the respective RII values and their significance level.

Table 4.1: Causes of disputes

Causes of disputes	RII	Significance Level
Errors, contradictory, ambiguities of documents [7], [3], [16]	0.946	H
Client-slow response to decision making [24]	0.933	H
Discrepancies in contract provisions [12]	0.931	H
Design complexity [29]	0.908	H
Frequent changes to scope [1]	0.903	H
Payment delay [2]	0.892	H
Unrealistic requirement (i.e. Time) [8]	0.890	H
Cost overruns	0.885	H
Inadequate contract administration [15]	0.869	H
Inadequate/errors in soil investigation [30]	0.867	H
Inadequate brief [20]	0.862	H
Delayed drawings [26]	0.862	H
Delayed instructions [32]	0.856	H
Incomplete source of fund [33]	0.849	H
Inappropriate procurement method [17]	0.849	H
Unstable financial status of client [19]	0.846	H
Unfavourable risk allocation [4]	0.846	H
Time overruns [23]	0.846	H
Extension of time [34]	0.846	H
Delay in progress of work [21]	0.846	H
Poor quality of work [10]	0.843	H
Fragmentation of the system [30]	0.841	H
Inappropriate selection of contractor (financial difficulties of contractor, technical inadequacy of contractor) [11]	0.838	H
Poor communication [5]	0.836	H
Poor documentation of contractor [35]	0.823	H
Delay in evaluation of completed works [36]	0.823	H
Unrealistic tender price [37]	0.821	H
Inadequate site investigation [38]	0.821	H
Unjust and untimely presentation of claims [39]	0.815	H
Delay in approvals [40]	0.813	H
Error in estimation (over or under) [41]	0.810	H
Design errors & poor quality design [6]	0.810	H
Unpredictable site/ground conditions [9]	0.797	H-M
Opportunistic behaviour [41]	0.792	H-M
Poor planning and scheduling [13]	0.790	H-M
Lack of team spirit [43]	0.790	H-M
Inappropriate contract type [44]	0.790	H-M

Causes of disputes	RII	Significance Level
Negligence/ lack of professionalism [14]	0.782	H-M
Acceleration of work [45]	0.782	H-M
No contractor involvement in design stage [46]	0.772	H-M
Poor supervision [27]	0.767	H-M
Different interests of project parties [47]	0.762	H-M
Adversarial culture [25]	0.762	H-M
Lack of risk management [48]	0.759	H-M
Competitive tendering and price competition [49]	0.751	H-M
Inflation [28]	0.733	H-M
Legal and economic factor [18]		
Excessive and exaggerated claims [50]	0.728	H-M
Unclear milestones [51]	0.723	H-M
Changes in government regulations	0.723	H-M
Poor labour productivity [52]	0.721	H-M
Weather Changes [22]	0.649	H-M
Material shortage [53]	0.644	H-M
Major Accidents [54]	0.569	H-M
Unexpected Social Event [55]	0.554	M
Environmental Pollution [56]	0.551	M

As observed in Table 4.1, a total of 32 causes which received above 0.800 RII values are denoted as highly significant, are considered as mostly contributing causes to disputes in Sri Lankan construction projects. The topmost significant causes of disputes with the RII value of 0.946, is errors, contradiction and ambiguities of documents in Sri Lanka. However, according to a recent study, a major source of dispute in the Sri Lankan construction industry is a lack of effective communication between the parties (Edirisinghe *et al.*, 2020). The authors suggest that the causes are interconnected and that one cause could have an impact on the emergence of another. Poor communication during the pre-tender stage, for example, might result in "errors and omissions in design," which can then lead to "variations" in the final product.

As per the findings of the current research, the client's slow response to decision-making and discrepancies in contract provisions are the next causes which lead to disputes. This finding is in support of Na Ayuldhya (2011) and Kumaraswamy (1997) where the authors found that slow response to decision making is one the top most leading causes of disputes. In line with the current findings, several researchers also identified discrepancies in contract provisions as one of the significant causes

leads to disputes (Farooqui & Azhar, 2014; Love *et al.*, 2010; Cakmak & Cakmak, 2013). The findings revealed that payment delays as the significant cause leading to disputes with the RII value of 0.892. On a similar note, Na Ayudhya (2011) also identified payment delays as a critical factor contributing to disputes. Contrarily, delay in payment is one of the least treacherous causes of disputes in Pakistan construction industry (Farooqui & Azhar, 2014). As shown in Table 4.1, major accidents, unexpected social event and environmental pollution are the least contributing causes of disputes with the RII values below 0.600. On a similar note, Na Ayudhya (2011) also identified noise pollution as the least contributing cause to disputes in construction projects.

4.3 Project Characteristics Contributing to Disputes

This section describes the analysis of participants' responses on the degree of influence of project characteristics on disputes. The respondents were required to indicate the level of influence of project characteristics on dispute occurrence using a scale of 1-5 where '1' represents very low while '5' represents very high. Based on the responses, RII values were calculated. As mentioned in methodology section, the significance level is identified as; high (H) ($0.8 < RI \leq 1$), high medium (H - M) ($0.6 < RI \leq 0.8$), medium (M) ($0.4 < RI \leq 0.6$), medium-low (M-L) ($0.2 < RI \leq 0.4$) and low (L) ($0 < RI \leq 0.2$). Accordingly, Table 4.2 presents project characteristics which influence on disputes along with the respective RII values and their significance levels.

Table 4.2: Project Characteristics Contributing to Disputes

Project Characteristics	RII	Significance Level
Degree of design complexity	0.949	H
Time constraint	0.915	H
Procurement method	0.887	H
Type of client	0.879	H
Size of project (gross floor area)	0.815	H
Site factors	0.813	H
Type of contract/standard form of contract	0.810	H
Source of funding	0.805	H
Project cost	0.801	H
Payment method	0.779	H-M

Project Characteristics	RII	Significance Level
Project scope	0.754	H-M
Duration of project	0.741	H-M
Type of project (i.e. building, road, bridge...)	0.677	H-M
Project location	0.674	H-M
Construction method and technological advancement	0.662	H-M

As observed in Table 4.2, altogether nine (09) project characteristics were identified as highly influencing on disputes in construction projects with the RII value above 0.800. The highly significant project characteristics are degree of design complexity, time constraint, procurement method, type of client, size of project, site factors, type of contract, source of funding and cost of project. The other project characteristics such as payment method, project scope, duration of project, type of project, location of project and construction method and technological advancement found to be influencing in high-medium level on disputes in construction projects.

The findings indicate that degree of design complexity (0.949) is the topmost influencing project characteristic on disputes in construction projects. In line with the current study, Bajere *et al.* (2017) identified the complexity of the project as the topmost project characteristic which influencing claims and disputes in Nigerian construction projects. On the other hand, many researchers have claimed complexity as an inherent feature of construction project (Cakmak & Cakmak, 2013; Love *et al.*, 2010; Sinha & Wayal, 2007; Cheung & Yiu, 2006). Bajere *et al.* (2017) also found that the size of the project as a significant project characteristic which influences in dispute occurrence. In addition, the authors identified the duration of the project as significant however as per the results of the current study it's given with a medium level of significance with the RII value of 0.741.

4.4 Dispute Avoidance Strategies Practiced in Sri Lanka

This section represents the responses of participants on the dispute avoidance strategies practiced in Sri Lanka. The thirty-one (31) dispute avoidance strategies identified through the literature review were presented to the research participants and requested to indicate the extent of those dispute avoidance strategies being practiced in the Sri Lankan construction industry. The level of contribution was

recorded on a scale of 1-5 where '1' represents 'very low' while '5' represents 'very high'. Based on the responses, the RII values were calculated. As mentioned in methodology section, the significance level is identified as; high (H) ($0.8 < RI \leq 1$), high medium (H - M) ($0.6 < RI \leq 0.8$), medium (M) ($0.4 < RI \leq 0.6$), medium-low (M-L) ($0.2 < RI \leq 0.4$) and low (L) ($0 < RI \leq 0.2$). Table 4.3 presents the dispute avoidance strategies along with the respective RII values and their significance level.

Table 4.3: Dispute avoidance strategies

Dispute avoidance strategies	RII	Significance Level
Provision for dispute resolution [10]	0.823	H
Use of Standard forms of contract [16]	0.818	H
Provision of a neutral arbitrator [1]	0.762	H-M
Practice of negotiation [9]	0.674	H-M
Timely site inspections by consultant	0.672	H-M
Proper documentation (i.e. contract document, drawing, spec....) [6]	0.667	H-M
Use of prequalification [14]	0.656	H-M
Proper procurement strategy [7]	0.638	H-M
Make timely payment to contractor	0.626	H-M
Project planning and management [19]	0.621	H-M
Clear identification of clients' needs [15]	0.610	H-M
Standing Adjudication [2]	0.608	H-M
Proper communication among parties [18]	0.608	H-M
Constructability of design [12]	0.605	H-M
Sourcing adequate finance	0.603	H-M
Maintain contemporary records	0.597	M
Proper and timely instructions by consultant	0.592	M
Practice of timely notices	0.590	M
Flexibility of design	0.590	M
Allocating fair contract risk [3]	0.572	M
Third party reviews of design and BOQ [17]	0.562	M
Administrating change control procedures	0.559	M
Integrated project team	0.554	M
Team work [4]	0.554	M
Preparation of adequate client brief	0.549	M
Proper risk management practice [20]	0.538	M
Early Contractor Involvement [8]	0.518	M
Use of Relationship contracting [5]	0.513	M
Design audits, reviews, verifications [21]	0.503	M
Non acceptance of lowest tender [13]	0.500	M
Risk analysis at the time of tendering	0.438	M-L

The findings revealed that two of the disputes avoidance strategies; provision for dispute resolution and use of standard forms of contract are highly practiced in the Sri Lankan construction industry with receiving RII values of 0.823 and 0.818 respectively. Correspondingly, Jannadia *et al.* (2000) also identified that drafting dispute resolution clauses as the mostly used disputed dispute avoidance technique in Saudi Arabia. As depicted in Table 4.3, altogether thirteen (13) strategies received high-medium and a total of fifteen (15) strategies received a medium level of usage in Sri Lankan construction projects. Only one strategy, risk analysis at the time of tendering, received the lowest RII value of 0.438. However, it's good to note that risk analysis at the time of tendering is being practiced in Sri Lanka though in less level whereas there is no evidence found in the existing literature. Although, early contractor involvement and relationship contracting are identified as several researchers (Love *et al.*, 2008; Love *et al.*, 2007; Jones, 2006; Jannadia *et al.* 2000), the findings revealed that those are indicated as practiced at medium level in the Sri Lankan construction industry. The research, therefore, concludes that the readiness towards using dispute avoidance strategies by the professionals in Sri Lanka revealed should be improved.

4.5 Summary

This chapter has presented the analyses of the questionnaire survey findings in line with objective 02; identify project characteristics which influence on disputes; the significant causes of disputes, and dispute avoidance strategies practiced in Sri Lanka. The findings revealed that the degree of design complexity is mostly influencing project characteristics on dispute occurrences in projects. The analysis indicated that among the 56 causes of disputes, 32 were found to be significant using the RII values calculated based on the responses. Then, the extent of the practice of dispute avoidance strategies in the Sri Lankan construction industry was also identified and the analysis indicated that provision for dispute resolution and use of standard forms of contract are the frequently followed strategies to avoid disputes in Sri Lankan construction projects. The next chapter presents the findings based on the analysis of projects surveyed through documentary review and semi-structured interviews.

CHAPTER FIVE

Data Analysis and Findings – Survey of Projects

5.0 Introduction

The previous chapter has presented generic judgments on causes of disputes, project characteristics and the dispute avoidance techniques practiced in Sri Lanka. A detailed investigation into projects which experienced disputes was carried out to investigate the causes of dispute and dispute avoidance strategies in different project contexts and thereby formulate relationships among them. A total of forty-four (44) projects which experienced disputes, were involved and the data was collected through documentary review and semi-structured interviews. Contract documents, monthly progress reports, project summary, adjudication and arbitration referrals, claim reports and other correspondences were involved in the documentary review. Semi-structured interviews were subsequently conducted among the experienced professionals who have been involved in the selected projects to verify the data collected through documentary review and to collect the missing information. The results of the analysis are presented in five (05) main sections which include (1) Project characteristics; (2) Causes of disputes; (3) Relationship between causes of disputes and project characteristics; (4) Dispute avoidance strategies; (5) Relationship between dispute avoidance strategies and project characteristics.

5.1 Profile of Research Participants

The projects which experienced disputes were sought by approaching the professionals involved in the dispute management process, at the first instant. Table 5.1 outlines the details of the research participants who have been involved in

managing disputes in the identified projects for the current study. In addition, Table 5.1 depicts the details regarding the number of projects surveyed under each interviewee and the documents referred to.

Table 5.1: Details of research participants and projects surveyed

Interviewee Code	Designation	Years of experience	Scope of work	Number of projects	Documents reviewed
I-01	Senior Quantity Surveyor	12 years	Claim management	3	Variation claims, contract document, EOT claims, Price escalation claims
I-02	Arbitrator	16 years	Dispute resolution	2	Arbitration referral
I-03	Arbitrator	14 years	Dispute resolution	3	Arbitration referral
I-04	Senior Quantity Surveyor	11 years	Claim management	2	Contract document
I-05	Director, QS Consultancy Firm	16 years	Claim management	1	Contract document, negotiation correspondence
I-06	AGM, Contracting Organisation	20 years	Claim management	1	Project summary report Contract document, negotiation correspondence
I-07	Project Manager	8 years	Project Management	3	Project summary report Contract document,
I-08	Project Manager	11 years	Project Management	2	Project summary report Contract document,
I-09	Senior Quantity Surveyor	6 years	Claim management	2	EOT claims, contract documents
I-10	MD, Consultant Organisation	17 years	Claim management	2	Project summary report
I-11	Project Manager	11 years	Project Management	3	Contract document, negotiation correspondence
I-12	Project Manager	12 years	Project Management	2	Project summary report Contract document
I-13	Arbitrator	13 years	Dispute resolution	2	Arbitration referral
I-14	Senior quantity Surveyor	6 years	Claim management	3	Contract documents, claim correspondences

Interviewee Code	Designation	Years of experience	Scope of work	Number of projects	Documents reviewed
I-15	Senior quantity Surveyor	12 years	Claim management	2	Contract documents, claim correspondences
I-16	Senior quantity Surveyor	11 years	Claim management	1	Contract document, claim correspondences
I-17	Senior quantity Surveyor	11 years	Claim management	1	Contract document, claim correspondences
I-18	Director, Qs consultancy firm	22 years	Claim management	3	Contract document, claim documents and other correspondence related to dispute negotiation
I-19	Director, Qs consultancy firm	25 years	Claim management	3	Contract document, claim documents and other correspondence related to dispute negotiation
I-20	Manager for projects, contracting organisation	17 years	Claim management	3	Contract document, claim documents and other correspondence related to dispute negotiation

As indicated in Table 5.1, a total of twenty (20) professionals including arbitrators, senior quantity surveyors, project managers and top-level managers were reached to collect the details about the projects which experienced disputes. Each professional provided details of more than one project which experienced disputes as depicted in the above table. Within the selected projects, the data were collected through documentary review and semi-structured interviews with the said professionals. The documentary reviews were carried out among the arbitration referrals, contract documents, project summary reports, EOT claims, price escalation claims, and correspondence related to disputes. The profile of participants was further summarised and depicted in Table 5.2.

Table 5.2: Profile of research participants

Background Information	Number		Percentage share
Designation	Arbitrator	3	Arbitrator 15% Project Manger 20% Top level managers 30% Senior quantity Surveyor 35%
	Project Manager	4	
	Top-level managers	6	
	Senior Quantity Surveyor	7	
	Total	20	
Scope of work	Dispute resolution	3	Dispute resolution 15% Claim management 65% Project Management 20%
	Claim management	13	
	Project management	4	
	Total	20	
Years of experience	5-10 years	3	5-10 years 15% 10-15 years 50% 15-20 years 25% above 20 years 10%
	10-15 years	10	
	15-20 years	5	
	above 20 years	2	
	Total	20	

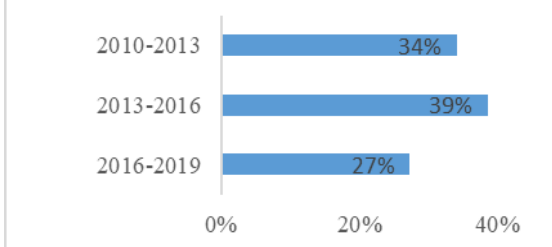
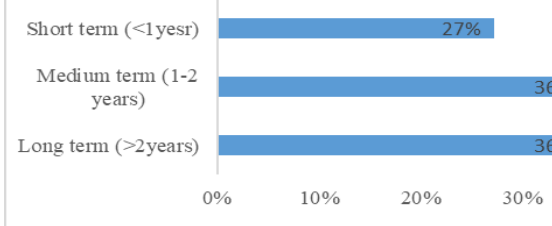
As observed from Table 5.2, in terms of designation, 35% (7 out of 20) of the participants worked in the capacity of senior quantity surveyors while a percentage of 30% (6 out of 20) positioned in as top-level managers like managing director,

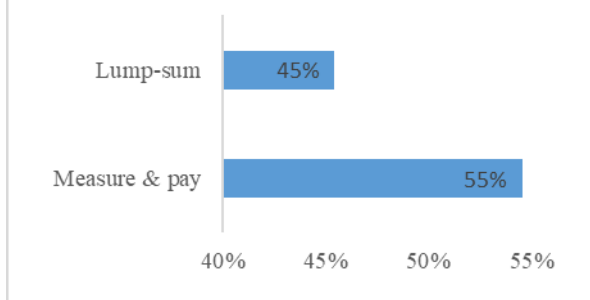
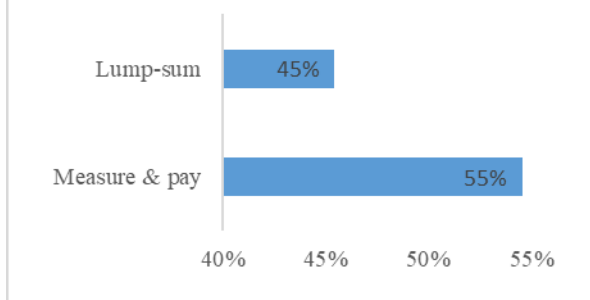
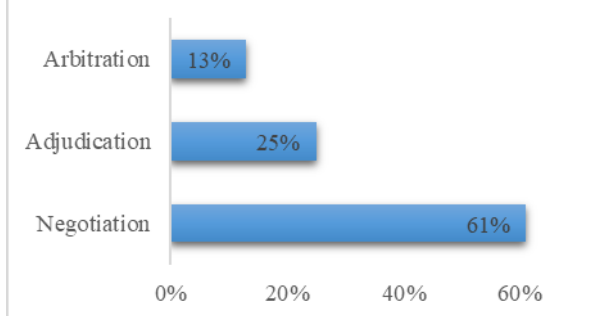
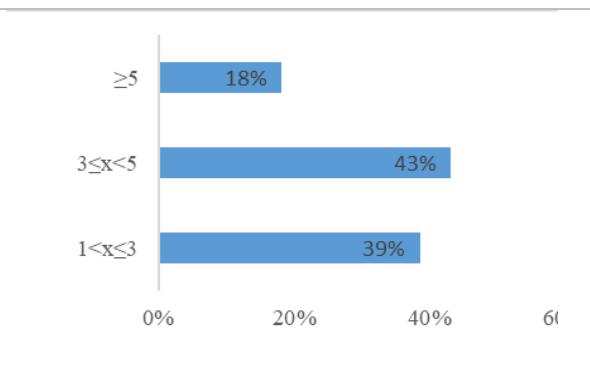
general manager, etc. Another 15% of them worked as arbitrators. According to the nature of work involved, a considerable number of respondents (13 out of 20) have been involved in claim management and 15% of them are handling dispute resolution activities. The remaining respondents here are involved in project management activities. In terms of experience, 10% (2 out of 20) of the participants have more than 20 years of experience, while 25% of them were with 15-20 years of experience in the relevant field. Another 50% of them have 10-15 years and 15% are with 5-10 years of experience. These respondents' profile together affirms the reliability and validity of the research findings.

5.2 Profile of the Projects Surveyed

Table 5.3 outlines the profile of the projects involved in the detailed investigation of the current research. It shows the distribution of selected projects in terms of the year of completion, duration of the project, location, payment method, contract type, dispute resolution methods adopted and frequency of disputes.

Table 5.3: Profile of projects surveyed

General information		Number	Percentage (%) share	
Year of completion	2010-2012	15		
	2013-2015	17		
	2016-2019	12		
Duration of the project	Short term (<1year)	12		
	Medium term (1-2 years)	16		
	Long term (>2years)	16		

General information		Number	Percentage (%) share								
Contract type	Lump-sum	20	 <table><tr><th>Contract type</th><th>Percentage (%) share</th></tr><tr><td>Lump-sum</td><td>45%</td></tr><tr><td>Measure & pay</td><td>55%</td></tr></table>	Contract type	Percentage (%) share	Lump-sum	45%	Measure & pay	55%		
	Contract type	Percentage (%) share									
Lump-sum	45%										
Measure & pay	55%										
	Measure & pay	24									
Payment method	Lump-sum	20	 <table><tr><th>Payment method</th><th>Percentage (%) share</th></tr><tr><td>Lump-sum</td><td>45%</td></tr><tr><td>Measure & pay</td><td>55%</td></tr></table>	Payment method	Percentage (%) share	Lump-sum	45%	Measure & pay	55%		
	Payment method	Percentage (%) share									
Lump-sum	45%										
Measure & pay	55%										
	Measure & pay	24									
Dispute resolution method	Negotiation	27	 <table><tr><th>Dispute resolution method</th><th>Percentage (%) share</th></tr><tr><td>Arbitration</td><td>13%</td></tr><tr><td>Adjudication</td><td>25%</td></tr><tr><td>Negotiation</td><td>61%</td></tr></table>	Dispute resolution method	Percentage (%) share	Arbitration	13%	Adjudication	25%	Negotiation	61%
	Dispute resolution method	Percentage (%) share									
	Arbitration	13%									
Adjudication	25%										
Negotiation	61%										
	Adjudication	11									
	Arbitration	6									
Frequency of disputes	1≤x<3	20	 <table><tr><th>Frequency of disputes</th><th>Percentage (%) share</th></tr><tr><td>≥5</td><td>18%</td></tr><tr><td>3≤x<5</td><td>43%</td></tr><tr><td>1<x≤3</td><td>39%</td></tr></table>	Frequency of disputes	Percentage (%) share	≥5	18%	3≤x<5	43%	1<x≤3	39%
	Frequency of disputes	Percentage (%) share									
	≥5	18%									
3≤x<5	43%										
1<x≤3	39%										
	3≤x<5	16									
	≥5	8									

As seen in Table 5.3, the study considered the projects which were completed during the period 2010-2019. The dispute has been persistent constantly throughout the last ten years as evidenced in the above table. In terms of duration, 12 projects are short-term whereas 16 projects are long-term and medium projects in each. Among these

44 projects, 55% of them adopt lump sum whereas the remaining project follows measure and pay method in making payments to the contractor. Similar distribution can be seen in type contracts. The profile of projects depicts the dispute resolution method utilised in the project to resolve disputes. The majority (27 out of 44) of projects resolved disputed using negotiation. A considerably less number of projects (11, 6) adopted adjudication and arbitration in solving disputes respectively. In terms of frequency, 43% of the projects have experienced in the range of $3 \leq x < 5$ disputes. Considerably less number of projects (8 out of 44) experienced more than 5 disputes. The next section of the research explains the project characteristics of the selected projects in detail.

5.3 Project Characteristics of the Projects Surveyed

This section describes the analysis of project characteristics of the projects which were gathered through documentary review and semi-structured interviews. The significant project characteristics identified in the questionnaire survey were analysed in detail in the survey of projects. The project characteristics such as procurement method, type of client, size/cost of project and type of contract document used were found in the contract document, project summary report and other project correspondence. In addition, semi-structured interviews conducted with the practitioners involved in the projects enabled collecting data on the degree of design complexity, time constraint, site conditions and source of the funding agency. Below Table 5.4 depicts the profile of projects in terms of its project characteristics.

Table 5.4: Project characteristics of the selected projects

Project characteristics		Number	Percentage (%) share
Degree of design complexity	High	17	39%
	Medium	15	34%
	Low	12	27%
Time constraints	Yes	14	32%
	No	30	68%
Procurement method	Traditional	24	55%
	Design & Build	20	45%
Type of client	Government	20	45%
	Private	24	55%
Site condition	Ordinary	26	59%
	Differing	18	41%

Project characteristics		Number	Percentage (%) share
Type of contract document	Proper standard document (SBD, FIDIC)	35	80%
	Improper document	9	20%
Source of funding	Government treasury	21	48%
	Completely foreign funded	2	5%
	Bank loan and equity	24	55%
Cost/size of the project	Large (500Mn<)	16	36%
	Meduim (100Mn-500Mn)	16	36%
	Small <100 Mn	12	27%

As seen in Table 5.3 the distribution of selected projects in terms of the procurement method adopted, type of client, project cost/size of the project is maintained possibly as in similar proportion to ensure consistency. As explained in the methodology section, a total of forty-four projects which experienced disputes were considered in the study. In terms of procurement method, the sample includes 55% (24 out of 44) of traditionally procured and 45% (20 out of 44) of design & build projects. Similarly, of the selected projects, 45% of projects are funded by the government while the remaining 55% are of private clients. The project cost of selected buildings varies from 100Mn-500Mn (36%) to above 500Mn (37%). The remaining 27% of projects are small size with less than 1000Mn. A similar distribution is seen for the size of projects as observed from Table 5.3.

Of these 44 projects, 39% of them are highly complex in design whereas 34% are low in design complexity. A total of fourteen (14) projects are exposed to time constraints in the programme schedules whereas eighteen (18) projects are exposed to different site conditions. In terms of source of funding, a considerably equal number of projects are funded by government treasury and bank loans & equity. Only two (02) projects are funded by the foreign government. The next subsection describes the findings on the causes of disputes of the selected projects.

5.4 Causes of Disputes in the Projects Surveyed

This section describes the analysis of collected data to the question of what are the causes contributed to disputes in the selected projects. Initially, causes of disputes are identified by reviewing the documents prepared during the arbitrator/adjudication process and correspondence related to claims and disputes. In addition to

documentary review, the semi-structured interviews among the professionals who involved in dispute management are conducted to ensure the causes and to collect detailed evidences about the causes. Table 5.5 presents the causes of disputes along with their respective frequencies.

Table 5.5: Causes of disputes and its frequency

Causes of projects	Frequency count (out of 44 projects)	Percentage
Payment delays	33	75%
Ambiguities in documents	33	75%
Scope changes	28	64%
Design errors	25	57%
Complexity of project	19	32%
Extension of time-related issues	16	36%
Poor quality of work	16	36%
Contractor's cash flow difficulties	16	36%
Delay in the progress of work	15	34%
Unrealistic time targets	13	30%
Government policy changes	12	27%
Improper coordination between parties	11	25%
Improper communication	11	25%
Administration issues on the contractor side	9	20%
Slow response to decision making	8	18%
Consultant's attitude	7	16%
Discrepancies and absence of provisions	7	16%
Cost overruns	7	16%
Administration issues on client-side	7	16%
Instability of government	7	16%
Price escalation related issues	6	14%
Disagree to remedying defects	4	9%
Client as a layman	3	7%
Absence of client representative	3	7%
Government showcases the progress of projects without budget allocation	3	7%

As observed in Table 5.5, payment delays and ambiguities in documents caused disputes in a majority of projects (75%). In line with the current research, several previous studies identified payment delay and ambiguities in documents as critical causes which lead to disputes (Na Ayudhya 2011; Cakmak and Cakmak 2013; Mitropoulos and Howell 2011; Acharya and Lee 2006; Kumaraswamy 1997). As per the current findings, 28 (out of 44) projects experienced disputes due to scope changes. The interviewees indicated that scope changes occur due to the client's instability in requirements and financial status. An interviewee added that the client reduced the number of floors from 25 to 12 affected the complete programme of the project. This leads to various claims and resulted in huge disputes between parties. A 57% percentage of projects experienced disputes due to design errors. The least cause leading to dispute as per the current study is adverse weather conditions. In line with the current study, Na Ayudhya (2011) also found weather conditions as an insignificant cause contributing to disputes. The research has further carried out a detailed investigation into the project characteristics such as degree of complexity, time constraint, procurement method, type of client, cost/size of project, site condition, use of standard form of contract, and source of funding. Table 5.6 depicts the causes of disputes (30% and above) and their related project characteristics. For example, payment delays were found in a total of 33 (out of 44) projects, wherein 18 (out of 33) are government and 15 (out of 33) of them are private projects. In terms of the degree of design complexity, 12 are highly complex while 13 of them are low in design complexity. Thus, the project characteristics of the projects which experienced disputes due to payment delays are indicated. Thus, Table 5.6, shows the analysis of the project characteristics of the projects for each cause of disputes.

Table 5.6: Causes of disputes and the project characteristics

Causes of disputes	Project Characteristics																		
	Degree of design complexity			Time constraints		Procurement		Type of client		Site condition		Type of contract doc		Source of funding			Cost/size of the project		
	High	Medium	Low	Yes	No	Traditional	D&B	Government	Private	Ordinary	Differing	Standard forms	Improper	Government treasury	Completely foreign funded	Bank loan and equity	Large	Medium	Small
Payment delays	12	8	13	14	19	17	16	18	15	19	14	26	7	18	0	15	15	11	7
Ambiguities in documents	14	8	11	12	21	16	17	16	17	21	12	25	8	15	2	16	11	13	9
Scope changes	16	8	4	12	16	12	16	15	13	17	11	24	4	15	2	8	14	9	5
Design errors	12	8	5	8	17	16	9	12	13	16	9	20	5	10	1	14	9	8	8
Complexity of project	15	4	0	8	11	10	9	11	8	7	12	12	7	8	2	9	9	5	5
Extension of time related issues	9	3	4	14	2	7	9	10	6	10	6	11	5	8	2	6	6	5	5
Poor quality of work	4	7	5	6	10	8	8	10	6	11	5	12	4	10	0	6	1	6	9
Contractor’s cash flow difficulties	5	5	6	7	9	8	9	9	7	12	4	11	5	9	0	7	5	6	5
Delay in progress of work	7	5	4	9	7	9	7	10	6	3	13	13	3	8	0	8	5	6	5
Government policy changes	7	4	4	10	5	9	6	6	9	11	4	13	2	8	1	6	6	4	5
Unrealistic time targets	3	6	4	9	4	7	6	8	5	9	4	8	5	8	0	5	4	5	4

5.4.1 Payment delays

The topmost frequent cause identified with a frequency count of 33 is payment delays. Few interviewees (I-01, I-03, I-06, I-07, I-15) indicated that *payment delays occur due to lack of funding with the client*. An interviewee (I-03) further added that *the client purposely delays the payment to the contractor towards the end of the project in order to facilitate his cash flow*. Among these 33 projects, 2 of them only experienced payment delays due to delays in the evaluation of payment applications by the consultant. Thus, most of the interviewees are of the opinion that the client is responsible for payment delays.

Further observing Table 5.6, among the project characteristics of the projects where payment delays become causes of disputes, the type of client, cost/size of project and source of funding are influencing disputes due to payment delays. The distributions of these project characteristics of the projects which contributed to payment delays are shown in Table 5.7.

Table 5.7: Payment delays and the related project characteristics

Project characteristics	Classifications	Frequency count	% share
Type of client	Government	18	55%
	Private	15	45%
	Total	33	100%
Size/Cost of project	Small scale	7	21%
	Medium scale	11	33%
	Large scale	15	46%
	Total	33	100%
Source of funding	Government treasury	18	55%
	Completely foreign funded	0	0%
	Bank loan and equity	15	45%
	Total	33	100%

As per Table 5.7, in terms of type of client, out of 33 projects 18 are government projects which experienced disputes. The remaining 45% of projects are privately funded. In terms of source of funding, the projects secure funding from government treasury, foreign solicitation and bank loan and equity. Among the 33 projects which experienced disputes due to payment delays, 18 sources the fund from government

treasury and the rest 45% depending on bank loan and equity. However, it's important to note that there is no project experienced disputes which fund from foreign solicitations. In addition, few of the research participants (I-08, I-12, I-18) expressed that *due to the unavailability of funds with client, payment gets delayed for a long period of time where there is no provision as a penalty for delayed payments in the contract document*. This assures that when the projects fail to adapt standard contract documents, there is a possibility of disputes. In most of the government-funded projects, payments are delayed as projects are commenced before seeking required funds for the projects and delay in cabinet approvals for payments as explained by the interviewees.

Further scrutiny into these 33 projects which had payment delays as a cause of dispute, the findings indicated that most of those projects are government-funded large to medium scale projects as per Table 5.7. In terms of cost/size of project, 46% of them are large scale while 33% are medium-scale projects. Considerably less number of projects (07) are of small scale projects. Further as evidenced in the selected projects, the large and medium scale projects experienced payment delays at the later stage of projects due to the client's financial difficulties. Thus, the payment delays could be attributed to the project characteristics such as type of client, source of funding and cost/size of project. Especially, payment delays are critical in projects where project characteristics such as large to medium scale or government client or funded purely using government treasury are taken place.

5.4.2 Ambiguities in documents

Survey findings showed that the second most frequent cause is ambiguities in contract documents with a frequency count of 33 as depicted in Table 5.4. Most of the interviewees indicated *that ambiguities are present in contract documents in many ways such as mismatch between BOQ and specifications, contradictions between BOQ and drawings, missing information in the contract document, absence of certain clauses and errors in BOQ*. These situations mainly happen due to negligence, lack of knowledge and experience of the part of the consultant. Further analysis into projects which experience ambiguities in documents indicates that these ambiguities in documents have happened in both traditional as well as D&B projects and also

irrespective of size or cost of projects. Further, analysing the type of contract document used as observed in Table 5.6, a total of eight (8 out of 9) projects have not followed any standard form of contract and all of them experienced ambiguities in documents mainly in absence of certain provisions and misinterpretations between the provisions in the contract document. However, the remaining 25 (out of 33) projects are found with ambiguities in documents though standard form of contracts are adopted. As already stated, ambiguities in documents mainly occur due to the poor performance of the consultant irrespective of the influence of project characteristics other than the standard form of contract. This can be concluded that the likelihood of ambiguities in documents is high in projects when the project failed to adopt a standard form of contract.

5.4.3 Scope changes

As seen in Table 5.5, scope changes contributed to disputes in about 28 (out of 44) projects. The interviewees (I-02, I-04, I-06, I-10, I-18) indicated that *scope changes occur due to the request of the client and design changes by the consultant*. Amongst, one project experienced very frequent, nearly hundred times scope changes as per I-06. This is the largest project with a contract sum of 37Bn and procured using the design and build procurement method. Below Table 5.8 depicts the distribution of project characteristics that could be attributed to scope changes.

Table 5.8: Scope changes and the related project characteristics

Project characteristics	Classifications	Frequency count	% share
Procurement method	Traditional	12	43%
	Design and built	16	57%
	Total	28	100%
Cost of project	Large-scale	14	50%
	Medium-scale	9	32%
	Small-scale	5	18%
	Total	28	100%
Degree of design complexity	High	16	57%
	Medium	8	29%
	Low	4	14%
	Total	28	100%

Of the 28 projects where scope changes were the contributing factor for disputes, most of them (16 out of 28) are design & build projects. Accordingly, the interviewees (I-10, I-11, I-19) supported that *client is required to commit to a concept design at an early stage and often before detailed designs are completed. This ultimately increased the likelihood of scope changes at the construction stage of projects in design and build projects. However, traditional projects complete the design first and provide the contractor to start the project with the completed drawings.* Therefore, it can be concluded that scope changes are critical in the design and build compared to traditionally procured projects.

Further scrutiny into these 28 projects (as in Table 5.8) which had scope changes as the cause of disputes, indicate that most of those projects are large in terms of size and cost project characteristics. 50% of them are large-scale while 32% are medium-scale projects. Considerably less number of projects (05) are of small scale projects. In addition, analysing the degree of complexity of these projects, among these 28 projects 16 are highly complex whereas 8 are of medium complexity in design. The remaining 14% of them are less complex. Therefore, it can be concluded that scope changes are attributed to the project characteristics such as procurement method, cost/size of project and degree of design complexity. Thus, scope changes should be carefully handled in the projects where design & build procurement or high complexity or large scale, appeared.

5.4.4 Design errors

As seen in Table 5.5, design errors have caused disputes in 25 of the selected projects. Further analysing these 25 projects, the interviewees (I-07, I-18) indicated that *the consultants are primarily responsible for such design errors.* In addition, the findings revealed that design errors occurred in many ways in the selected projects such as the incompleteness of design, missing design information, ambiguities in drawings and specifications. Amongst, 16 projects are of design and build projects and the remaining are traditionally procured as depicted in Table 5.8. This gives an indication that design errors are frequent in traditionally procured buildings than design & build. In support of this, Kelly *et al.* (2002) indicated that some procurement strategies are better than others in handling the changes in the design. For example, design and build

procurement facilitates correcting the design errors which fall within the allocated budget. Therefore, the use of design & build procurement method could help to minimise disputes which arise from design errors in construction projects.

As depicted in Table 5.9, 48% are high in degree of design complexity while 32% of them are medium complex projects. Few projects (05) which experienced disputes due to design errors are with a low degree of design complexity. An interviewee (I-06) expressed that *high complex projects have a tendency for design errors which critically influence disputes in construction projects*. This can be concluded that design errors can be correlated to the project characteristics such as procurement method and degree of design complexity.

Table 5.9: Design errors and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Procurement method	Traditional	16	64%
	Design and built	9	36%
	Total	25	100%
Degree of design complexity	High	12	48%
	Medium	8	32%
	Low	5	20%
	Total	25	100%

5.4.5 The complexity of the project

The design complexity of the project is noted as one of the significant causes which lead to disputes. A total of nineteen (19) projects experienced disputes due to the complexity of its nature. An interviewee (I-11) indicated that as *the project is large and unique, the complexity of the project became high in terms of design as well as parties and work packages involved*. In few of the projects, disputes took place due to the complexity of design for the reasons of client's requirement, nature of project, high water table, weak soil, adjacent buildings and existing ground level differences. Table 5.10 depicts the distribution of project characteristics that could be attributed to the complexity of project.

Table 5.10: Project complexity and the related project characteristics

Project characteristics	Classifications	Frequency count	% share
Degree of design complexity	High	15	79%
	Medium	4	21%
	Low	0	0%
	<i>Total</i>	<i>19</i>	<i>100%</i>
Site condition	Ordinary	7	37%
	Differing	12	63%
	<i>Total</i>	<i>19</i>	<i>100%</i>
Cost/Size of project	Large scale	9	48%
	Medium scale	5	26%
	Small scale	5	26%
	<i>Total</i>	<i>19</i>	<i>100%</i>

As seen in Table 5.3 which depicts the project characteristics, a total of nineteen (19) projects are highly complex in design. Amongst, the majority (15 out of 19) of projects experienced disputes due to the design complexity as depicted in Table 5.10. In addition, there are no projects reported with disputes which claimed as less complex projects. Thus, the complexity of the project creates a positive relationship with the degree of design complexity.

Further analysing the project characteristics, of these 19 projects which had complexity as a cause of disputes, 12 (63%) are exposed to differing site conditions. The interviewees (I-04, I-17) expressed that *in these projects disputes occur due to unexpected soil conditions like groundwater, mud, quicksand and rock formation. Further, the interviewees stated that the unpredictable ground conditions lead to complexity in foundation designs.* Thus, the complexity of the project can be related to site conditions. As seen in Table 5.10, the large-scale projects in terms of cost/size experienced disputes due to complexity compared to medium and small-scale projects. The interviewees supported that *in large-scale projects, more drawings and more parties and resources are involved thereby the complexity of the project increases and this could contribute to disputes.* Thus, the complexity of the project can be related to the project characteristics such as degree of design complexity, cost/size of project and site conditions.

5.4.6 Extension of time related issues

As depicted in Table 5.5, the extension of time-related issues cause disputes in about 16 construction projects. The respondents of these projects indicated that *in most of the cases the consultant used to reject or reduce the amount of claims in terms of cost and time of the EOT claims*. An interviewee (I-01) indicated that *in some cases it is difficult to identify the party responsible for the particular delay i.e. concurrent delay*. Further, the interviewee indicated that *though the EOT claims are submitted as per the timeframe, the consultant failed to approve on time. All the EOT claims accumulated and becomes disputed towards the end of the project*. The respondents (I-03, I-07, I-15) further highlighted that *the procedure to get EOT approval in government projects is a difficult task and time taken process, thereby this leads to disputes in EOT claims*. Therefore, the type of client involved in these projects which experienced disputes due to EOT claims was further analysed. Accordingly, 10 out of 16 projects which experienced EOT claims-related disputes are government projects while the remaining 6 projects belong to private clients. Thus, it could be seen that government-funded projects have a higher tendency to EOT claims which result in disputes. Further analysing these 16 projects, the majority of (88%) projects were exposed to time constraint as seen in Table 5.11. the interviewees explained that EOT claims used to face disputes in those projects which experience time constraints caused due to the critical programme of work agreed at the beginning of the project as well as due to unrealistic client's requirements to meet time targets. Thus, EOT claim issues occur mostly in the projects which exposed to tight time schedules and where client is government.

Table 5.11: EOT related issues and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Type of client	Government	10	64%
	Private	6	36%
	Total	16	100
Time constraint	Yes	14	88%
	No	2	12%
	Total	16	100%

5.4.7 Poor quality of work

The findings revealed that about 36% (16 out of 44) of cases experienced disputes due to poor quality of work. The interviewees (I-05, I-14, I-18) stated that *poor quality of work includes the poor quality of materials as well. Without the engineer's approval of certain materials, the contractor starts the work at the site which leads to disputes in the project.* Among these 16 projects, few are experienced disputes due to poor quality of work where the contractor refused to rectify the defects though the consultant notified the quality issues as per the provision stipulated in the contract. This evidenced that the contractor is mainly responsible for the poor quality of work. Among these projects 16 projects, most of them (15 out of 16) are small and medium scale projects. It is important to note that only a single large-scale project experienced disputes due to poor quality of work. This indicates that the likelihood of poor quality of work is less in large-scale projects. This may be due to the proper selection of contractors for such large-scale projects which also follow the quality assurance process. Thus, poor quality of work is directly influenced by the nature of the contractor who involves in the projects. This can be concluded that poor quality of work creates an indirect relationship with the size/cost of the project.

5.4.8 Contractor's cash flow difficulties

Contractors' cash flow difficulties have contributed to disputes in sixteen (16) projects as depicted in Table 5.5. Further observing the project characteristics of the projects where contractor's cash flow difficulties become causes of disputes, the project characteristics such as type of client and source of funding are found to be influencing as shown in Table 5.12.

Table 5.12: Contractor's cash flow difficulties and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Type of client	Government	09	64%
	Private	07	36%
	Total	16	100
Source of funding	Government treasury	9	56%
	Completely foreign funded	0	0%
	Bank loan and equity	7	44%
	Total	16	100%

When the project costs of these projects are considered, all small (06), medium (08) and large (06) scale projects have experienced contractors' cash flow difficulties contributed to disputes. As depicted in Table 5.12, contractors' cash flow difficulties have influenced both private and public projects. Among these 16 projects, nine (09) are government and seven (07) private. Further analysing the source of funding, 64% of them depend on government treasury for the complete funds while remaining projects secure funds through the bank loan and equity. Interviewees (I-01, I-03, I-06, I-07, I-15) indicated that *contractors' cash flow difficulties primarily occur due to contractors' improper cash flow management, using the cash flow for other ongoing projects, having lack of working capital and clients' payment behaviour*. This evidenced that contractors' cash flow difficulties can be attributed to the type of client and source of funding.

5.4.9 Delay in the progress of work

As seen in Table 5.4, delays in the progress of work caused disputes in sixteen (16) number of selected projects. The cause was then further analysed in terms of the project characteristics of the respective projects and findings are furnished in Table 5.13.

Table 5.13: Delay in the progress of work and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Type of client	Government	10	63%
	Private	06	38%
	Total	16	100
Degree of design complexity	High	7	44%
	Medium	5	31%
	Low	4	25%
	Total	16	100%
Differing site conditions	Yes	13	25%
	No	3	31%
	Total	16	100%
Time constraint	Yes	9	50%
	No	7	50%
	Total	16	100%

As shown in Table 5.13, 10 are government projects and the remaining are private projects. The interviewees expressed that (I-01, I-06, I-07, I-15) *delay in cabinet approval for any changes in the projects and the procedural delays cause delays in the progress of work in government projects. In addition, the delay in the progress of work can occur due to contractors' poor coordination as well as clients' delay in decision making and approval.* When analysing the degree of design complexity, 44% of them are highly complex while 25% are less complex in design. Most interestingly, delay in progress often occurred in the projects which exposed to differing site conditions (13 out of 18). An interviewee (I-07) indicated that *inadequate site investigation further continuously caused disputes in the project with the seasonal high water table and the situation was not documented properly in the contract.* In terms of site condition, majority of projects which exposed to differing site conditions (9 out of 14) were exposed to disputes related to delay in the progress of work. The interviewees (I-06, I-19) added that *the projects with tight time schedules could not contain float in the programme of work to manage any delay in progress.* Thus, delay in the progress of work can be correlated to type of client, degree of design complexity, site condition and time constraint. This can be concluded that delay in the progress of work is critical in projects where government client or high design complexity or differing site condition or time constraints are in place.

5.4.10 Government policy changes

As seen in Table 5.5, a total of fifteen (15) projects experienced disputes due to government policy changes. Amongst, 7 of them are government and the remaining are private projects. Policy changes result in disputes irrespective of the size or cost of projects or any other project characteristics. An interviewee (I-20) expressed that *government policy changes critically influence the progress and its smooth running of projects. For example, the recent change in the percentage of tax and tax registration restrictions for less turnover contract organisations cause disputes in the selected projects. Further explaining the restriction on tax registration, the companies which has less than 300Mn quarterly turnover is not allowed for tax registration in the new regulations. Therefore, certain small & medium contractors faced issues in the ongoing projects.* However, no strong relationship was found with the project

characteristics. This can be concluded that disputes arise due to government policy changes irrespective of project characteristics.

5.4.11 Unrealistic time targets set by the client

Survey findings offered that the unrealistic time targets set by clients contributed to disputes in thirteen (13) projects. Table 5.14 indicates the distribution of project characteristics of the projects which experienced disputes due to unrealistic time targets set by the client.

Table 5.14: Unrealistic time targets set by the client and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Type of client	Government	8	27%
	Private	5	73%
	Total	13	100
Time constraint	Yes	9	20%
	No	4	80%
	Total	13	100%

Amongst, 8 are government projects and the remaining is private. The interviewees (I-10, I-19) indicated that *expecting return on investment, client request or even push the contractor to finish the project soon as possible and this may lead to poor quality of work*. In addition, another interviewee indicated that *the government shows the progress of projects to ensure its political stability*. As per the client's request, the contractor tends to accelerate the progress work without proper material and plant and this could lead to chain effects and in the end lead to unsuccessful projects. Further analysing the time constraints, of these 13 projects, seven (09) are exposed to time constraints. This can be concluded that unrealistic time targets set by the client can be addressed from the perspectives of the client and time constraints. The next section summarises and presents the findings on the relationships between causes of disputes and project characteristics.

5.5 Relationship between Causes of Disputes and Project Characteristics

This section of the study summarises the findings of the survey of projects on the relationship between causes and project characteristics. A total of eleven causes

which were found in 30% and above selected projects, are taken for the detailed investigation in the previous section. Amongst 9 causes found to be correlated to certain project characteristics. Thus, Table 5.16 presents the causes of disputes and the related project characteristics.

Table 5.15: Relationship between causes of disputes and project characteristics

Causes of projects	Related Project Characteristics	Critical project characteristics
Payment delays	Type of client, Cost/size of project, Source of funding	Large to medium scale, Government client, Funded purely using government treasury
Ambiguities in documents	Standard form of contract	Not adopted the standard form of contract
Scope changes	Procurement method, Cost/size of project, Degree of design complexity	High design complex, design & build, large scale
Design errors	Procurement method, Degree of design complexity	High complex, traditional
Complexity of project	Degree of design complexity, Site condition	High design complex, large scale, differing site condition
Extension of time-related issues	Type of client, Time constraint	Government client, time constraint
Poor quality of work	Cost/size of project,	Small scale
Contractor's cash flow difficulties	Type of client, Source of funding	Government client and rely on the treasury for funding, the private client when funding is unavailable
Delay in the progress of work	Type of client, Degree of design complexity, time constraints, site condition	Government client, High complexity, time constraints, differing site condition
Government policy changes	No strong relationship found	All types of projects
Unrealistic time targets set by the client	Type of client, Time constraint	Government client, Exposed to time constrain

Table 5.15, depicts the significant causes of disputes arrived through survey of projects which experienced disputes and the related project characteristics. In

addition, this offers the critical project characteristics along with the possible causes of disputes. For example, a project with large to medium scale or government client or funded purely using government treasury could experience critical payment delays and turn into disputes. A construction project with a high degree of design complexity or procured using design & build or large scale, could face frequent scope changes and thereby experience disputes. Looking from the perspective of project characteristics, the cause such as payment delays, the extension of time-related issues, contractor's cash flow difficulties, delay in the progress of work, government policy changes and unrealistic time targets set by the client could cause disputes in government projects. The next section of the study presents the findings on dispute avoidance strategies practiced in Sri Lankan construction projects with special emphasis to project characteristics.

5.6 Dispute avoidance strategies adopted in the projects surveyed

This section describes the analysis of the participants' responses to the question, what are the strategies practiced in the projects to avoid disputes. The dispute avoidance strategies practiced in the projects were identified through semi-structured interviewees conducted with the professionals who were involved in managing claims and disputes in the selected projects. Table 5.16 presents the dispute avoidance strategies along with their respective frequencies.

Table 5.16: Dispute avoidance strategies and its frequency

Dispute avoidance strategies	Frequency count (out of 44 projects)	Percentage
Drafting dispute resolution provisions in contract	41	93%
Practice of negotiation	40	91%
Practice of timely notices	35	80%
Proper documentation	18	41%
Early contractor involvement	17	35%
Third party review on design	14	32%
Standing adjudication	13	30%
Clarifying any issues in tender documents during tendering stage	13	30%

Dispute avoidance strategies	Frequency count (out of 44 projects)	Percentage
Practicing proper risk management mechanism	9	20%
Proper record keeping	8	18%
Appointing neural arbitrator	7	16%
Variations are managed properly	6	14%
Giving adequate time for the bidders to price	4	9%
Identifying client's needs properly	4	9%
Preparing comprehensive client brief	4	9%
Making timely payment to the contractor	3	7%
Source the complete funding of projects	3	7%

As depicted in Table 5.16, a total of seventeen (17) strategies are practiced in the Sri Lankan construction projects. Amongst, drafting dispute resolution provisions in contracts, practice of negotiation and practice of timely notices are identified as mostly used strategies with the frequency counts 41, 40 and 35 respectively (out of 44). Several previous studies also mentioned that drafting dispute resolution clauses could minimise the disputes (Jannadia *et al.*, 2000; Love *et al.*, 2008). Another 30-50% of the selected projects utilised proper documentation, early contractor involvement, third party review on design, standing adjudication and clarifying any issues in tender documents during tendering stage to avoid disputes. The remaining strategies such as practicing proper risk management mechanism, proper record keeping, appointing neural arbitrator, managing variations properly, giving adequate time for the bidders to price, identifying client's needs properly, preparing comprehensive client briefs and making timely payments to contractors are less practiced in Sri Lankan projects as these strategies are identified in less than 30% of the selected projects. This shows that Sri Lankan construction projects are utilising dispute avoidance strategies to a certain extent only. The following subsections describe the strategies from the viewpoint of project characteristics to formulate the relationship between them.

Table 5.17 depicts the dispute avoidance strategies (more than 30%) and their related project characteristics. Thus the study further carried out a detailed investigation into project characteristics of the project which adopts the dispute avoidance strategies.

For example, drafting dispute resolution provisions in contract adopted in a total of 41 (out of 44) projects, wherein 24 (out of 41) are government and 17 (out of 41) of them are private projects. In terms of the degree of design complexity, 17 are highly complex while 9 of them are low in design complexity.

Table 5.17: Dispute avoidance strategies and the project characteristics

Dispute avoidance strategies	Project Characteristics																		
	Degree of design complexity			Time constraints		Procurement		Type of client		Site condition		Type of contract doc		Source of funding			Cost/size of project		
	High	Medium	Low	Yes	No	Traditional	D&B	Government	Private	Ordinary	Differing	Standard forms	Improper forms	Government treasury	Foreign funded	Bank loan and equiv	Large	Medium	Small
Drafting dispute resolution provisions in contract	17	15	9	11	30	24	17	24	17	24	17	35	6	18	2	21	16	16	9
Practice of negotiation	16	14	10	12	28	24	17	22	18	24	16	34	6	18	2	20	16	15	9
Practice of timely notices	14	15	6	7	28	19	16	19	16	18	17	33	2	15	2	18	15	13	7
Proper documentation	9	4	5	7	11	8	10	9	9	12	6	18	0	9	2	7	9	4	5
Early contractor involvement	5	7	5	5	12	0	17	8	9	11	6	15	2	8	2	7	6	7	4
Third party review on design	5	6	3	5	9	0	14	6	8	7	7	12	2	6	2	6	6	4	4
Standing adjudication	10	2	1	7	6	7	6	3	10	10	3	13	0	4	1	8	8	5	0
Clarifying any issues in tender documents during tendering stage	7	2	4	5	8	8	5	7	6	9	4	10	3	5	0	8	6	4	3

5.6.1 Drafting dispute resolution provisions in contract

As per Table 5.16, the top most frequently used dispute avoidance strategy is ‘drafting dispute resolution provisions in contract’. The findings revealed that dispute resolution provisions included in contract documents in the majority (41 out of 44) of selected projects. The dispute resolution clauses are not properly incorporated in the contract documents of the remaining three (03) projects which failed to adopt a standard form of contract. Further scrutinising the project characteristics of those three projects, all of them are private projects and in terms of size and cost, they are small-scaled. Meanwhile, large and medium scale projects have followed a proper standard document adopted the drafting dispute resolution provisions in the contract document which support in managing disputes and promote avoiding disputes wherever possible. Table 5.18 shows the project characteristics of the projects which utilised drafting dispute resolution provisions in the contract.

Table 5.18: Drafting dispute resolution provisions in contract and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Standard for of contract	Standard for of contract (SBD, FIDIC)	35	80%
	Not adopted standard form of contract	6	14%
	Total	41	100%
Cost/size of project	Large-scale	16	36%
	Medium-scale	16	36%
	Small-scale	9	28%
	Total	41	100%

As depicted in Table 5.18, all the large and medium scale (16 out of 16) were adopted drafting dispute resolution clauses into contract document. The interviewees further indicated that the clauses such as 19.2-Dispute Resolution, 19.3-Procedure for Adjudication, 19.4-Replacement of Adjudicator, and 19.5-Arbitration are mainly incorporated in the contract under SBD 02. Another interviewee added the clauses related to amicable settlement are also incorporated in the contract document as per FIDIC 99. An interviewee (I-10) indicated that ‘*In a situation where there is a*

disagreement or a dispute, parties tend to resolve it through amicable settlement. If it fails, then adopts other resolution methods as per the contract'. This can be concluded that the use of a proper standard form of contract could promote the use of dispute resolution clauses and thereby avoid disputes. In addition, large and medium scale projects include dispute resolution provisions compared to small-scale projects.

5.6.2 Practice of negotiation or amicable settlement

As observed in Table 5.16, the next most frequently adopted dispute avoidance strategy is practice of negotiation or amicable settlement. Among 44 projects, majority (91%) of them have experienced the benefit of the practice of negotiation. An interviewee (I-07) indicated that *'their contracting organisation has a policy to settle the disagreements through negotiations before it materialises*. In addition, the interviewee (I-07, I-11, I-12) mentioned that *'negotiation is highly promoted and training sessions are also conducted to the employees in improving their negotiation skills*'. Few of the interviewees (I-11, I-12) indicated that *"the active team members foresee the possible issues which may turn into disputes in future and negotiate with the respective parties to solve before it materialises as a dispute"*. Settling disputes using negotiation is being practiced in Sri Lankan construction projects, irrespective of its project contexts such as large scale or complex or design and built, etc. This can be related to the use of the standard form of contract as depicted in Table 5.17. The projects utilised a standard form of contract include the provision for amicable settlement and thereby promoting the use of negotiations to settle disputes.

5.6.3 Practice of timely notices

The majority of the selected projects (35 out of 44) have adopted the 'practice of timely notices' to avoid disputes. The interviewees (I-06, I-12, I-19, I-20) indicated that *'it is very important to carefully follow the notice provisions because it often indicates the timeframe within which notice of a potential issue must be given to the other party. There are certain instances, if notice is not given within the time prescribed in the notice provision, the contracting party may waive its right to make a claim for additional money or time*'. In addition, the interviewees indicated that *failing to follow the notice provisions within the stipulated timeframe before the*

submission of claims could probably results in disputes. Table 5.19 shows the project characteristics of the projects which utilised practice of timely notices.

Table 5.19: Practice of timely notice and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Standard for of contract	Standard for of contract (SBD, FIDIC)	33	94%
	Not adopted standard form of contract	2	6%
	Total	35	100%
Cost/size of project	Large-scale	15	43%
	Medium-scale	13	37%
	Small-scale	7	20%
	Total	41	100%

In terms of cost of projects, most of the large-scale projects (15 out of 16) and medium-scale (13 out of 16) were practiced timely notices to avoid disputes in projects. However, the practice of timely notices was identified considerably less number of small scale projects (7 out of 12). The interviewees (I-06, I-07, I-11, I-19) added that *most of the large and medium scale projects involved well-experienced professionals with adequate skills to handle the contract management activities where the timely notices are handled properly in order to cope up with the smooth running of the project.*

Further scrutinising the project characteristics of the projects which utilised the price of timely notice, majority of these projects (94%) adopted proper standard form contract. It's interesting to note that only few projects (2 out of 9) that failed to adopt any standard form of contract utilised timely notices. This indicates that practice of timely notices can be related to cost/size of the project and the use of the standard form of contract. Thus the practice of timely notice can be seen in large and medium scale projects and in the projects where the standard form of contract is used.

5.6.4 Proper documentation of contract document

As seen in Table 5.16, proper documentation was followed by a considerable number (18 out of 44) of projects to avoid disputes. The interviewees indicated that the projects mainly rely on the contract document for any information. The specification should be properly written to reveal the exact quality and the detailed design should be error-free. An interviewee (I-19) mentioned that *the experienced consultant is involved thereby minimised ambiguities and errors within the contract document*. In addition, the finding indicated that the properly and clearly drafted contract provisions avoid misinterpretations. Of these 18 projects, all of them had adopted a standard form of contract to formulate the contract document. Thus, this can be concluded that proper documentation could be related to the project characteristics, use of a standard form of contract.

5.6.5 Early contractor involvement

A total of seventeen projects claimed that early contractor involvement in projects reduces the likelihood of disputes. An interviewee (I-05) indicated that *during the design phase, the contractor adds value through experience sharing, value engineering, and constructability verification which mitigates the claims classified under potential changes*. In line with this, another interviewee stressed that *constructability of design increases due to the contractor's input into the design*. As observed in Table 5.17, of these 17 projects, all of them were procured under design and build procurement methods. Literature also suggests that design & build procurement facilitates early contractor involvement. This concludes that early contractor involvement is directly correlated to the procurement method.

5.6.6 Third party review on design

A total of fourteen (14 out of 44) construction projects adopted third-party review on design as a strategy to avoid disputes. An interviewee (I-05) indicated that *due to the involvement of a third party in reviewing the design, the design errors were captured, proper use of installation of material was suggested, new construction methods were suggested and thereby the construction cost of the project was reduced by 120 Mn*. Further, scrutinise into the 14 projects' characteristics, it is found that all of them were

procured using the design & build procurement method. In line with this, an interviewee stated that *thirty party review of design is essential for a design and build project*. This concludes that third-party review on design is directly correlated to the procurement methods.

5.6.7 Standing Dispute Adjudication Board (DAB)

A total of nineteen (13 out of 44) projects claimed that standing DAB is used to avoid disputes. An interviewee (I-07) indicated that *it's advisable to appoint a standing rather ad-hoc DAB, particularly in large-scale complex projects*. Further, he elaborated that *adapting DAB from the initial stage of the project can be beneficial in avoiding disputes*. In case of any disagreements related to the project, they used to seek advice from the adjudicators. They continuously monitor the project and provide solutions for any issues or disagreements. The interviewees (I-07, I-19) further indicated that *a panel of three independent, impartial, qualified, experienced and available professionals were appointed as adjudicators to the standing DAB*. Table 5.20 shows the project characteristics of the projects which utilised standing adjudication board.

Table 5.20: Standing dispute adjudication board and related project characteristics

Project characteristics	Classifications	Frequency count	% share
Degree of design complexity	High	10	57%
	Medium	2	15%
	Low	1	8%
	Total	13	100%
Cost/size of project	Large-scale	8	62%
	Medium-scale	5	38%
	Small-scale	0	0%
	Total	13	100%
Type of client	Government	4	31%
	Private	9	69%
	Total	13	100%

Further scrutinising the project characteristics of the projects which utilised standing dispute adjudication board, most of these projects (8 out of 13) are large scale in terms

of cost and size as depicted in Table 5.20. Considering the degree of design complexity, of these 57% of them are highly complex in design whereas the rest of them are medium complex in design. In terms of the type of client, 9 (out of 13) projects are private and 4 are government projects. An interviewee (I-07) indicated that *government projects rarely accommodate standing adjudication boards due to existing regulations*. Several interviewees (I-07, I-10, I-11, I-15, I-19) indicated that *as large and complex project have more likelihood of disputes, standing adjudication was found to be a better solution to prevent disputes*. This indicates that the practice of standing dispute adjudication board can be related to cost/size of project, degree of design complexity and type of client.

5.6.8 Clarifying any issues in tender documents during tendering stage

As observed in Table 5.16, clarifying any issues in tender documents during the tendering stage is adopted in 30% (13 out of 44) of the selected projects. The interviewees (I-04, I-15) indicated that *“the issues with the tender documents were discussed between the parties and resolved before entering into a contract”*. Interviewees further elaborated that *the bidders were given enough time to go through the documents and raise any concerns. Pre-bid meetings and site visits were conducted to facilitate the bidders to clarify any issues*. The participants to research mentioned that *the amendments to the original tender documents are informed to all the bidders through ‘addendum’*. An interviewee (I-15) indicated that *this strategy could minimise the chain effects which turn as causes of disputes such as ambiguities in documents, errors in documents and misinterpretation of contractual provisions*. Further scrutinising the project characteristics of the projects which utilised clarifying any issues in tender documents during the tendering stage, 46% of them are large scale and 31% of them are medium-scale projects. This concludes that large projects adopt clarifying any issues in tender documents during the tendering stage, compared to medium and small scale projects.

5.7 Relationship between Dispute Avoidance Strategies and Project Characteristics

This section of the study summarises the findings of the survey of projects on the relationship between dispute avoidance strategies and project characteristics. A total of eight dispute avoidance strategies which were found in 30% and above, selected projects, carried for a detailed investigation in the previous section. Amongst all the dispute avoidance strategies found to be correlated to certain project characteristics. Thus, Table 5.21 presents the dispute avoidance strategies and the related project characteristics.

Table 5.21: Relationship between dispute avoidance strategies and project characteristics

Dispute Avoidance Strategies	Project Characteristics
Drafting dispute resolution provisions in contract	Use of standard form of contract, cost/size of project
Practice of timely notices	Use of standard form of contract, cost/size of project
Practice of negotiation	Use of standard form of contract
Proper documentation	Use of standard form of contract
Early contractor involvement	Procurement method, cost/size of project
Third party review on design	Procurement method, cost/size of project
Standing adjudication	Degree of design complexity, cost/size of project, type of client
Clarifying any issues in tender documents during the tendering stage	Size/cost of project

Table 5.21, depicts the significant dispute avoidance strategies arrived through the survey of projects which experienced disputes and their related project characteristics. As indicated, large to medium scale or design and build projects are used to adopt early contractor involvement to avoid disputes. High design complex or large scale or government projects accommodate DAB from the beginning of projects to prevent disputes. Table 5.21 offered that the use of a standard form of contract facilitates several dispute avoidance strategies such as drafting dispute

resolution provisions in the contract, practice of timely notices, practice of negotiation and proper documentation. The next section of the study concludes the current chapter with a summary at last.

5.8 Summary

This chapter has presented analyses of surveying findings of disputed projects in line with the research objectives as identified in chapter one. Analyses are performed using content analysis and frequency count. Firstly, the causes of disputes in the selected projects are analysed and significant causes are found. Further scrutinizing the causes of disputes, the project characteristics which influence those causes are explored. Then the dispute avoidance strategies practiced in Sri Lanka are investigated emphasizing the project contexts thereby develop the relationships between dispute avoidance strategies and project characteristics. The next chapter presents the discussion of research findings based on literature review, questionnaire survey and survey of projects.

CHAPTER SIX

Discussion of Research Findings

6.0 Introduction

Following the analysis of survey of projects, this chapter compares and discusses the findings derived through the literature survey, questionnaire survey and survey of projects. The first section provides a discussion on sources of disputes investigated in global context with the Sri Lankan context. This is followed by a comparison on project characteristics which influences on disputes with literature and questionnaire survey. Then this compares the strategies to avoid disputes with the triangulated findings. Further the current chapter explains the discussion on the relationships formulated between causes of disputes, project characteristics and dispute avoidance strategies derived through the detailed investigation of construction projects which experienced disputes. Finally, the chapter summary provides the key findings derived through the discussions.

6.1 Causes of Disputes

This section of the research collates the findings on causes of disputes using the triangulated findings derived through literature survey, questionnaire survey and survey of projects. A questionnaire survey carried out among professionals revealed that there are thirty-two (32) causes significantly contributing to disputes with the RII value above 0.800. They are errors/contradictory/ambiguities of documents, client-slow response to decision making, discrepancies in contract provisions, design complexity, frequent changes to scope, payment delay, unrealistic requirement (i.e. Time), cost overruns, inadequate contract administration, inadequate/errors in soil investigation, inadequate brief, delayed drawings, late instructions, incomplete

source of fund, inappropriate procurement method, unstable financial status of client, unfavourable risk allocation, time overruns, delay in progress of work, fragmentation of the system, inappropriate selection of contractor, poor communication, poor documentation of contractor, delay in evaluation of completed works, unrealistic tender price, inadequate site investigation, unjust and untimely presentation of claims, delay in approvals, error in estimation, design errors and poor quality design. These situations are more common in global context as well. Thus, previous researchers suggested the significant causes of construction disputes includes scope changes, payment delays, inadequate/incomplete specification and drawing, unclear and unfair risk allocation, poor communication, design errors, ambiguities in contract document, unrealistic requirements (e.g. Time), differing site conditions, poor quality of work, inappropriate selection of contractor and alike (Illankoon *et al.*, 2019; Saseendran *et al.*, 2018; Ariffin *et al.*, 2016; Cakmak, 2016; Cakmak & Cakmak, 2013; Na Ayudhya, 2011; Acharya & Lee, 2006).

This was further validated through a detailed investigation into actual projects in Sri Lanka. Accordingly, the factors such as payment delays, ambiguities in documents, scope changes, design errors, complexity of project, extension of time related issues, poor quality of work, contractor's cash flow difficulties, delay in progress of work, policy changes, administration issues on contractor side, improper coordination between parties, improper communication, unrealistic time targets, slow response to decision making, consultant's attitude, discrepancies and absence of provisions, cost overruns, administration issues on client side, instability of government, price escalation related issues, disagree to remedying defects, client as a layman, absence of client representative, and government showcases the progress of projects without budget allocation, are significantly contributing to disputes in Sri Lankan construction projects. This is slightly different to global context where disagree to remedying defects, client as a layman, absence of client representative, government showcases the progress of projects without budget allocation, government policy changes, instability of government and price escalation related issues are identified as new sources of disputes. Among these new causes, most of them occur due to

clients. In addition, it is important to note that these take place in the projects where government acts as the client.

Further scrutinising these causes in terms of stages of projects, many of these causes such as payment delay, unrealistic requirement (i.e. Time), cost overruns, inadequate contract administration, delayed drawings, late instructions, unstable financial status of client, time overruns, delay in the progress of work, poor documentation of contractor, delay in evaluation of completed works, unjust and untimely presentation of claims, design errors and poor quality design are attributed to the construction stage of project. The causes such as client's slow response to decision making, poor communication, delay in approvals, frequent changes to scope are attributed to all the stages of projects. Discrepancies in contract provisions and design complexity take place in tendering and construction stages whereas the causes such as inadequate/errors in soil investigation, inadequate brief, inappropriate procurement method and unfavourable risk allocation occur in the preparation stage of construction projects. This evidenced that, many of the contributing factors take place in construction stage of project thereby the likelihood of dispute is high during the construction phase.

All three parties such as client, contractor and consultant are responsible for the causes which contribute to disputes in construction projects. Amongst, consultant contributes to disputes at a high level compared to contractor and client. Accordingly, the causes such as errors/ contradictory/ambiguities of documents, discrepancies in contract provisions, design complexity, inadequate/errors in soil investigation, inadequate brief, delayed drawings, late instructions, inappropriate procurement method, unfavourable risk allocation, inappropriate selection of contractor, poor communication, delay in evaluation of completed works, delay in approvals, error in estimation, design errors and poor quality design occur due to consultant. Contractor related causes are inadequate contract administration, time overruns, delay in progress of work, poor communication, poor documentation of contractor, inadequate site investigation, unjust and untimely presentation of claims and unrealistic tender price while client-related causes are frequent changes to scope,

payment delay, unrealistic requirement, incomplete source of fund, unstable financial status of client and poor communication.

Since decades, many researchers have identified scope changes, payment delay, inadequate/incomplete specifications and drawings, unclear and unfair risk allocation, poor communication and design errors as few of the critical factors which lead to disputes (Saseendran *et al.*, 2018; Khahro & Hussain Ali, 2014; Cakmak and Cakmak, 2013; Yiu and Cheung, 2007; Odeh & Battaineh, 2002; Kumaraswamy, 1997). Similarly, findings of the questionnaire survey conducted among the experienced professionals indicated 0.903, 0.892, 0.946, 0.846, 0.836, and 0.810 RII values. This was further validated through actual projects. Accordingly, 28 projects out of 44 experienced disputes due to frequent scope changes whereas majority (33 out of 44) of projects payment delays and documentation issues related disputes. Another 57% of projects confirmed the design errors caused disputes while 25% of the project identified disputes due to poor communication among parties involved.

The synthesis of findings based on literature review, questionnaire survey and survey of projects indicate that the causes such as payment delays, ambiguities in contract documents and changes to scope of work are significantly contributing to disputes. Most of the causes of disputes take place during construction projects where contractor, consultant and client are contributing towards dispute occurrences. Most of the new causes such as absence of client representative, government policy changes, government showcases the progress of projects without budget allocation and instability of government identified in the survey of real projects indicated that the causes took place in the projects where government act as the client.

6.2 Project Characteristics Influencing Disputes

This section of the research compares findings on project characteristics which influence disputes. Literature suggested a total of fifteen (15) project characteristics that govern the context and its uniqueness of any construction project. They are degree of design complexity, time constraint, procurement method, type of client, size of project (gross floor area), site factors, type of contract (standard form of

contract), source of funding, project cost, payment method, project scope, duration of project, type of project, project location, construction method and technological advancement (Turner, 1990; Love *et al.*, 1998; Alhazmi & McCaffer, 2000; Luu *et al.*, 2003). Then these project characteristics were carried to a questionnaire survey using Likert scale to identify the significant project characteristics which influence on disputes.

The questionnaire survey revealed that a total of nine (09) project characteristics are highly influencing on the dispute occurrence in construction projects. They are degree of design complexity, time constraint, procurement methods, types of client, size of project, site conditions, type of contract, source of funding and project cost. Amongst, the top most influencing project characteristic is degree of design complexity. In line with the findings of the current study, Bajere *et al.* (2017) identified that the complexity of projects as the top most project characteristic which influences disputes. Several researchers including Cakmak and Cakmak (2013); Love *et al.* (2010); Sinha and Wayal (2007); Cheung and Yiu (2006) claimed that complexity as an inherent feature of construction project. Further, the questionnaire survey findings found that payment method, scope of project, duration, type of project, location and construction method technological advancement are influencing on disputes with medium level of significance.

These significant project characteristics were further investigated through actual projects which experienced disputes and referred to dispute resolution methods such as negotiation, adjudication and arbitration. Of these 44 projects, 39% of them are highly complex in design whereas 34% are low in design complexity. Thus, in terms of complexity, a considerably similar proportion of projects was included in the study. Time constraint was identified in less projects (14 out of 44) comparatively. In terms of procurement method, a total of 24 traditionally procured projects and 20 design and build projects are involved. In terms of site condition, the considerable number of projects (41%) exposed to differing site conditions which includes marshy land, high water table and soil with less bearing capacity. The survey of findings indicated that the project characteristics such as highly complex, large scale, time

constraint, different site conditions and unavailability of the standard form of contract are critical and increase the likelihood of disputes.

6.3 Dispute Avoidance Strategies

The existing literature evidenced that a range of dispute avoidance strategies are used in construction projects in order to avoid disputes or manage them effectively to minimise its consequences. These strategies include; provision of a neutral arbitrator, appoint an adjudicator from the beginning of the project, allocating fair contract risk, teamwork, use of relationship contracting (i.e. alliances and partnering), proper documentation (i.e. contract document, drawing, spec....), proper procurement strategy, early contractor involvement (contractor's input to design), practice of negotiation, provision for dispute resolution, constructability of design, integrated project team, non-acceptance of lowest tender, use of prequalification, clear identification of clients' needs, use of standard forms of contract, third party reviews of design and BOQ, proper communication among parties, project planning and management, proper risk management practice, design audits, reviews, verifications (Gebken & Gibson, 2006; Love *et al.*, 2008; De Alwis *et al.*, 2016; Mosey, 2019; Hardjomuljadi, 2020; Zhu & Cheung, 2020).

The questionnaire survey carried out among professional who have involved in dispute management in construction projects assessed the level of practice of dispute avoidance strategies in Sri Lankan context. The professionals indicated several new strategies which are practiced in the Sri Lankan construction projects. They are maintaining contemporary records, practicing timely notices, proper and timely instructions by the consultant, administering change control procedures, timely site inspections by consultant, risk analysis at the time of tendering, the flexibility of design, preparation of adequate client brief, sourcing adequate finance and make timely payment to the contractor.

Accordingly, among the thirty-one strategies, provision for dispute resolution and use of standard forms of contract are highly practiced dispute avoidance strategies in Sri Lanka as per the findings of the questionnaire survey. In support of questionnaire

survey findings, the survey of construction projects revealed that most of the projects (41 out of 44) included provisions for dispute resolution in the contract documents. The interviewees confirmed that this is used as a dispute avoidance strategy as most of the projects included clauses related to amicable settlement as the first provision for dispute resolution and thereby promoting negotiation. In the global context, few researchers (3 out of 20) only indicated drafting dispute resolution clauses could help to avoid disputes (Jannadia *et al.*, 2000; Love *et al.*, 2008; CRCCI, 2009).

Findings revealed that 80% (35 out of 44) of projects adopted the standard form of contract such as FIDIC, SBD 02, SBD 03 and SBD 04 in preparing the contract document. Though the projects have followed the standard form of contract, the interviewees failed to claim this as a strategy to avoid disputes. However, literature evidenced the standard form of contract practiced in different countries to avoid disputes in construction projects (Love *et al.*, 2008; CRCCI, 2009).

Results of the questionnaire survey indicated that many of the dispute avoidance strategies were not practiced at the expected level in Sri Lanka. Most of the strategies (28 out of 31) gained RII values between 0.600 to 0.800. In addition, risk analysis at the time of tendering is the least utilised strategy to avoid disputes as per the questionnaire survey.

The detailed investigation of disputed projects revealed that the majority of projects (93%, 91%) included provisions for dispute resolution in contract documents and practiced negotiation to avoid disputes in the selected projects. In addition, the practice of timely notices is identified in 80% of projects which involved in the detailed investigation. In the Sri Lankan context, certain new strategies such as clarifying any issues in tender documents during tendering stage, manage variations properly, giving adequate time for the bidders to price and making timely payment were mentioned by the professional who involved in the selected projects for the detailed investigation.

From the above synthesis, it can be concluded that though many strategies are identified in both global and Sri Lankan context, they are not fully utilised in Sri Lankan construction projects. Thus, disputes are still prevalent in Sri Lankan

construction projects. This situation encourages the current study to investigate the disputes in construction projects using a different perspective. Thus, the next section collates the findings on the causes of disputes from the perspective of project characteristics and thereby creates the relationships between disputes and project characteristics.

6.4 Relationships between Causes of Disputes and Project Characteristics

This section of the current study compares the findings of literature review and survey of projects on the relationship between causes of disputes and project characteristics. As per the conceptual framework developed in Chapter 3, several causes of disputes were conceptually correlated with project characteristics. For example, unrealistic time target can be correlated with type of client and time constraint whereas scope changes can be correlated with project scope. Inappropriate procurement method, unfavourable risk allocation and fragmentation of the system could be attributed to procurement method. Adding further to this, the literature suggests that the procurement methods decides the risk sharing of parties to a contract thereby the unfavourable risk allocation can be addressed from the view point of procurement method. In addition, as per the literature, a procurement system defines design, build, management, finance and operation responsibilities of each parties. Thus, the fragmentation of system could be addressed from the perspective of procurement method. Inadequate or error in soil investigation is another factor which contributes to the likelihood of disputes in construction projects, could be directly related to site condition. In addition, the causes of incomplete source of fund and unstable financial status of client can be addressed from the perspective of type of client. Adding to this, fund allocation and the cash flow of client could vary as per the clients such as government, private and corporate company. Source of funding also another project characteristic which categorised into government treasury, equity, bank loan, bank funded and foreign funded. Similar, incomplete source of fund could be related to source of funding.

The aforementioned evidence that causes of disputes can be correlated to project characteristics. Therefore, a detailed investigation of projects carried out to strengthened the conceptual relationships identified in literature survey.

Literature suggested that payment delays are critical in government projects (Na Ayuldhya, 2011; Francis and Ramachandra, 2016). In line with literature, the current study also identified that most of the government projects (18 out of 20) involved in this study experienced disputes due to payment delays. Scrutinising the projects where payment delays cause disputes, the project characteristics of type of client, cost/size project and source of funding found to be correlated. The findings further revealed that payment delays are critical in projects where government client or funding through government treasury or large-scale are in place.

The findings revealed that failing to adopt standard forms of contract lead to many of the ambiguities in contract documents. In addition, the ambiguities in document may occur in different ways such as documents in many ways such as mismatch between BOQ and specifications, contradiction between BOQ and drawings, missing information in contract document, absence of certain clauses and errors in BOQ. This can be concluded that ambiguities in documents mainly occur due to the poor performance of the consultant or negligence of professionals irrespective of the influence of project characteristics other than the standard form of contract document.

Scope changes are critical in design and build projects as the contractor is agreed to a lump sum amount whereas the client is agreeing to a conceptual drawing. When scrutinising the projects where scope changes cause disputes, the project characteristics of procurement method, cost/size of project, degree of design complexity are found to be correlated. Scope change in design and build projects is found to be critical in the selected design and build projects (16 out of 20). In line with this, Love et al. (2008) argued that client changes to project scope can be expensive. The findings offered that scope changes are crucial in project characteristics such as design & build procurement method, high complexity and large scale. Further, the survey of projects revealed that complexity of projects

causes more disputes in projects with high design complexity, large scale and exposed to differing site conditions. In terms of delay in progress, Amarasekara *et al.* (2018) mentioned that the impact of different site condition is high in the project duration that directly influence in delaying the progress of work and thereby leads to disputes (Chen & Liew, 2003). In line with this, delay in progress of work was identified in majority (13 out of 18) of projects which exposed to differing site conditions. The findings further confirm that delay in progress of work can be correlated to type of client, degree of design complexity, time constrain and site condition.

Considering the project characteristics, type of client particularly the government is correlated to many of the causes such as payment delays, extension of time-related issues, contractor's cash flow difficulties, delay in the progress of work and unrealistic time targets set by the client. Thus, the study concludes that possible relationships exist between causes of disputes and project characteristics. In addition, the study offered that disputes are critical in projects where the project characteristics such high complexity of design, large scale, government client, and unavailability of standard form of contract, are in place. In such projects, the professionals should foresee possible disputes and be well-prepared to avoid disputes beforehand.

6.5 Relationship between Dispute Avoidance Strategies and Project Characteristics

This section provides a discussion on relationship between dispute avoidance strategies and project characteristics based on the findings derived through literature review and survey of projects. A conceptual relationship is identified between several dispute avoidance strategies and project characteristics. Amongst strategies such as use of prequalification, proper procurement strategy, allocating fair contract risk, integrated project team, team work, early contractor involvement and use of relationship contracting, could be correlated with procurement method. Literature evidenced that use of relationship contracting like partnering and alliancing are the emerging trends of procurement method. In addition, early contractor involvement is also found as a strategy to avoid disputes and project procured under design and

build facilitates early contractor involvement. This could increase the constructability of design. Thus, the procurement method itself act as a strategy to avoid disputes. This was further validated using the actual projects investigated in this study. The findings revealed that early contractor involvement and third party review on design were identified in majority of design and build projects. Thus, these can be correlated to the procurement method.

Standard of form contract could be attributed conceptually to certain strategies such as provision for dispute resolution, use of standard forms of contract, provision of a neutral arbitrator, practice of negotiation, proper documentation and appoint adjudicator from the beginning of the project. The detailed investigation of project surveyed also confirmed that the strategies such as drafting dispute resolution provisions in contract, practice of negotiation or amicable settlement, practice of timely notices, and proper documentation can be related to standard form of contract document. Further scrutinising the analysis of selected projects, early contractor involvement, third party review on design and standing adjudication could be related to cost/size of projects whereas degree of design complexity could be correlated with standing adjudication. It was evidenced in the selected projects that, large and high complex projects adopt standing DAB and neutral arbitrator to avoid disputes. Thus, this can be concluded that a strong relationships exit between dispute avoidance strategies and project characteristics. Thus disputes can be avoided by properly placing the project characteristics, particularly by adopting a proper standard form of contract and procuring using a well-suited procurement method could possibly minimise disputes in construction projects.

6.6 A strategic framework to avoid disputes in Sri Lankan Construction Industry

The research develops a strategic framework to avoid disputes in the Sri Lankan construction projects using the findings from literature review, questionnaire survey and survey of disputed projects, is depicted in Figure 6.1,

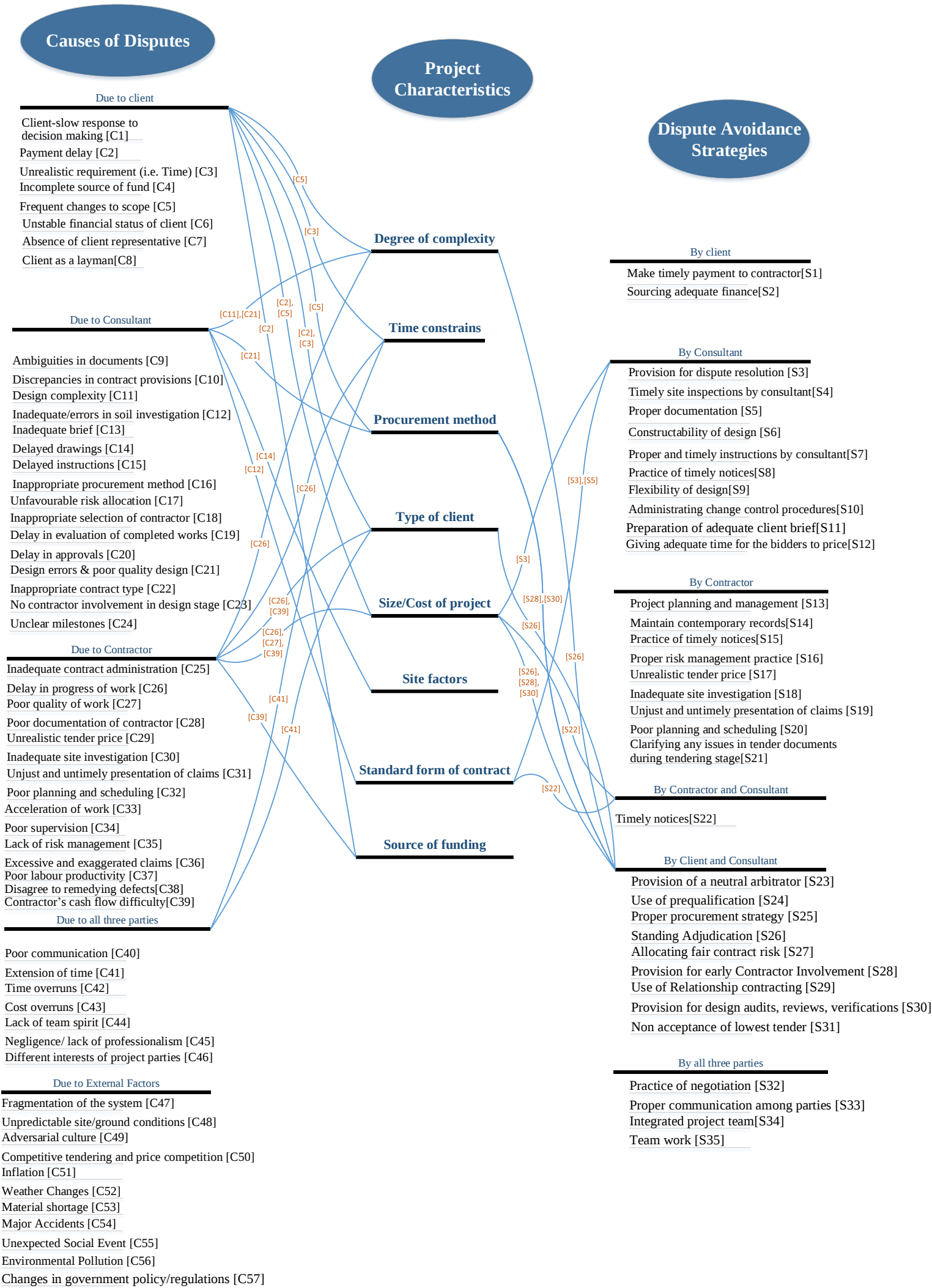


Figure 6.1: Strategic framework to avoid disputes in Sri Lankan Construction Projects from the perspective of project characteristics

Firstly, a strategic framework incorporated the causes of disputes, project characteristics which influence on disputes and the dispute avoidance strategies practiced in Sri Lanka. The causes of disputes and disputes avoidance strategies have been classified in terms of the parties responsible and the parties performing respectively. For example, client contributes to disputes in various ways such as client-slow response to decision making, payment delay, unrealistic time target, incomplete source of funding, frequent changes to scope, unstable financial status of client, absence of client representative and client as layman occur. Certain of these causes could be avoided if the client could make timely payment to contractor and sourcing adequate funding prior to the start of project.

The relationship between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics are also shown using lines. These relationships identified through the detailed investigation of projects which experienced disputes. As shown in the strategic framework, payment delay is correlated to type of client, source of funding, cost/size of project. Further explaining, payment delays are critical in projects where large to medium scale or funding solely using government treasury or government client is in place. Ambiguities in contract document are critical when a standard form of contract is not adopted to prepare the contract document. As depicted in the strategic framework, scope changes can be related to procurement method, size/cost of project and degree of design complexity. Thus, scope changes are critical in project characteristics such as design & build, large scale and high design complexity.

The relationship between project characteristics and disputes avoidance strategies also depicted in the framework. As shown in Figure 6.1, certain relationships are identified. For example, the strategies of early contractor involvement and third party review on design formulate relationship with procurement method. The procurements which facilitate early contractor involvement are identified as a technique to avoid disputes in a proactive way. In addition, several strategies such as practice of negotiation, practice of timely notices, standing adjudication and proper documentation can be related with standard form of contract as shown in the strategic framework. Standing adjudication board is linked to cost/size of project, degree of design complexity and type of client. Thus the framework explains the

correlation between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics thereby avoid disputes in Sri Lankan construction projects.

6.7 Summary

This chapter compares the findings of literature review, questionnaire survey, detailed investigation of project surveyed. These are summarised under six main subsections such as causes of disputes; project characteristics which influencing disputes; dispute avoidance strategies; relationship between causes of disputes and project characteristics; relationship between dispute avoidance techniques and project characteristics. A strategic framework to avoid disputes from the perspective of project characteristics in Sri Lankan construction project is developed at the end. The next chapter explains the conclusions and recommendations of the current study.

CHAPTER SEVEN

Conclusions and Recommendations

7. Introduction

This chapter concludes the research based on the findings and synthesise of literature review, questionnaire survey and survey of projects. Firstly, this chapter emphasizes the aim and objectives of the study and explains how these were achieved. This is followed by contribution of the current research to exiting knowledge. Subsequently, recommendations are provided based on the findings of this study in order to suggest mechanisms to manage disputes in construction projects from the viewpoint of project characteristics at the early stage of the projects. Then, the limitations of the current research are elaborated. Finally, the chapter provides a summary at last.

7.1 Achievement of Research Objectives

The prime aim of this study is to develop a strategic framework to avoid disputes in the Sri Lankan construction projects from the perspective of project characteristics. In this view, the research established four (04) objectives which were indicated in chapter one. Firstly, the research involved in reviewing literature related to two major aspects such as disputes and related issues; project characteristics and its influence on disputes. Then, a mixed approach using a questionnaire survey and survey of projects consisting of documentary review and semi-structured interviews were employed to achieve the objectives of the study. The followings explain the achievement of the research objectives.

Objective 1 - To critically review the causes of disputes, dispute avoidance strategies and project characteristics influencing disputes

The first objective of the study was to review the literature related to two major aspects, disputes and related issues; project characteristics and its impact on disputes.

The review of disputes covered identifying causes of disputes, effects of disputes and practices of dispute avoidance. A total of fifty-five (55) causes were identified from twenty (20) key research papers and classified in terms of frequency of previous studies, responsible parties to contract and the stages of project. Scope changes, payment delays and inadequate/incomplete specification and drawing are few of the frequently quoted causes of disputes by the previous researchers. In terms of parties to contract, the causes of opportunistic behaviour, lack of team spirit, poor communication and different interest of parties are identified as responsible by all three parties: contractor, consultant and client. These could be occurring in any stage of construction project. In addition, client contributes to disputes in many ways such as scope changes, payment delays, slow response to decision making, delay in approvals, unrealistic requirements and unstable financial status.

The review identified that there are several project characteristics such as type of client, type of project, scope of project, size of project, degree of complexity, risk factors, procurement method, and construction methods, govern the context of every construction projects. Amongst certain project characteristics influence on disputes. For example, the projects with large size or high complexity or funded by government or high risk involvement are more likely to experience disputes within its lifetime. The literature evidenced that the projects procured traditionally experience higher disputes while partnering and alliancing are less favour in terms of dispute occurrence.

A total of twenty-one (21) dispute avoidance strategies were identified by reviewing key research papers merely from the year 2000 to 2020. Amongst, provision of a neutral arbitrator and appointing adjudicator from the beginning of the project were the most quoted strategies by previous studies. The review further classified these dispute avoidance strategies in terms of design management, procurement management, contract management and stakeholder management. For example, allocating fair risk allocation, use of relationship contracting (e.g., alliances and partnering), design and construct and early contractor involvement were identified as procurement method-related techniques.

The review summarised the findings on causes of disputes, dispute avoidance strategies and project characteristics thereby developed a conceptual framework to avoid disputes in the construction industry highlighting the possible relationship between causes of disputes, project characteristics and dispute avoidance techniques. For example, risk factor is one of the project characteristics which was conceptually related to causes such as weather changes, unpredicted site conditions, inflation, unexpected social event and major accident. Payment delays, unrealistic requirements of the client, unstable financial status of client and incomplete source of funding could be related to the type of client. In addition, the dispute avoidance strategies such as allocating fair risk contracts, use of relationship contracting, early contractor involvement and proper procurement strategy can be correlated to the procurement method. Thus, the framework established a theoretical understanding on causes of disputes, disputes avoidance strategies and their possible relationships with project characteristics.

Objective 2 - To investigate the significant causes of disputes; significant project characteristics influencing disputes; dispute avoidance strategies practiced in Sri Lanka

The second objective of the research aimed at investigating the significant causes of disputes; significant project characteristics influencing disputes; significant dispute avoidance strategies practiced in Sri Lanka. The causes of disputes, project characteristics and dispute avoidance strategies which were identified from literature review then carried to a questionnaire survey in order to investigate its significance. A total of thirty-two (32) causes identified as significantly contributing to disputes in construction projects. Of these, the top three causes of disputes are ambiguities and incompleteness of documents, client's slow response to decision making and discrepancies in contract provisions. The research found new sources of disputes such as disagree to remedying defects, client as a layman, absence of client representative, government showcases the progress of projects without budget allocation, government policy changes, instability of government and price escalation related issues. A total of nine (09) project characteristics are identified as significantly influencing on disputes. Amongst, degree of design complexity, time constraint and procurement method are the top most characteristics which influence

disputes. Further, the research findings revealed that provision for dispute resolution, use of Standard forms of contract and provision of a neutral arbitrator are the mostly utilised avoidance strategies in Sri Lankan construction projects. It was highlighted that other strategies were less practiced. The research concluded that the practice of dispute avoidance strategies should be improved to avoid disputes in Sri Lankan construction projects.

Objective 3 - To formulate the relationship between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics.

The third objective of the research aimed at formulating relationships between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics. This was primarily achieved through a detailed investigation into projects which experienced disputes. The significant project characteristics are further scrutinised using the projects which experienced disputes and investigate the relationship between disputes and project characteristics. For example, the cause of payment delays creates relationships with the project characteristics such as type of client, cost/size of project and source of funding. The finding further offered that the payment delays are critical in projects where the project characteristics such as large and medium scale or government client or funding solely rely on government treasury is in place. Ambiguities in documents can be attributed by standard form of contract. Scope changes can be addressed by the project characteristics such as procurement method, cost/size of project and degree of design complexity. Thus, scope changes are critical in projects where design and build procurement or large scale or high design complexity is in place. In addition, certain dispute avoidance strategies were found to be correlated with project characteristics. For example, drafting dispute resolution provisions in contract, practice of negotiation or amicable settlement, the practice of timely notices and Standing Dispute Adjudication Board (DAB) are related to the use of the standard form of contract whereas early contractor involvement and third party review on design are attributed to procurement method. Thus, the research confirmed that the disputes in terms of its causes and avoidance strategies can be related to project characteristics.

Objective 4 - To develop a strategic framework to avoid disputes in the Sri Lankan construction industry.

The last objective of the research aimed at developing a strategic framework to avoid disputes in the Sri Lankan construction industry. This was achieved by compiling the findings of literature review, questionnaire survey and survey of projects into a framework. The framework depicted the causes of disputes, project characteristics and dispute avoidance strategies. Then, the relationships among these, which were identified through the survey of projects also clearly indicated in the framework. The causes of disputes are classified in terms of the contributing party and dispute avoidance strategies are categorised in terms of the parties who are responsible to perform. Thus, the framework well explains the causes occur in different project contexts and who are the parties responsible for such causes and what are possible dispute avoidance strategies to be practiced by the parties to eliminate the disputes. For example, in projects where the government client involves, the causes such as payment delays, scope changes, complexity of project and contractor's cash flow difficulties possibly contribute to disputes. In such projects, adopting the dispute avoidance strategies such as drafting dispute resolution provisions in contract, practice of timely notices, early contractor involvement, third party review on design, standing adjudication and clarifying any issues in tender documents during the tendering stage could help to avoid and minimise such disputes.

7.2 Contribution of the Research

The contribution of the research to the knowledge originates from the achievement of the research objectives. Accordingly, the next subsections explain the contributions under two topics; contribution to theory and contribution to practice.

7.2.1 Contribution to theory

As literature evidenced, disputes are unavoidable in complex and competitive construction projects in Sri Lanka. The top ten (10) factors such as ambiguities of documents, client-slow response to decision making, discrepancies in contract provisions, design complexity, frequent changes to scope, payment delay, unrealistic time requirement, cost overruns, inadequate contract administration,

inadequate/errors in soil investigation, inadequate brief, delayed drawings, late instructions, incomplete source of fund, inappropriate procurement method, the unstable financial status of client contribute to disputes in construction projects. The current study has further strengthened these findings using two different approaches of questionnaire survey and survey of projects. Adding to the existing knowledge, this study found certain new causes which contribute to disputes in Sri Lankan construction projects such as changes in government regulations, instability of government, disagree to remedying defects, the client as a layman, absence of client representative, government showcases the progress of projects without budget allocation. Amongst, most of these occur in projects where government acts as the client.

The causes of disputes have been investigated in many ways as an attempt to avoid disputes in the global context. For example, the causes have been classified in terms of root and proxy; indirect and indirect; owner related, contractor related, design-related, contract-related, human behaviour related, project-related and external factor related. In line with the previous studies, this study has clustered the factors in terms of project participants and stages of the project. Further the current study reinvestigated the causes of disputes from the perspective of project characteristics and found that there could be relationships exist between causes of disputes and project characteristics. For example, payment delays could create relationships with the project characteristics such as type of client, cost of project and source of funding. Ambiguities in documents can be attributed by the standard form of contract. Scope changes can be addressed using the project characteristics such as procurement method, cost/size of project and degree of design complexity.

The strategies such as the provision of a neutral arbitrator, appoint an adjudicator from the beginning of the project, allocating fair contract risk, teamwork, use of relationship contracting (i.e. alliances and partnering), proper documentation (i.e. contract document, drawing, spec....), proper procurement strategy, early contractor involvement (contractor's input to design), practice of negotiation, etc. are practiced by the professionals who involved in construction projects to avoid disputes in different countries. Slightly different to the global context, the strategies of maintaining contemporary records, practicing timely notices, proper and timely

instructions by the consultant, administrating change control procedures, timely site inspections by the consultant, risk analysis at the time of tendering, flexibility of design, preparation of adequate client brief, sourcing adequate finance, make timely payment to the contractor are identified as new methods practiced in Sri Lankan projects to avoid disputes. Adding to existing knowledge, the study found that the strategies like drafting dispute resolution provisions in the contract, practice of negotiation or amicable settlement, practice of timely notices and practice of Standing Dispute Adjudication Board (DAB) could be adopted in projects where proper standard form of contract are in place.

Unlike previous studies, the current study is positioned under pragmatism research paradigm which enabled the mixed-method approach by employing qualitative and quantitative methods. Thus, the current study has derived knowledge using a triangulation approach where questionnaire survey, documentary review and semi-structured interviews are employed in the inquiry of current research phenomena.

7.2.2 Contribution to practice

Unlike previous studies that examined the causes of disputes and dispute avoidance strategies, the current study has used two different approaches where a questionnaire survey was administered among professionals who are experts in dispute management and subsequently detailed analysis into projects which experienced disputes were carried out to investigate the factors contributing to disputes and strategies to avoid disputes in different project contexts thereby establish relationships between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics.

The previous studies evidenced that disputes are more frequent in construction projects. Sri Lanka is not exceptional to this situation as per the current study. The study found that payment delays and ambiguities in documents are critical in Sri Lankan projects. The study further revealed that payment delays occur due to the client most probably towards the end of the projects as the client faces financial difficulties. Payment delays could be attributed to the type of client, cost of project and source of funding. For example, payment delays are more critical in large-scale

government projects which completely rely on the government treasury for funding. Therefore, in such projects, the professionals need to be well prepared to manage the payment delays which could happen towards the later stage of projects. The strategies suggest the clients to make timely payments to contractors and source complete funds prior to the commencement of the project in order to avoid payment-related disputes in construction projects.

Though many studies have investigated on disputes and related issues, still disputes are prevalent in Sri Lankan construction projects. Hence, there is a need to change the way, the disputes to be addressed. This study, therefore, takes the project characteristic perspective in order to analyse disputes in Sri Lankan projects. The developed framework could motivate the industry practitioners such as quantity surveyors, engineers, project managers, architects, site supervisors, arbitrators and adjudicators to address the causes of disputes in different project contexts while following the dispute avoidance strategies in order to avoid disputes in Sri Lankan construction projects. A robust approach in avoiding disputes highlighting the possible relationships between causes of disputes, project characteristics and disputes avoidance strategies are depicted in the framework.

7.3 Recommendations

Considering the findings and conclusions presented in previous chapters, this study suggests following recommendations to theory and practice.

1. Practically, disputes are more frequent in projects where the project characteristics such large scale, high complex, government client, time constraint, unavailability of standard form of contract and differing site conditions, are in place. In such projects, the related causes should be identified and proper strategies need to be adopted to avoid disputes effectively. For example, the sources such as scope changes, payment delay and poor quality of work could contribute to disputes in large scale projects where appointing adjudicator from the beginning of the project, proper risk management practice and practice of timely notices could minimise the consequences of disputes and possibly avoid them effectively.

2. The study investigated the causes of dispute and dispute avoidance strategies in Sri Lankan construction projects using two approaches where questionnaire survey administered among professionals who involved in dispute management in Sri Lankan construction projects and survey of projects which experienced disputes using documentary review and semi-structured interview. Thus, data triangulation was achieved with the use of different data collection instruments. The study confirms that there is a correlation exists between disputes and project characteristics. Finally, a framework was developed to avoid disputes in Sri Lanka from the perspective of project characteristics. The framework establishes the links between causes of disputes, project characteristics and disputes avoidance strategies. This framework helps the professionals to foresee the factors which could contribute to disputes in different project context and the possible dispute avoidance strategies. Therefore, the research recommends the industry professionals to adopt this framework from the beginning of the project in eliminating disputes.
3. Sri Lankan government projects widely experienced disputes due to payment delays. This occurs due to lack of funds with Sri Lankan government and the ruling party initiates new projects in order to showcase the progress of development activities without the complete source of funding arrangement to confirm its stability. On the other hand, foreign-funded large-scale projects less experienced disputes as the complete funding available, an experienced contractor involves, practice timely noticed and parties to sort disagreements mutually.
4. The study found dispute avoidance strategies practiced in the Sri Lankan construction industry to avoid disputes. Therefore, the study recommends adopting those dispute avoidance strategies beforehand. The study further recommends the practice of negotiation to avoid disputes as it less time taken, no cost involved and improves the relationship between parties.

7.4 Recommendations to Further Research

This research study can be extended into the following areas:

Investigating the strategies to avoid disputes in Sri Lankan government projects

One of the key findings of the study is the type of client highly contributing to disputes. Particularly, the government projects experience more issues due to payment related disputes. The commencement of projects prior to the complete source of funds, delay in cabinet approvals, attitude of client and political pressures are the major reasons behind the payment related issues in government projects. However, the government is the major client in the construction industry and the contractors should quote for government projects knowing these circumstances. Therefore, a current study recommends to investigate the strategies to avoid disputes in Sri Lankan government projects.

Developing a decision making matrix to avoid disputes from the perspective of project characteristics

The current research provides a new way to address the disputes from the perspective of disputes. The first level project characteristics are considered in the current study with a limited number of samples. The relationship between the causes of disputes, dispute avoidance strategies and project characteristics are found in the current study. However, every project characteristic has its variants. The variants of project characteristics are not completely addressed in this study. Therefore, a study can be conducted focusing the project characteristics of projects which experienced disputes in a detailed manner with a large number of samples. Thus, the study could develop a decision-making matrix to avoid disputes from the perspective of project characteristics.

Investigating the relationship between dispute resolution methods and project characteristics

The current study focused on the relationship between dispute avoidance strategies and project characteristics. The dispute resolution methods adopted in the projects are not considered in this study. In addition, there is no research conducted in addressing the relationship between dispute resolution methods and project characteristics. Therefore, the current study recommends to investigate the relationship between dispute resolution methods and project characteristics.

7.5 Limitations of the Research

The research focused on formulating the relationship among the causes of disputes, project characteristics, dispute avoidance strategies in Sri Lankan construction projects. The study adopted two approaches comprising of questionnaire survey and survey of projects. The questionnaire survey was targeted to reach 30 samples of each quantity surveyor, project manager and adjudicator/arbitrator. However, it was able to receive 12 filled questionnaires from adjudicator/arbitrator due to the less practicing group. The Sri Lankan building projects which experienced disputes were surveyed using documentary review and semi-structured interviews. Most of the selected projects were located in Colombo district. There are many variables involved in this study, however, few of them such as type of client, procurement method and cost/size of projects were considered in the systematic sample selection using tree diagram (as explained in chapter three). Thus, the study accommodated a total of forty-four (44) projects.

The findings rely on cross-sectional data rather than longitudinal data. This may not reflect the changing nature of worker behaviors over time. The cross-sectional data can be affected by the respondent's predisposition of any events that have happened in the past or by the mental position at the time of participating in the survey. Another limitation of this study was the validation of the developed framework was not done with real projects in Sri Lanka due to time constraints.

7.6 Summary

This chapter firstly described the conclusions of the study under each objective. Then it explains the contribution of the research to theory and practice. The limitations are explained followed by the recommendations of the study. Finally, it is hoped that this thesis contributes to existing knowledge and will improve industry practice in avoiding disputes in the Sri Lankan construction industry.

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Appendix 1 – Questionnaire

Appendix 2– Survey of projects interview guideline

Appendix 3– Sample documentary/interview transcript

Appendix 1 – Questionnaire**Developing a Framework to Avoid Disputes in Construction Projects:
A Perspective of Project Characteristics**

Dear Sir/ Madam,

I am Mathusha Francis, a MPhil candidate at the Department of Building Economics, University of Moratuwa. My research focuses ‘Developing a Framework to Avoid Disputes in Construction Projects: A Perspective of Project Characteristics’. My research aims to develop a strategic framework to avoid disputes in Sri Lankan construction projects from the perspective of project characteristics. Within the scope of the research, a questionnaire survey is employed in order to achieve the following objective:

- To investigate the significant causes of disputes, project characteristics influencing disputes and dispute avoidance strategies practiced in Sri Lanka

I have identified you as a potential respondent to the questionnaire survey. I strongly believe that you would support my research by providing your valuable views related to my research topic.

The information collected through this questionnaire survey will be kept strictly confidential and be used only for the purpose of the thesis. Any of your personnel information will not be disclosed within the research.

Please provide the following background information

Designation :

Years of experience in the industry :

Scope of work :.....

1. How frequently you have experienced disputes in construction projects? Please indicate using the appropriate scale.

5-Very frequently 4-Frequently 3-Occasionally 2-Rarely 1-Not at all

☐ ☐ ☐ ☐ ☐

2. If you have experienced disputes, please indicate the extent of influence of the following project characteristics on disputes. Please use the scale and select the appropriate.

(1-very low, 2- low, 3-moderate, 4-high, 5-Very high)

Project Characteristics	1	2	3	4	5	N/A
Type of project (i.e. building, road, bridge...)	☐	☐	☐	☐	☐	☐
Duration of project	☐	☐	☐	☐	☐	☐
Type of client (i.e. government, individual, corporate...)	☐	☐	☐	☐	☐	☐
Source of funding	☐	☐	☐	☐	☐	☐
Size of project (gross floor area or volume of building)	☐	☐	☐	☐	☐	☐
Project cost	☐	☐	☐	☐	☐	☐
Project scope	☐	☐	☐	☐	☐	☐
Degree of Complexity (design)	☐	☐	☐	☐	☐	☐
Degree of flexibility (in design)	☐	☐	☐	☐	☐	☐
Procurement method (traditional, design & build...)	☐	☐	☐	☐	☐	☐
Type of contract (Measure & pay, lump sum)	☐	☐	☐	☐	☐	☐
Payment method (Measure & pay, lump sum)	☐	☐	☐	☐	☐	☐
Project location	☐	☐	☐	☐	☐	☐
Site factors	☐	☐	☐	☐	☐	☐
Construction method and Technological advancement	☐	☐	☐	☐	☐	☐
Time constrains (time targets)	☐	☐	☐	☐	☐	☐
<i>If any other factors, please indicate</i>	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

3. Could you please indicate the level of contribution of the following causes to disputes? Please use the appropriate scale.
(1-very low, 2- low, 3-moderate, 4-high, 5-Very high)

Causes of disputes	1	2	3	4	5	N/A
Slow response to decision making	☐	☐	☐	☐	☐	☐
Unrealistic requirement (i.e. Time)	☐	☐	☐	☐	☐	☐
Frequent changes to scope	☐	☐	☐	☐	☐	☐
Opportunistic behaviour	☐	☐	☐	☐	☐	☐
Poor communication	☐	☐	☐	☐	☐	☐
Negligence/ lack of professionalism	☐	☐	☐	☐	☐	☐
Payment delay	☐	☐	☐	☐	☐	☐
Unstable financial status of client	☐	☐	☐	☐	☐	☐
Time overruns	☐	☐	☐	☐	☐	☐
Delay in progress of work	☐	☐	☐	☐	☐	☐
Incomplete source of fund	☐	☐	☐	☐	☐	☐
Inadequate brief	☐	☐	☐	☐	☐	☐
Complexity of project (i.e. design)	☐	☐	☐	☐	☐	☐
Competitive tendering and price competition	☐	☐	☐	☐	☐	☐
Inappropriate procurement method	☐	☐	☐	☐	☐	☐
Unfavourable risk allocation	☐	☐	☐	☐	☐	☐
Fragmentation of the system	☐	☐	☐	☐	☐	☐
Adversarial culture	☐	☐	☐	☐	☐	☐
No contractor involvement in design stage	☐	☐	☐	☐	☐	☐
Inappropriate selection of contractor (Financial difficulties of contractor, Technical inadequacy of contractor)	☐	☐	☐	☐	☐	☐
Different interests of project parties	☐	☐	☐	☐	☐	☐
Lack of team spirit	☐	☐	☐	☐	☐	☐
Inappropriate contract type	☐	☐	☐	☐	☐	☐
Design errors & poor quality design	☐	☐	☐	☐	☐	☐
Poor quality of work	☐	☐	☐	☐	☐	☐
Cost overruns	☐	☐	☐	☐	☐	☐
Unrealistic tender price	☐	☐	☐	☐	☐	☐
Error in estimation (over or under)	☐	☐	☐	☐	☐	☐
Inadequate site investigation	☐	☐	☐	☐	☐	☐
Inadequate/Error in soil investigation	☐	☐	☐	☐	☐	☐
Errors, ambiguities, contradictory in documents (i.e. contract document, drawing, specification....)	☐	☐	☐	☐	☐	☐
Different interpretation of contract provisions	☐	☐	☐	☐	☐	☐
Late instructions	☐	☐	☐	☐	☐	☐

Causes of disputes	1	2	3	4	5	N/A
Delayed drawings	☐	☐	☐	☐	☐	☐
Delay in evaluation of completed works	☐	☐	☐	☐	☐	☐
Unclear milestones	☐	☐	☐	☐	☐	☐
Delay in approvals	☐	☐	☐	☐	☐	☐
Poorly done planning and scheduling	☐	☐	☐	☐	☐	☐
Lack of risk management	☐	☐	☐	☐	☐	☐
Excessive and exaggerated claims	☐	☐	☐	☐	☐	☐
Acceleration of work						
Inadequate contract administration	☐	☐	☐	☐	☐	☐
Poor supervision	☐	☐	☐	☐	☐	☐
Unjust and untimely presentation of claims	☐	☐	☐	☐	☐	☐
Poor documentation of contractor	☐	☐	☐	☐	☐	☐
Poor labour productivity	☐	☐	☐	☐	☐	☐
Material shortage						
Weather Changes	☐	☐	☐	☐	☐	☐
Major Accidents	☐	☐	☐	☐	☐	☐
Environmental Pollution	☐	☐	☐	☐	☐	☐
Inflation	☐	☐	☐	☐	☐	☐
Legal and economic factors	☐	☐	☐	☐	☐	☐
Unexpected Social Event	☐	☐	☐	☐	☐	☐
Unpredictable Site Conditions	☐	☐	☐	☐	☐	☐
Changes in government regulations	☐	☐	☐	☐	☐	☐
<i>If any other factors, please indicate</i>	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

4. Please indicate the **extent** of the following dispute avoidance strategies being adopted in the Sri Lankan construction industry using the appropriate scale.

(1-very low, 2- low, 3-moderate, 4-high, 5-Very high)

Dispute avoidance strategies	1	2	3	4	5	N/A
Allocating fair contract risk	☐	☐	☐	☐	☐	☐
Early Contractor Involvement (Contractor's input to design)	☐	☐	☐	☐	☐	☐
Integrated project team	☐	☐	☐	☐	☐	☐
Team work	☐	☐	☐	☐	☐	☐
Use of Relationship contracting (i.e. alliances and partnering)	☐	☐	☐	☐	☐	☐
Practice of negotiation	☐	☐	☐	☐	☐	☐
Non acceptance of lowest tender	☐	☐	☐	☐	☐	☐

Dispute avoidance strategies	1	2	3	4	5	N/A
Use of prequalification	☐	☐	☐	☐	☐	☐
Proper procurement strategy	☐	☐	☐	☐	☐	☐
Clear identification of clients' needs	☐	☐	☐	☐	☐	☐
Preparation of adequate client brief	☐	☐	☐	☐	☐	☐
Sourcing adequate finance	☐	☐	☐	☐	☐	☐
Make timely payment to contractor	☐	☐	☐	☐	☐	☐
Provision for dispute resolution	☐	☐	☐	☐	☐	☐
Provision of a neutral arbitrator	☐	☐	☐	☐	☐	☐
Appoint adjudicator from the beginning of the project	☐	☐	☐	☐	☐	☐
Use of Standard forms of contract	☐	☐	☐	☐	☐	☐
Proper documentation (i.e. contract document, drawing, spec....)	☐	☐	☐	☐	☐	☐
Third party reviews of design and BOQ	☐	☐	☐	☐	☐	☐
Maintain contemporary records	☐	☐	☐	☐	☐	☐
Proper communication among parties	☐	☐	☐	☐	☐	☐
Practice of timely notices	☐	☐	☐	☐	☐	☐
Proper and timely instructions by consultant	☐	☐	☐	☐	☐	☐
Administering change control procedures	☐	☐	☐	☐	☐	☐
Timely site inspections by consultant	☐	☐	☐	☐	☐	☐
Project planning and management	☐	☐	☐	☐	☐	☐
Proper risk management practice	☐	☐	☐	☐	☐	☐
Risk analysis at the time of tendering	☐	☐	☐	☐	☐	☐
Constructability of design	☐	☐	☐	☐	☐	☐
Design audits, reviews, verifications	☐	☐	☐	☐	☐	☐
Flexibility of design	☐	☐	☐	☐	☐	☐
<i>If any other factors, please indicate.....</i>	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐

Appendix 2 – Interview Guideline**Developing a Framework to Avoid Disputes in Construction Projects:****A Perspective of Project Characteristics**

Dear Sir/ Madam,

I am Mathusha Francis, a MPhil candidate at the Department of Building Economics, University of Moratuwa. My research focuses ‘Developing a framework to avoid disputes in construction projects: A perspective of project characteristics’. My research aims to develop a strategic framework to avoid disputes in Sri Lankan construction projects from the perspective of project characteristics. Within the scope of the research, a survey method is employed in investigating the projects which experienced disputes in order to achieve the following objectives:

- To investigate the causes of disputes and dispute avoidance strategies practiced in Sri Lanka under different project contexts
- To formulate the relationship between causes of disputes and project characteristics; dispute avoidance strategies and project characteristics

This research intends to collect data of the completed building project which experienced disputes and this requires collecting details related to project characteristics and disputes and related issues through documentary review and semi-structured interview. I have identified you/your organization as a potential participant who could provide me valuable information to this research. I strongly believe that you would support my research by providing your valuable views related to my research topic.

The information collected through the documentary review and interview will be kept strictly confidential and be used only for the purpose of the thesis. Any of your personnel information will not be disclosed within the research.

SECTION 01- Background Information

Please provide the following background information

Your Designation :

Years of experience in the industry :

Scope of work :

SECTION 02- Project Characteristics

Please provide the following project information of the project which experienced disputes.

Project Characteristics	Description
<i>Type of client</i>	
<i>Contract price</i>	
<i>Actual project cost</i>	
<i>Scope of the project</i>	
<i>Size (gross floor area)</i>	
<i>Type of contract</i>	
<i>Duration of the project</i>	
<i>Exceeded time period (if exceeded only)</i>	
<i>Degree of complexity (low, medium, high)</i>	
<i>Payment method</i>	
<i>Project location</i>	
<i>Site factor</i>	
<i>Risk factor</i>	
<i>Construction method and innovative technology</i>	
<i>Procurement Method</i>	
<i>Availability of fund with the client</i>	
<i>Source of fund</i>	

Use of standard form of contract	
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SECTION 02- Nature of Disputes

- i. How many times disputes occur in the selected project?
- ii. In which stages the disputes occur?
- iii. Who is responsible for the disputes?
- iv. Explain the causes of disputes occur inception to handing over stage in detail.
- v. What are the effects of such disputes?

SECTION 03- Dispute avoidance and management

- i. Please indicate the method used to resolve the disputes occur in the selected project?
- ii. What is the reason to choose the above method to resolve disputes?
- iii. What is the output of the resolution process?
- iv. Please describe the dispute avoidance strategies adopted in the selected project?

I would like to thank you for the information given and time you have dedicated to this research. If you are interested to know the outcome of this research, it would be my pleasure to share it with you.

Yours faithfully,
Mathusha.F,
Lecturer,
Department of Building Economics,
University of Moratuwa.

Sample Copy

Please provide the following background information

Your Designation : Contract managerYears of experience in the industry : 18 yearsScope of work : Claim management, contract administration

SECTION 01- Project Characteristics

- i. Please provide the following project information of the project which experienced disputes.

Project Characteristics	Description
<i>Type of client</i>	Private company
<i>Contract price</i>	0.9Bn
<i>Actual project cost</i>	1.2Bn
<i>Scope of the project</i>	12 storeyed building including civil and mechanical services
<i>Size (gross floor area)</i>	Aprox. 120,000 ft ²
<i>Type of contract</i>	Measure and pay
<i>Duration of the project</i>	30 months (21/2 years)
<i>Exceeded time period (if exceeded only)</i>	6 months
<i>Degree of complexity (low, medium, high)</i>	Medium
<i>Payment method</i>	Measure and pay
<i>Project location</i>	Colombo
<i>Site factor</i>	Soil bearing capacity is low
<i>Construction method and innovative technology</i>	Value engineering is done to several elements in order minimize the cost of building
<i>Procurement Method</i>	Traditional procurement method
<i>Availability of fund with the client</i>	Financial status of client is unstable, lack of

	fund with client.
<i>Source of fund</i>	Equity and bank loan
<i>Use of standard form of contract</i>	SBD 02

SECTION 02- Nature of Disputes

- i. How many times disputes occur in the selected project?

Nearly 10 times. Amongst 1 dispute continued till the end of the project. This was due to a major scope change.

- ii. In which stages the disputes occur?

After the mid of the project, disputes occurred frequently.

- iii. Who is responsible for the disputes?

Most of the disputes were related to payment which was ultimately it's client responsibility. Major scope change made the client after the award of contract.

- iv. Explain the causes of every dispute in detail manner.

Major causes of disputes are payment-related issues such as non-payment and delay payment. Due to the cash flow difficulties of the client, client used to delay the payment. This mostly happened after the mid of the project. We have kept on adding the interest claims for late payments, however, the client never paid the additional amount for the interest claims. That amount was also disputed. We finally gave up those interest claims as knowing the situation that the client would never pay.

Client doesn't have complete source of fund ready in hand. There is a big error in the project feasibility study. The client started the project with an expected profit of his ongoing business (this project is an extension building to his business). However, the expected profit was not achieved from his business which become a wrong assumption. He expects to facilitate his cash flow from his ongoing business, as it was not as expected, he couldn't make payments properly.

Another cause was client's attitude toward handling the contractual matters and payment behaviour. And also the client is a layman. But, he didn't hire a representative to assist him contractually. As the client doesn't have a representative to make him aware of contract provisions, there were many issues in responding to emails and other correspondence. It was difficult to work with a client like that.

Major scope changes was also initiated by the client. After the award of the contract additional four (4) floors are added. However, the client couldn't cope up with the increased contract sum.

v. What are the effects of such disputes?

Time overrun happened. When the payment got delayed, we faced cash flow difficulties then we slow down the progress of work to manage our cash flow. In a worse scenario, we suspend the work for two weeks due to the payment delay. Then only the client clear the payments as the client waited for the completion of this hospital project to earn money.

SECTION 03- Dispute avoidance and management

i. Please indicate the method used to resolve the disputes occur in the selected project?

Usually we tried our best to solve the disputes through negotiation. If the dispute is not solved by negotiation, we referred to arbitration. Here, only one dispute was taken to arbitration and the others sorted out using negotiation. Three arbitrators panel was used in the arbitration and that took nearly 6 months to come to an agreement.

ii. What is the reason to choose the above method to resolve disputes?

As per the contract.

iii. What is the output of the resolution process?

Most of the disputes were settled and we were satisfied with the resolution methods.

iv. Please describe the dispute avoidance strategies adopted in the selected project?

We have followed several dispute avoidance and management strategies such as maintaining risk registry/risk plan. In the risk register we indicate several aspects related to the risks such as what is the risk, what is of the risk to the project, likelihood to occur, seriousness of the consequences, action under taken, responsible person and mitigation measures. Thus, from our side we were well planned to handle any potential risk. We used to update the risk registry once in two weeks and act accordingly. In addition, we used to send contractual notices as per the timeframe. For the suspension also we properly notify our stand suspension which happen due to delay payment. And we carried out negotiations for any disagreements then the variations were well handled. As the client is a layman and he didn't appoint any professional to assist him on contractual matters, the problems occurred mainly. Even we advised the client to appoint a representative to assist him. However, it didn't happen till end.