

SOURCES OF DISPUTES IN ROAD CONSTRUCTION PROJECTS

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Resolution

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Thesis submitted in partial fulfilment of the requirements for the degree of
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Declaration

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Name of the supervisor: Ch.QS Vijitha Disaratna

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Abstract

Sources of Disputes in Road Construction Projects

In every industry where people have to work together and cooperate there is a possibility for disputes to arise, and construction industry is not an exception. Often there is a lack of understanding about the reasons behind the disputes, but to avoid disputes from occurring and resolving them if they occur, it is vital to understand the sources of disputes (Love, 2008).

According to Harmon (2003), “Construction projects are comparatively complex, resulting in tedious contract documents. These complex construction can tend to result in complex disputes. Due to the disputed situation a project can deviate from its original scope and lead to complicated litigation or arbitration hence, increased costs, and a breakdown the parties’ relationship”.

The road construction projects are not an exception for disputes. Therefore, identification of factors affecting for disputes in road construction projects are necessary for its smooth execution. This research tried to identify most common sources of disputes which affected to road construction project life and cost.

In this research mixed approach was used to explore the research topic. A detailed literature review was carried out to determine the sources of disputes in construction projects and filtered them through experts’ interview to identify the sources which are more relevant to the road projects.

37 number of sources of disputes were shortlisted with expert’s opinions out of 95 sources of disputes identified through the literature review. The same has tested through questionnaire survey with the road construction experts. Identified 12 number of significant sources of disputes which were affected the road construction projects regularly were identified.

A framework was developed based on the identified common sources of disputes occur in road construction projects regularly. The same framework has recommended the possible actions that can be taken at formulation or at execution of the road projects. The recommended proactive actions may give guidance to the road project parties to avoid or minimize dispute before the dispute hit on the project.

Keywords: Source of disputes, Road construction projects, Dispute resolution

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List of Abbreviations

ADB – Asian Development Bank
BOQ – Bill of Quantities
DAB – Dispute Adjudication Board
RDA – Road Development Authority
VO – Variation Orders

CHAPTER 01

INTRODUCTION

1.1 Research Background

The Oxford dictionary defines “dispute” as “a disagreement or argument” between parties (dictionary, 2017).

Mururu (1991) described that dispute is the formation of a position to maintain in conflict. Brown (1999) suggested that dispute can be viewed as a class or kind of conflict that require resolution. Furthermore, according to Hellard (1987), construction dispute is the opposition of interests, values or objectives.

Because of contractual incompleteness, whenever events/contingencies occur ex post which are not fully specified ex ante, one or both of the parties may behave opportunistically. Such behavior predictably results in conflict and disputes.

According to the statement made by Tillet (1991) “construction dispute is the incompatibility of two (or more) people’s (or groups’) interests, needs, or goals” which is more relevant for this research.

As all parties to the contract are sought to maximize fulfillment of their own interests, or needs, or achievement of their own bargaining or negotiating through compromise, one party may yield to the other on that which is less important. When this happens, the dispute is usually settled (Smith, 1992).

This was consistent with the view of Fenn (1997) who described that dispute requires resolution and is associated with distinct justifiable issues. Similar proposition is also suggested by Burton (1990) who maintained that dispute is always negotiable. Bristow and Sykes (1996) disputes are arise due to someone’s personality and unrealistic expectation, lack of team spirit and

misunderstandings. These studies suggested that conflict is a prime driver of dispute.

A plethora of definitions as to what constitutes a dispute can be found in the normative literature (Brown and Marriott, 1993). The terms dispute, conflict and claim are used alternatively, but the meaning of each are different to other. Examples of how each of these terms has been defined include:

- **Dispute** – “any contract question or controversy that must be settled beyond the jobsite management” (Diekmann and Girad, 1995).
- **Conflict** – “serious disagreement about something important” (Collins, 1995). Similarly, Leung (2005) states conflict as a “functional or dysfunctional element in the management process”. Willmot and Hocker (1998), has stated the conflict as “an expressed struggle between at least two independent parties who perceive incompatible goals, scarce resources, and interference from other achieving those goals”.
- **Claim** – Powell-Smith and Stephenson (1993) states that “for the assertion of a right to money, property or remedy” as a claim. Likewise, Semple, Hartman, jergeas (1994) clarify a claim as “a request for compensation for damages incurred by any party to a contract”.

Reid and Ellis (2007) pointing in different view and states there is no definite meaning of a dispute and the existence of which is relies on the facts, the law and policy considerations with common sense approach. Ndekugri and Russell (2006) and Reid and Ellis (2007) refer to the Halki Principle, where a dispute does not raise to top until a claim has been submitted and rejected; a claim being a launch for compensation for damages incurred by any party to the contract (Love, 2008).

In construction projects where people have to work and cooperate together there is a great possibility for disputes to arise. Often there is a lack of understanding about the facts behind the disputes, but to avoid disputes from

occurring and resolving them if they occur, it is vital to understand the sources of disputes (Love, 2008).

It is irrefutable that roads are important for development. It's a common fact that, economies are built on reliable and fast connections between ports, airports, towns and different industries. Convenient personal transport is also becoming an important factor of social development. Sri Lanka has followed many other countries by prioritizing road development as a foundation for economic prosperity (Kumarage, 2014)

Construction projects are comparatively complex, resulting in tedious contract documents. These complex construction can direct to result in various disputes, which mostly arise through work, poorly prepared and/or executed contract documents, inadequate planning, financial issues, and communication problems. Any one of these factors can deviate the project from its original scope and lead to complicated litigation or arbitration, increased costs, and a breakdown in the parties' relationship (Harmon, 2003).

The continuing process of costly disputes in the construction industry has led to a common vacuum of researchers in different countries to identify the generic aspects of conflicts, claims, disputes and their resolution (Younis, 2010).

It's a common fact that, road construction projects are also ended up with dispute situation due to the various factors experiencing by the contract parties, where such disputes may have opportunity to resolve or minimize the effect by forecasting or foreseeing the cause and effect.

1.2 Problem Definition

Disputes arise on any contract, will adversely affect to the progress of the project and the relationships between the parties to the contract. Hence avoidance is the optimum solution for such disputes.

Raising of disputes in the construction projects is a global issue and the costs associated with resolving disputes are significant. According to Love et al. (2010) direct costs associated with disputes range from 0.5 to 5 percent of project's contract value. The costs involved due to resulting from lost productivity, stress, fatigue, loss of future work, the cost of strained business relationships among the various parties and disturbed image may cause even more damage to the project and parties to the contract involved. Hence, avoiding of disputes becomes one of the most important factors that determine the performance of a construction project and it depends highly on a solid understanding of dispute occurrence.

According to the year 2007 performance report by Department of External Resources reports, 24% of the total foreign financing are invest on roads and bridges. Foreign aid plays a vital role in financing development projects in Sri Lanka, especially in the road sector (Jayakanthan, 2012). Jayawardane and Panditha (2003) quote that the delays are an indicator in assessing the success of a project and the efficiency of all the parties involved in a project. Further Jayakantha(2012) states that, "delays are common both in building and civil engineering projects, inevitably resulting in contractual claims and increased project cost" Therefore, it is much important to complete such projects within the time allocation with the budget allocated. Disputes will drag these goals adversely with additional budget requirements.

Any disputes will delay benefits to the public and where the cost implications involved in such disputes will drag the financial capacity of the contract. Hence the zero disputes will be the most benefitted solution expected. But, is that possible to avoid disputes totally?

The general accepted view is that in complex construction projects, disputes are inevitable. This points to the need for construction professionals to exercise proactive dispute management. This would include developing skills to avoid disputes and where dispute materializes, to resolve them through assisted or unassisted negotiations (Cheung., 2006).

Road construction projects are always suffering with many disputes which have created within and beyond the contract. These disputes adversely affect to the forecasted budget and hence the final product. Since most of the projects are executed under the foreign funds, finding additional budget created due to disputes are very challenging.

There are many researchers found different factors which leads to disputes or conflicts in construction sites but not categorized or not focused to find most common sources of disputes in road construction area. Therefore, there is a research gap to find out most common sources of disputes in road construction projects. Since, the government is spending huge amount of funds on road sector, the identification of sources of disputes will help to maximize the effective use of money including timely completion of projects. Therefore, finding common sources of disputes is an important requirement.

1.3 Aim

The aim of this research is to minimize disputes in road construction projects

1.4 Objectives

The, following objectives are set for this research,

1. To identify sources of disputes in construction projects
2. To identify sources of disputes which arise in road construction projects
3. To identify sources of disputes which occur more frequently in road construction projects
4. To give recommendations to reduce the occurrences of most common sources of disputes in road construction projects
5. To introduce a framework for addressing most common sources of disputes in road construction projects

1.5 Methodology

In this research, mixed approach was proposed to explore the research topic. A detailed literature review was carried out to determine the sources of disputes in construction projects.

The methodology composed of following steps,

1. Identify a common list of sources of disputes from literature review related to construction projects
2. Short list the above list to identify the sources related to road construction projects, by preliminary interviews with Senior Engineers, Arbitrators, Team leaders, Project Managers, etc.
3. Questionnaire survey to identify the significant sources of disputes in road construction projects from the above short list
4. Carry out data analysis to identify the most occurrence disputes in the road construction projects
5. Make recommendations to reduce occurrence of most common sources of disputes identified for the road construction projects

1.8 Scope and Limitations of the Research

This research is limited to analyzing the road projects with local / Sri Lankan contractors and basically, the data collected is limited to the knowledge of professionals who are actively engaged in the road construction projects, Dispute Boards and Arbitration and also the other stakeholders viz engineers, consultants etc.

1.6 Chapter Breakdown

Following chapters will be included into this research to fulfil the aim targeted,

Chapter 01 – Introduction

Discusses the summarized introduction of this research which includes aim, objectives, research problem, scope of the research, its limitations and research dissemination.

Chapter 02 – Literature Review

Critically review the literature on the subject to elaborate the research problem and to clarify the aim and objectives.

Chapter 03 – Research Methodology

Clarifies the methodology used in this research with information on approach, process, data collection and analysis methods.

Chapter 04 – Data Collection and Analysis

Consists the data collected through literature review, interviews and from the questionnaire survey then analysis with statistical tools

Chapter 05 – Conclusions and Recommendations

Concludes the study with recommendations and further research.

1.6 Summary

In any industry where people have to work together and cooperate there is a possibility for disputes to arise, and construction industry is not an exception. Often there is a lack of understanding about the facts behind the disputes, but to avoid disputes from occurring and resolving them if they occur, it is vital to understand the sources of disputes (Love, 2008).

General accepted view is that in complex construction project, disputes are inevitable. This points to the need for construction professionals to exercise proactive dispute management. This would include developing skills to avoid dispute and where dispute materializes, to resolve them through assisted or unassisted negotiations (Cheung., 2006).

Therefore, identification of common factors affecting for disputes road construction projects is necessary.

In this research, mixed approach was used to explore the research topic. A detailed literature review was carried out to determine the common sources of disputes in road construction industry.

CHAPTER 02

LITERATURE REVIEW

A project is a “planned set of interrelated tasks to be executed over a fixed period and within certain cost and other limitations” (dictionary, 2017). Therefore, while achieving such tasks during the restricted period, shortfalls may arise from all parties involved for the project which may lead to have disputes between the parties.

It is irrefutable that roads are important for development. The economy of developed countries are built on reliable and fast connections between ports, airports, cities and different industries. Easy personal transport is also becoming an important factor of social contentment. Convenient access to work and school, as well as to hospitals, shops are important quality of life features. Sri Lanka has followed many other countries by prioritizing road development as a foundation for economic prosperity (Kumarage, 2014).

Dragging of road construction works due to any dispute or conflict will penalize many parties such as,

1. General public due to delay of completion of the construction works
2. Loss of huge bunch of funds from government, due to claims and created through such disputes
3. Loss of relationships between the parties

According to Tazelaar & Anijiders (2010), a dispute must be resolved; it cannot be managed. Disputes are usually resolved by third parties (courts, arbiters). Many researchers dealing with construction processes insist in one way or another that the relationship between/among the parties to a construction project are harsh and differ often mature to conflicts and litigation.

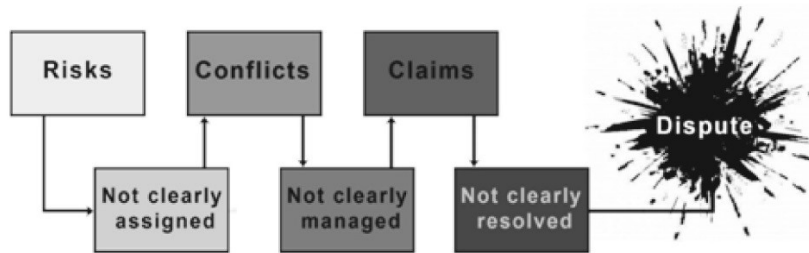


Figure 2. 1 : Risk, conflict, claim and dispute continuum model (Source: Social and Behavioural Sciences 2014)

The dispute pyramid is a useful tool to analyse dispute resolution was first introduced and schematised by Sarat (1984).

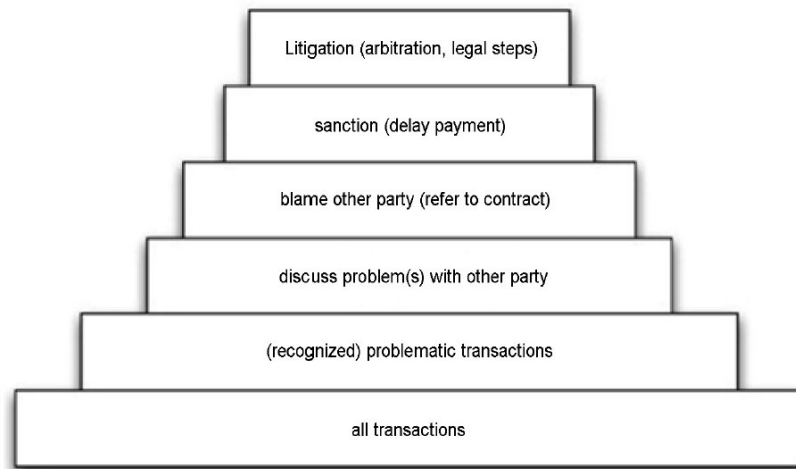


Figure 2. 2: Sarat’s pyramid of conflict (Source: Sigita 2013)

Different authors have attended to identify the factors involved for such shortfalls and attempts to address them within the project or in future projects to achieve the goals with minimum disputes.

In project management, changes in projects can sources substantial adjustment to the contract duration time, total direct and indirect cost, or both. Therefore,

parties to a construction project should have capacity to handle the dispute situation effectively in order to minimize the impact.

Common project planning tools such as risk analysis can be used to mitigate the critical consequences of change. Because they give insights and predictions to identify possible conflicts (Ibbs, 2001). Pinto (1995) has recommended that good communication can lead to changes that have a positive effect on the project, as managers can learn important lessons from the conflict incident.

Before the project is started, one other strategy that can be considered is to think through the project and their output from the study to prevent conflict. Development and implementation of a project change management system before the project commences is a good, proactive step toward constructively managing change (Ibbs, 2001)

2.1 Variations and Disputes

Since the changes are common to projects, it is very necessary to understand that managers challenge, embrace, familiarize, and use changes to impact positively the situations they face and to identify changes as growth. Kartam (1996) has recommended that conflict will be minimized when an issue has been studied as early as possible, since the issue can be identified, and beneficial changes can be made.

As stated by Memon & Rahman (2014), "Variation Order (VO) is a common phenomenon in construction projects. It deal with an amendment of the original scope of work as in the contract. VO is caused from various factors. Variations often cause disputes and dissatisfactions among the parties involved in construction projects. Thus, it is very important to control VOs in a construction project". Therefore, sources of variations will become sources of disputes indirectly. Hence the sources of variation orders also considered for this research as sources of disputes.

2.2 Sources of disputes identified by different researchers

Many researchers have identified different sources of disputes according to the focused area of their research in construction projects. The different sources identified are discussed below to get better understanding of wide range of construction disputes in projects.

2.2.1 Classification identified by Hellard (1987)

A lot of researchers have come up with several lists of the most common sources of disputes (Hellard, 1987) at his research concluded that following major five number of sources of disputes in construction projects were affected to their respective progress and budget,

- a. the contract nature,
- b. the design deficiency,
- c. the construction process,
- d. the consumer reaction,
- e. time

2.2.1.a The contract nature

a.1 The lack of perfection in the contract documents

Contractual drawings at contract documents may have human errors while drafting or lack a needed dimension or detail. The design and draftsmen errors are very often in construction design drawings. In addition to the human errors, there are deviations always occurring as projects undergo the design and construction program which if not properly documented could lead to disputes. The larger and more complex a construction project is, the more are the chances for such sort of defects.

a.2 Failure to account the cost

Disputes continually arise in a construction project when the cost at the beginning of the project is not defined correctly. The legitimate claims made by the contractor are not included in the initial project budget, and if the client rejects these claims then disputes initiate.

a.3 The psychology of people in construction

Construction industry is all about people. There are people involved in every phase of construction, and the contract administrator knows a few about people involved in the project. This is a major variable in the projects which might lead to the disputes.

2.2.1.b The design deficiency

Further Hellard (1987) stated at his research, defects in the design can cause serious disputes within the parties in the construction project, it is one of the most common sources. The most common sources for this kind of design issues are:

b.1 The underground or subsurface problem

One of the most common sources of disputes in construction are the subsurface conditions. Usually client provides the underground data based on preliminary soil investigation completed, so that contractor can bid based on these details. At the construction stage, often it turns out that the subsurface conditions are different than planned at bidding time, so the contractor asks the client for extra money - compensation for the unexpected expenses. To escape this, the client can consist of different disclaimers in the contract and transfer all the risks to contractor, but that does not always necessarily mean that there will be no disputes (Cushman, 2001).

b.2 Defective plans

Improper planning is widespread issue in construction projects. It can be said that all plans are defective or deficient to some extent. Disputes can arise when these improper plans result in additional costs to contract. Of course, usually the designer is questionable for these defects

b.3 Methods or means and specification performance

Usually the designer prepares the specification to achieve project goals and quality. Even the contractor follows the same specification, the results may not the same expected at the beginning. Of course, the designer is responsible for the damages, but often the responsibility throw to contractor, hence the dispute begins.

2.2.1.c The construction process.

Variations and extra works in the construction process is almost impossible to avoid and can sometimes have very expensive consequences, change and additional work issues are where most of the disputes relating to the construction process takes play.

2.2.1.d The consumer reaction

After completion of the construction project, the ultimate user the building is not satisfied. It often occurs because the users of the building do not know what the design requirements were that designer should have met. This may cause to arise disputes between the parties.

2.2.1.e Time

In construction industry, it's not only the cost that is important, but the time is equally important too. Delaying the project generates different

extra costs or losses, with which either the client or the contractor must bear.

Scheduling and proper planning will help the contractor to overcome this obstacle and complete his jobs on agreed time. This will avoid any dispute that may occur due to delay. (Tarar, 2006)

2.2.2 Broad View on Sources of disputes by Diekmann (1994)

Dispute in construction can be attributed to the conflicting interest of the large number of participants. A more generalized treatment was forwarded by Diekmann (1994) who suggested that

1. people
2. process and
3. product

are the main sources of construction disputes

2.2.3 Sources identified by Roy (1994)

As cited by Roy(1994), defined construction dispute as the imbalance of two (or more) parties' interest, needs or goals as they seek to gain their own interest through compromise, one party may yield to the counter partner on less important. Roy (1994) listed ten main sources where parties are getting their incompatibilities at construction projects

1. management
2. culture
3. communications
4. design
5. economics
6. tendering pressure
7. law
8. unrealistic expectations
9. contracts
10. workmanship

2.2.4 Categorization of Sources of Disputes by Spittler and Jentzen (1992)

To certain extent, the diagnostic approach is more informative as far as understanding construction dispute is concerned. Construction disputes often underpinned the conflicting interest of the contracting parties. Furthermore, spittle and Jentzen (1992) found that followings are the main sources of construction disputes.

1. Ambiguous contract documents
2. Competitive/adversarial attitude
3. Dissimilar perception of fairness by the participants

It is further suggested by them that if the interests of the participants can be satisfied, dispute can be resolved by managing the time, cost and quality factors

2.2.5 Classification Identified by Hewit (1991)

As cited by Herwit (1991), suggested that a decision maker will only evaluate all possible options if the cost of searching and possessing information are zero and human information possessing capabilities are perfect. In reality, such searches will normally be limited because of the cost required. Furthermore, decision makers are also bounded by their limitations on computational capacity as well as the ability to calculate consequences, understand implications, make comparative judgements on complex alternatives, organize and utilize memory. Hewit (1991), identified six types of major sources which contributes for construction projects disputes,

1. change of scope,
2. change conditions,
3. delay,
4. disruption,
5. acceleration,
6. termination.

2.2.6 Different Sources of Disputes Identified by Watts and Scrivener (1993)

Based on review on the construction disputes that reached the Supreme Courts of New South Wales and Victoria, Australia, in 1989 and 1990, Watts and Scrivener (1993) identified most frequently occurrence of disputes are due to following sources,

1. Determination of the agreement;
2. Payment related;
3. The site and execution of work;
4. Time related;
5. Final certificate and final payment;
6. Tort related.

2.2.7 Sources of Disputes Identified by Heath (1994)

Conflicts in construction contracts are generally rooted in the facts while the client on the one hand usually aims to optimize quality and functionality at minimum cost, the contractor on the other strives to satisfy the client and achieve maximum profit at the same time using minimum resources. These priorities are mutually exclusive, unsurprisingly at conflict with one another and set the framework for a repetitive cycle of hostilities. This is responsible for the adversarial win-lose relationships generally found in construction contract as cited by Heath (1994). Heath (1994) has identified seven main types of sources of disputes in construction projects due to the different perspective by other parties,

1. contract terms
2. payments
3. variations
4. extensions of time
5. nomination
6. re-nomination
7. availability of information

2.2.8 Source of Disputes Identified by Conlin (1996)

Collin (1996) has identified following sources of construction disputes in his research,

1. Payment
2. Delay
3. Negligence
4. Quality
5. Administration

2.2.9 Sources of Disputes Identified by Kumaraswamy (1997)

Kumaraswamy (1997) classified construction claims based on their relative significance in terms of magnitude and frequency. As such he advocated that dispute sources were interwoven and could not be isolated and controlled. The sources of construction disputes were categorized in the order of perceived significance as follows:

1. variation due to site conditions
2. variations due to client changes
3. variations due to design errors
4. unforeseen ground conditions
5. ambiguities in contract documents
6. variations due to external events
7. interferences with utility lines
8. exceptional inclement weather
9. delayed design information
10. delayed site possession

2.2.10 Different Sources of Disputes Identified by Totterdill (1991)

Totterdill (1991) focused specifically on the contractual basis under which claims are submitted. The types of technical, legal, and managerial dispute

issues must have a contractual reference. The findings of that study suggested that sources are,

1. site overhead,
2. loss of productivity,
3. loss of revenue, and
4. financing costs

2.2.11 Sources of Disputes Identified by Yate (1998)

Yate (1998) pinpointed that construction dispute sources are arising from the contract document include:

1. variations
2. ambiguities in contract documents
3. inclement weather
4. late issue of design information/drawings
5. delayed possession of site
6. delay from other contractors employed by the client
7. postponement of part of the project

2.2.12 Sources of Disputes Identified by Sheridan (2003)

Sheridan (2003) conducted a survey for the Adjudication Reporting Centre and categorized sources of disputes settled by adjudication. The statistics showed that

1. “valuation of variations,”
2. “valuation of final account,” and
3. “failure to comply with payment provisions”

are the major sources for most of the disputes resolved by adjudication.

2.2.13 Sources of Disputes Identified by Brooker (2002)

Brooker (2002) examined the types of disputes where mediation had been used. A total of 233 construction mediations in U.K. were reported disputes involving

1. payment,
2. delay,
3. defect/quality and
4. professional negligence

72% of the cases are based on above source of dispute categories.

2.2.14 Sources Identified by Cheung (2006)

The disputes categories and sources can be easily identified at arbitration centers or with DB members who involve with it. A study on construction mediation conducted in Hong Kong by (Cheung., 2006) summarized that following are the most common sources for the disputes in construction projects,

1. variation,
2. delay in work progress,
3. parties' expectations and
4. intraparty' problem

2.2.15 Sources Identified by Spittler (1992)

Spittler (1992) showed that following are the main sources of construction dispute and he further suggested that if the interests of the participants can be satisfied, disputes can be resolved by managing the time, cost, and quality factors.

1. ambiguous contract documents,
2. competitive/adversarial attitude and
3. dissimilar perceptions of fairness by the participants

2.2.16 Sources Identified by Semple (1994)

Semple (1994) suggested that insufficient contract provision is an ingredient of dispute. His study found that the most contributed sources of construction contract disputes can be categorized as follows,

1. increase in work scope,

2. weather,
3. restricted access and
4. acceleration.

2.2.17 Sources Identified by Sykes (1996)

Sykes (1996) identified that construction disputes originate from two main interrelated sources;

1. construction contracts and
2. unpredictable events.

It is a fact that construction works are subjected to many uncertainties. The tedious task in planning for these uncertainties within the contract laid the sources for disputes. This may be the result of failing to address sources of the uncertainties. More commonly though is the inclusion of contradicting provisions in an attempt to deal with them. Mitropoulos (2001) developed a model to illustrate the development of disputes in construction industry. This model applied the framework of Williamson which combined the effect of project uncertainty, contract, working relations and problem-solving effectiveness on the development of disputes and explained how the combination of “environmental” and “behavioral” factors had led to contractual problem. The main factors or the sources of disputes are identified as listed below,

1. project uncertainty;
2. contractual problems;
3. opportunistic behavior.

Moreover, factors such as contractors’ financial position, cost of conflict, and culture are also identified as determining factors for dispute development (Cheung., 2006).

(Love, 2008), summarizes the factors or else the sources that contribute for disputes. Again, different researchers have found different factors according their scope of the research or the article as identified in the Table 2.1

Table 2. 1: Identification of Construction Dispute Sources

Author(s)	Sources
Blake, Dawson, Waldron (2006)	<p>Key sources in disputes:</p> <ol style="list-style-type: none"> 1. Variations to scope 2. Contract interpretation 3. EOT claims 4. Site conditions 5. Late, incomplete or substandard information 6. Obtaining approvals 7. Site access 8. Quality of design 9. Availability of resources
Cheung and Yui (2006)	<p>Three root sources of disputes:</p> <ol style="list-style-type: none"> 1. Conflict - Task interdependency, differentiations, communication obstacles, tensions, personality traits 2. Triggering events - Nonperformance, payment, time 3. Contract Provision
Yiu and Cheung (2004)	<p>Significant sources:</p> <ol style="list-style-type: none"> 1. Construction related: variation and delay in work progress 2. Human behavior parties: expectations and inter parties' problems
Killian (2003)	<ol style="list-style-type: none"> 1. Project management procedure: Change order, pre-award design review and quality assurance. 2. Design errors: errors in drawings and defective specifications 3. Contracting officer: Knowledge of local statutes, faulty negotiation procedure, scheduling, bid review 4. Contracting practices: 5. Site management: scheduling, project management procedures, quality control, and financial packages 6. Bid development errors: estimating error

Mitropoulos and Howell (2001)	<p>Factors that drive the development of a dispute:</p> <ol style="list-style-type: none"> 1. Project uncertainty 2. Contractual problems 3. Opportunistic behavior
Conlin (1996)	<ol style="list-style-type: none"> 1. Payment and budget 2. Performance 3. Delay and time 4. Negligence 5. Quality 6. Administration
Sykes (1996)	<p>Two major groupings of claims and disputes:</p> <ol style="list-style-type: none"> 1. Misunderstandings 2. Unpredictability
Bristow and Vasilopoulos (1995)	<p>Five primary sources of disputes</p> <ol style="list-style-type: none"> 1. Unrealistic expectations by parties 2. Ambiguous contract documents 3. Poor communications between project participants; 4. Lack of team spirit 5. Failure of participants to deal promptly with changes and unexpected outcomes
Heath (1994)	<p>Seven main types of disputes:</p> <ol style="list-style-type: none"> 1. Contract terms 2. Payments 3. Variations 4. Extensions of time 5. Nomination 6. Re-nomination 7. Availability of information
Rhys Jones (1994)	<p>Ten factors in the development of disputes:</p> <ol style="list-style-type: none"> 1. Poor management 2. Adversarial culture

	<ol style="list-style-type: none"> 3. Poor communications 4. Inadequate design 5. Economic environment 6. Unrealistic tendering 7. Influence of lawyers 8. Unrealistic client expectations 9. Inadequate contract drafting 10. Poor workmanship
Semple et al. (1994)	<p>Four commons categories of sources of disputes:</p> <ol style="list-style-type: none"> 1. Acceleration 2. Restricted access 3. Weather/cold 4. Increase in scope
Watts and Scrivener (1992)	<p>Most frequent disputes which are arising from:</p> <ol style="list-style-type: none"> 1. Variations 2. Negligence in tort 3. Delays
Hewitt (1991)	<p>Six areas of most frequent disputes caused due to:</p> <ol style="list-style-type: none"> 1. Change of scope 2. Change conditions 3. Delay 4. Disruption 5. Acceleration 6. Termination

Source – Casual Modelling of Construction Disputes (Love, 2008)

Ndihokubwayo (2009) at research has concluded his finding that variation orders will be a source of disputes between the contractual parties due to the time and cost implications involved. Further he has emphasis that “Generally it was found that a clause permitting variation orders was an essential feature of any construction project. The client was found to be the most major origin party of variation orders as a result of unclear briefing and changing scope”.

Halwathura (2013), has found at his research, the factors which involved for the variation order for construction projects. Accordingly, the followings can be considered as sources of disputes for construction projects,

2.2.18 Different Sources identified by Halwathura (2013)

Halwathura (2013), has identified sources of variation at construction projects in Sri Lanka. Further, shortlisted following sources may lead to disputes at the end of the process,

1. Poor estimation
2. Unforeseen site conditions
3. Political pressure
4. Poor investigation
5. Client-initiated variations
6. Natural disasters
7. The scope of work for the contractor is not well defined
8. Unrealistic contract durations imposed by client
9. New government regulations/change in economic condition
10. The objective of the project is not well defined
11. Change in design by consultant/design changes
12. Errors and omissions in design
13. Weather conditions
14. Poor performance of subcontractors
15. Inadequate planning
16. Delay in approval
17. Residents
18. Contractor's desire to improve his financial situation
19. Shortage of materials
20. Other organizations
21. Consultant's lack of judgment and experience
22. Workmanship or material not meeting requirement of specifications
23. The contractor's financial difficulties

24. Additional preliminaries due to time extension
25. Lack of coordination between consultant and contractor
26. Defective workmanship
27. The required tools and equipment are not available
28. Substitution of material and procedure
29. Unavailability of skills (shortage of skilled manpower)
30. Conflict between project documents
31. Value engineering
32. Safety considerations
33. Technology change

2.3 Sources of Disputes in Road Construction Projects in Sri Lankan Context

The risk in long-duration road and highway infrastructure projects is compounded by the potential for quality issues and cost overruns. Cost overruns are a major concern because large amounts of funding are involved, and litigation expenditures have been shown to increase at a steady rate. If this trend continues, it will have large negative impacts on the use of public funds for road and bridge infrastructure. On the other hand, if greater control of cost overruns can be achieved, it will be a major advance that leads toward improved contracting methods and construction cost control. Claims and their causes are a major factor in cost overruns,

Any construction including highways include with various kinds of challenges such as natural disasters, accidents in construction, disputes, cost and time overruns due to variations, material wastage etc. Among those, Latham (1993) highlights variations as potentially a major source of disputes in highways construction and often have a disastrous impact on a project's performance.

Further Priyantha (2011) concluded that variations sources at least a 9.9% mean change of initial contract sum. Thus, it can be argued that effect of variations is visible in the form of cost overruns in highways construction in Sri Lanka.

At the World-Bank report (2014) on pilot study on Sri Lankan roads for time and cost overrun is recognize that, on improving dispute minimization and dispute resolution protocols and mechanisms as one of potential improvement area at their in-depth investigation.

The causes of disputes are numerous and different, and data about them can improve understanding based on the factors involved. Perceptions of how claims arise may vary according to the views of owners, contractors, and consultants.

2.4 Summary

Limitations at the implementation of the project will appear when the project objectives are not achieved as expected. Sources of conflicts or disputes between the parties involved in the project must be managed properly in order to avoid losses. Many sources can lead to disputes, including the sources initiated within the contract or influenced by external sources. These sources affect the efficiency and productivity of work, so that it can interrupt the implementation of the project. (Rauzana, 2016) Construction is a project-based activity that requires endeavors from multiple parties among numerous organizations, each with their own interests to pursue through the implementation of a project (Dulaimi et al. 2003). This complexity, joint with the different variety of unforeseen situations that can appear during a construction project, makes conflict unavoidable (Yiu and Cheung, 2006).

Many researchers were concentrating on disputes and try to identify root cause for such disputes, hence, to minimize the dispute situations. Accordingly, identified sources of disputes through this literature review are listed out following Table 2.2.

Table 2. 2: Sources of Construction-Disputes Extracts from Literature Review

1	contract nature	35	failure to account the real cost
2	acceleration	36	faulty negotiation procedure
3	access to site	37	Final certificate and final payment
4	additional preliminaries due to time extension	38	financing management
5	bid development errors: estimating error	39	government regulations/change in economic condition
6	bid review	40	inadequate planning
7	change conditions	41	increase in work scope
8	change in design by consultant/design changes	42	Influence of lawyers
9	change of scope	43	interferences with utility lines
10	client-initiated variations	44	knowledge of local statues
		45	lack of information
11	competitive/adversarial attitude	46	lack of team spirit
12	conflicts / ambiguities between project documents	47	loss of productivity
13	construction process	48	loss of revenue
14	consultant's lack of judgment and experience	49	methods or means and specification perform
15	consumer reaction	50	misunderstandings
16	contract administration	51	nomination of sub-contractors
17	Contracting officer	52	opportunistic behaviour
18	contractor's desire to improve his financial situation	53	other organizations
19	contractor's financial difficulties	54	parties' expectations
20	contractual problems	55	payment delays and deductions
21	defective plans	56	political pressure
22	delay by other contractors employed by the client	57	Poor communications between project participants
23	delay in approval	58	postponement of part of the project.
24	delay of the project	59	pre-award design review
25	delayed design information	60	pre-construction conference proceedings
26	delayed site possession	61	professional negligence
27	design deficiency	62	project management
28	determination of the agreement	63	Project management procedure
29	disruption	64	project performances
30	dissimilar perceptions of fairness by the participants	65	psychology of people in construction
31	EOT claims	67	quality
32	Equipment costs	66	quality assurance
33	errors and omissions in design	68	residents' influences
34	failure of participants to deal promptly with changes and unexpected outcomes	69	safety considerations
		70	scheduling
		71	scope of work for the contractor is not well defined
		72	shortage of materials
		73	site management
		74	site overhead

75	substitution of material and procedure
76	technology change
77	termination
78	the required tools and equipment are not available
79	the site and execution of work
80	Tort related
81	unavailability of skills (shortage of skilled manpower)
82	unforeseen site conditions
83	unrealistic contract durations imposed by client
84	unrealistic expectations
85	value engineering
86	variations due to client changes

87	variations due to design errors
88	variations due to external events
89	weather conditions
90	workmanship
91	workmanship or material not meeting requirement of specifications
92	Employers risk and force majeure situation
93	Re nominations
94	non appointment of DAB at the early stage of the project
95	Lack of proper cooperation & support by sureties, insurance companies and contractor's bankers

CHAPTER 03

Research Methodology

3.1 Introduction

This chapter describes the approaches and methods followed by the researcher to reach the required data and to achieve the intended outcome. Mainly, the previous research related to sources of disputes were analysed and shortlisted with the subject experts. Questionnaires were prepared based on the factors shortlisted, to examine the professionals' perspective regarding the construction disputes in road construction industry. Questionnaire were critically analysed to find out the most common disputes in road construction projects in Sri Lanka.

According to Naoum (2012) the description of types of researches there are two basic methods which can be used as an approach to the research. It is quantitative approach and the qualitative approach. Both methods can be used as a mixed method for this research. First one is the method which can involve with the gathering of data in quantitative form which can make a quantitative analysis of the data as a whole. This method can be reached under sub ways of experimental and, inferential, and simulation approaches to research.

According to Campion, Campion, & Hudson Jr (1994), under the way of inferential it is to form a data base from which to infer characteristics or relationships of population which is recognized in relation to the research. Under this the population is studied under the questionnaire or observations relevant to the research area. Experimental approach is something like greater control over the research environment and observe the effects on the variables of the environmental background of the research. Further in the approach of simulation it is like involvement of construction of an artificial environment of the real research and which is engaged with the relevant information of the research.

3.2 Literature Review

Based on the research problem a comprehensive literature review was conducted to explore the sources of disputes identified by different researches in construction industry. The literature review basically focused on related textbooks, journals and scholarly research articles.

3.3 Research Philosophy

A research can describe in a way which the data of the research have to collect analyses and used in a better way. There are two main research philosophies already recognized by the western tradition named positivist and interpretivist. Positivist believe that reality is stable and can be observed and described from an object viewpoint (Levin, 1988). Most of the debates argues that positivist's paradigm is most suitable for the researches based on social sciences. Interpretivist is different than positivists and it is much more contend with a subjective interpretation of the reality. The research problem of this research is to identify most common sources of disputes in road construction industry, with involvement of experience of industry experts. The interpretivism is the most suitable philosophy to achieve the aim under the topic of the research.

3.4 Research Approach

Research approaches are plans and the procedures for research that bridge the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. The complete decision involves which approach should be used to study a topic. Informing this decision should be the philosophical assumptions the researcher brings to the study; procedures of inquiry (called research designs); and specific research methods of data collection, analysis, and interpretation (Creswell, 2014). The choice of a research approach is also based on the nature of the research problem or issue being addressed, the researchers' personal experiences, and the audiences for the study.

3.4.1 Quantitative Approach

Quantitative research is one in which the researcher primarily uses post positivist claims for developing knowledge (i.e., cause and effect thinking, reduction of specific variables, and hypotheses and questions, use of instrument and observation, and the test of theories), employs instruments that generate statistical data (Creswell, 2014).

3.4.2 Qualitative Approach

Qualitative research is one in which the inquirer often makes knowledge claims based on constructivist perspectives (i.e., the multiple meaning of individual experiences, meaning socially and historically constructed, with a focus of developing a theory or pattern) or advocacy/participatory views (i.e., political, issue oriented, collaborative or change oriented) or both. The researcher gathers open-ended, developed data with the primary intent of developing themes from the data (Creswell, 2014).

3.4.3 Mixed method Research Approach

Mixed methods research is a set of processes that should be used when incorporating qualitative and quantitative procedures reflects the research question(s) better than each can independently. The merging of quantitative and qualitative methods should better inform the researcher and the effectiveness of mixed methods should be evaluated based upon how the approach enables the investigator to answer the research question(s) fixed in the purpose(s) (why the study is being executed or is needed; the justification) of the study (Onwuegbuzie, Jhonson, & Turner, 2007)

Survey research can be identified as the most importantly engage with asking questions of relevant people and getting answers. Questions and questioning is the core concept of the survey research and once selected the survey method it should have to construct the survey addressing number of issues like types of questions, conclusions about questions content, selecting of question wording, decisions about question placement and sequence in the instrument. Those questions should have to be relevant with the objectives and the aim of the research and as well as the research hypothesis.

3.4.4 Selection of Research Approach

According to the objectives of the research it is more useful to adopt the mixed method of research approach, because researcher should have to gather research information through literature review and shortlist it with road construction professionals. Further to that most occurrence factors were identified through questionnaire survey.

3.5 Data Collection

Burns (2000) states that the survey is the most used descriptive method in research and gathers data at a particular point of time. Survey research mainly focuses on people and the vital fact of people and their opinions, attitudes, motivations, memory, behaviors, actions, interactions and even future.

The impacts of how the participants will answer the questions are based on the way how the questions are phased. Those questions should have to be phased by understand the different level of individuals, and culture and also the educational level of the people. Interviews are mainly useful for receiving the story behind a participant's experiences. The interviewer can trail in-depth data around the topic. Interviews may be beneficial as follow-up to certain respondents to questionnaires, e.g., to further investigate their responses. (McNamara, 1999)

Data collection for this research was mainly based on two interviews and questionnaire. These surveys targeted professionals in the road construction projects and to find out their experiences to formulize the research topic. The identified most common sources of disputes were addressed by face to face interviews with construction project experts. The aim of this research is to give recommendations to reduce occurrence of most common sources of disputes at road construction projects.

3.5.1 Questionnaire Survey

The identified sources of disputes were shortlisted through the interview had with road construction professionals. The comments made on the selected sources of disputes were recorded

Based on the interviews with road construction projects experts, the questionnaire was prepared. In this part of the research the design of the questionnaire was structured under different types of methods like, determine the questions to be asked. The key link need to be established between the research aim and the individual question via the research issues.

- Choose the question type for each question and specify the wording and
- Design the question arrangement and overall questionnaire layout

The second interviews with the road construction professionals were carried out with the outcome of the questionnaire survey. The solutions, remedies or mitigation measures were discussed and noted for the recommendations.

Since the aim of doing a very precise and judgemental questionnaire this is the best approach to achieve the aim.

3.5.2 Sample Selection

Selection of the sample from the related population of the research is the basic requirement to achieve the intended outcome from a questionnaire and schedule. In this research the person who is selected for the sample should possess considerable experience in contract administration, involve with ADR processes, claims in road construction industry. The sample of the data collection was selected from a wide group of people engaging in the road construction industry professional / experts.

3.6 Data Analysis

Bazeley (2009) stated, all mixed methods research involves, as a minimum, integrating conclusions that are drawn from various strands in the research and strategies for analyzing data,

The conversation of qualitative data to quantitative by allocating a rate for each answer is more suitable for this research to analyse the data collected. In addition to this technique content analysis were done in data analysis. Those techniques facilitate statistical data analysis including descriptive statistics as plots, frequencies, charts, and lists. The MS Excel was used to assist the plotting charts.

Accurately following briefly defines each technique and justifies the selection of each technique for this research study.

3.6.1 Mean weighted rating

$$\text{Mean Weighted Rating} = (\sum V_i * F_i) / n$$

Where,

- V_i - Rating of each factor
- F_i - Frequency of responses
- n - Total number of responses

Since ratings range between 1 and 5, point 3 is considered as the neutral point. To select most common sources through the questionnaire feedback, it was used the mean weighted rating as indicated at above system.

3.6.2 Content analysis

Content analysis was used in this research to develop objective inferences from the communicated data, and analysis was done.

In this research mix method was focused since it is necessary to examine the “latent” or inferred meanings of the communication which will lead to the construction of theories based on the researcher’s knowledge and the evidences drawn from the study.

3.7 Key Steps of the research

The purpose of the research survey is to minimize the occurrence of common sources of disputes at road construction projects and hence utilize the public funds effectively. Therefore, questionnaire was selected as appropriate for the study. The research adopted key steps were followed in order to achieve the aims and objectives of the research has illustrated at the figure 3.1

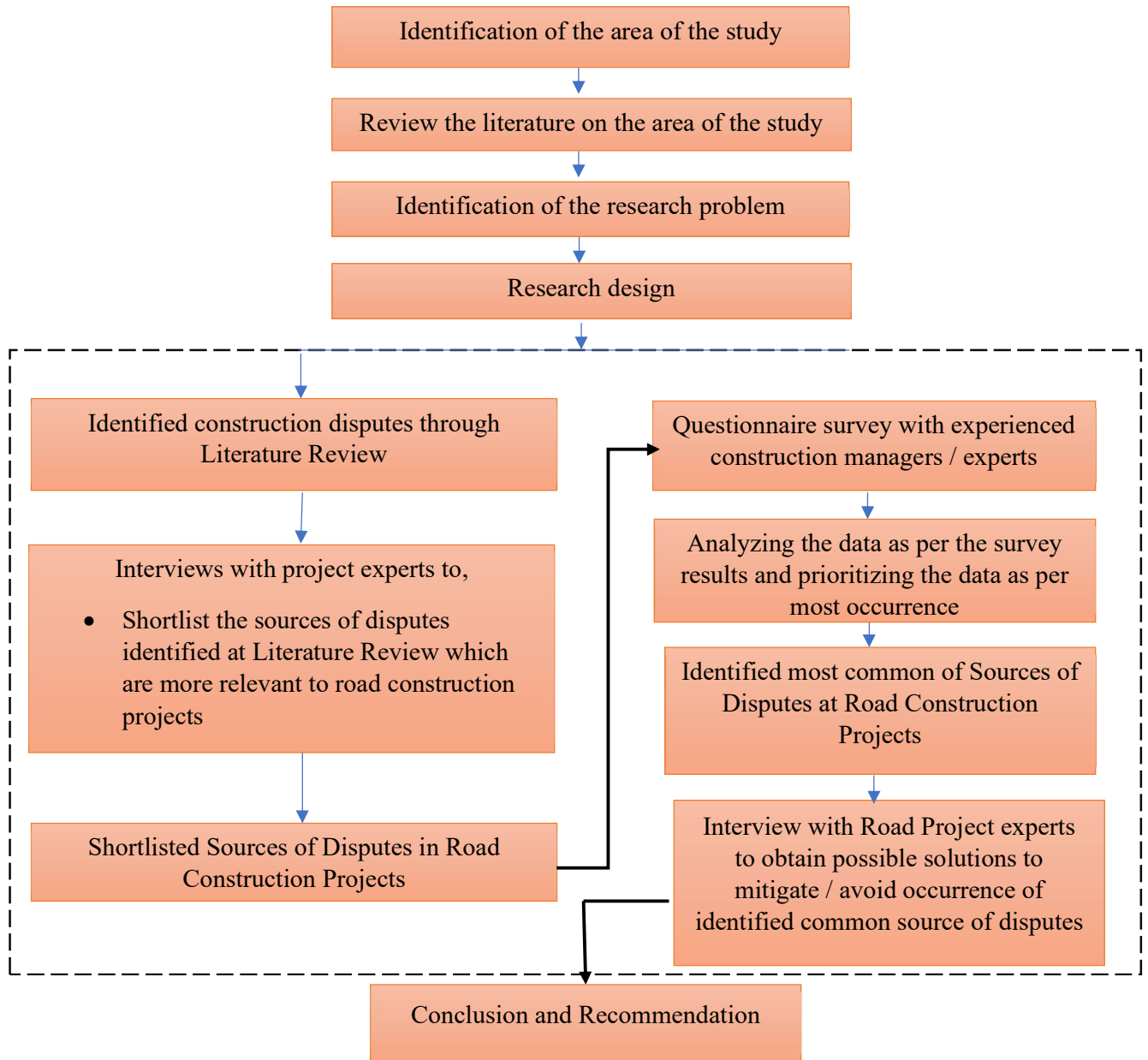


Figure 3. 1 : Key Steps of the Research

3.8 Summary

The purpose and the aim of this chapter is to describe the research philosophy, research approach, data collection and data analysis which were used to achieve the aim and objectives of this research. Accordingly, mixed method of research is selected to achieve the research goals. This chapter further justifies the research process and the methodology adopted to achieve the intended outcome through selected research design, data collection & analysis techniques.

CHAPTER 04

Analysis, Discussion and Research Findings

4.1 Introduction

This chapter analyses the primary and secondary data collected, in order to present the findings of the research. Since the aim of this research is to maximise the effective use of funds and timely completion of road construction projects, suggestions are made to mitigate the possible common sources of disputes which adversely caused for hike in project cost and time.

Road construction projects become one of the largest investments involved by government and the demand on the rehabilitation and construction is rapidly increasing every year. Nevertheless, it will purely be contributed to the country's development. The benefits of road construction may get delayed or disrupted due to the disputes arises while executing the projects. With the complexity of the projects and different goals with parties it more tends to have disputes. This has proven at research of Cheung (2006) and he further states that construction disputes are inevitable.

The main objective of identifying the most common sources of disputes in road construction projects is to reduce their occurrences at projects and hence to enhance the effective usage of public funds for general public.

4.2 Selection of sources of disputes related to construction projects

By scrutinizing the literature from different researchers and other related sources, 95 number of sources had been filtered as related to sources of construction project disputes. The filtered sources were shortlisted with road construction experts for the sources which are more relevant to the road construction projects. The profile of the three respondents are given below.

Table 4. 1: Respondent’s profile - selection of sources of disputes relevant to road construction projects

Respondent	Profile	Experience
R1	Team Leader	30 years
R2	International Contract & Claims Specialist	36 years
R3	Contract & Claims Engineer	26 years

4.3 Sources of disputes which are relevant to road construction projects

The sources of disputes identified under the literature review and by content analysis are listed below with their selection for questionnaire survey. The selection for questionnaire was carried out with majority of the selection by respondents.

Table 4. 2: Selection of sources of disputes with respondents’ comments

No	Source of Dispute	Respondent Summery (Y-YES, N-NO)			Selection for Questions	Justification / Comments by Respondents
		R1	R2	R3		
01	contract nature	Y	N	N	-	
02	acceleration	Y	Y	Y	selected	R2 stated that “The acceleration claims will arise when the contractor makes his effort to catchup the delay events where the delay has occurred beyond the control of him. These claims may lead to dispute situations”
03	access to site	N	Y	N	-	
04	additional preliminaries due to time extension	N	N	N	-	
05	bid development errors: estimating error	Y	Y	N	selected	R2 stated that “The tendering procedure is not easy task to follow, and every activity in the tendering process has a time and cost implication. Therefore, every activity of the tendering procedure has economic value separately. Due to the available limited time available, the contractor will have no relaxation to analyze the risk properly. Hence the contractor will carry out the tender with many assumptions.”

06	bid review	N	N	Y	-	
07	change conditions	N	N	N	-	
08	change in design by consultant/design changes	Y	Y	N	selected	R1 stated that “Contractor sign the agreement based on original drawings provided to him. But as per the Employers requirement, design errors, omissions at initial stages or site condition, the Engineer needs to alter the original design”.
09	change of scope	N	Y	N	-	
10	client-initiated variations	Y	Y	Y	selected	R3 stated that “In road construction projects, the variations are very common due to the ambiguities in the documents, lack of information’s, incomplete BoQs and drawings, etc. Further to these variations, the client may need to accommodate the public and other social requirements. Which may cause to variations to the contract. This scenario lead to unnecessary delay to contract and then disputes.”
11	competitive/adversarial attitude	Y	N	N	-	
12	conflicts / ambiguities between project documents	Y	Y	Y	selected	R1 stated that “Signing a contract with incomplete documents such as specifications, conditions and drawings will lead the contract to cost overrun and time delays in road construction projects. Further it will be a risk for every party to the contract “
13	construction process	N	N	N	-	
14	consultant’s lack of judgment and experience	N	Y	N	-	
15	consumer reaction	N	N	N	-	
16	contract administration	Y	N	N	-	
17	Contracting officer	N	N	N	-	
18	contractor’s desire to improve his financial situation	N	N	N	-	

19	contractor's financial difficulties	Y	Y	N	selected	R1 stated that "The most important feature of financial management is to avoid extended cash shortages which are caused by having too great a gap between cash inflows and outflows. Cash flow management is defined as a process of monitoring, analyzing and adjusting projects' cash flow. Thus, a well-managed cash flow is important to enable the delivery of a successful project by performing a cash flow analysis on a regular basis to identify cash flow problems".
20	contractual problems	N	N	Y	-	
21	defective plans	N	N	Y	-	
22	delay by other contractors employed by the client (e.g. utility companies)	Y	Y	Y	selected	R2 stated that "Within these constrains or sub-contractor by himself, the works can be delayed. This affected to the main contractor program and let the contract get delay. The claim from main contractor time and cost for such delay may lead to have disputes between parties."
23	delay in approval	Y	Y	N	selected	R2 stated that "the factors affecting for the approvals or the conditional approvals, <ol style="list-style-type: none"> 1. Not following the standard drawings / specifications 2. Incapacity of the Engineer due to lack of knowledge on the specific matters 3. Lack of design personnel at the Engineers team 4. Approval of the drawings will become a VO or additional works to the contract, Engineer may need to have Employers consent 5. Due to the work progress, to continue the works Engineer may issue the drawings with conditional approval, etc"
24	delay of the project	Y	N	N	-	
25	delayed design information	Y	Y	Y	selected	R3 stated that "Due to the nature of the construction the road construction projects are very much different from other construction. The projects have to deal with utility shifting, third party involvement, changing of ground conditions, etc. Hence the instruction may need from time by time to suit the ground conditions".

26	delayed site possession	Y	Y	Y	selected	R2 stated that “As per the conditions of contract, the Employer should permit to contractor to handover the site within the period stipulated in the contract data. Due to the practical difficulties, the date of site possession may be delayed. Such delays will be affected to the commencement of physical works of the contractor. Therefore, delaying the site possession will affect to the completion date of the contract and prolongation costs. The said claims will lead the parties to the dispute”.
27	design deficiency	Y	N	N	-	
28	determination of the agreement	Y	Y	Y	selected	R3 stated that “From the conditions of contract, one of the Engineer’s obligation is to interpret the contract documents. At such interpretation the Contractor may not agree with the erroneous interpretation by the Engineer. In such situations the parties are ended up with disputes between them”.
29	disruption	Y	N	N	-	
30	dissimilar perceptions of fairness by the participants	Y	N	N	-	
31	EOT claims	Y	Y	N	selected	No specific statement made by respondents
32	Equipment costs	N	N	N	-	
33	errors and omissions in design	N	Y	N	-	
34	failure of participants to deal promptly with changes and unexpected outcomes	N	N	Y	-	

35	failure to account the real cost	Y	Y	Y	selected	<p>R1 stated that “The preliminary quantities provided for the tender documents are based on provisional quantities which tends to vary at the construction stage. The percentage of change of such provisional quantity will affect to the project cost and time.</p> <p>With the time factor, it will further increase the cost of Engineer and his facilities. Hence the account of project cost as much as close to its real cost is very much beneficial to all parties and minimize the disputes”.</p>
36	faulty negotiation procedure	Y	Y	N	selected	<p>R1 stated that “At the tendering stage, before awarding the contract the negotiations will be carried out between contractor and client. The primary concern of negotiation, that both parties should get agreed for the conclusion and it should be clearly documented”.</p>
37	Final certificate and final payment	Y	N	Y	selected	<p>R1 stated that “With the final application, all the supporting documents are to be submitted along with relevant pay items. The finalization of final certificate become tedious when the supporting documents are not available and bad documentary management by any party to the contract”.</p>
38	financing management	Y	Y	Y	selected	<p>R2 stated that “Contractor's Financial Management is an extremely important subject. It has been told that a large percentage of bankrupt contractors were profitable at the time of their failure, but due to their poor financial management failure resulted. Good financial management looks at history of the company as well as planning for its future. Management needs to understand the basics of why they are making or losing money”</p>
39	government regulations/change in economic condition	Y	Y	N	selected	<p>R1 stated that “The legislation may change with the time according to the several requirements of the government. If the legislation has changed after awarding a contract, it will affect the contract and contractor should adjust according to new legislation. The effect will appear as a claim to the Employer. Disputes occurred with these claims”.</p>
40	inadequate planning	Y	Y	N	selected	<p>R2 stated that “As well as the proper program, the capacity of the project manager regarding the project management procedures are very critical for the project execution. Bad management practices will be ended up with many disputes and poor-quality end products”.</p>
41	increase in work scope	N	N	N	-	

42	Influence of lawyers	N	N	N	-	
43	interferences with utility lines	Y	N	N	-	
44	knowledge of local statues	N	N	N	-	
45	lack of information	Y	N	N	-	
46	lack of team spirit	Y	N	N	-	
47	loss of productivity	N	N	N	-	
48	loss of revenue	N	N	N	-	
49	methods or means and specification perform	N	Y	N	-	
50	misunderstandings	Y	N	N	-	
51	nomination of sub-contractors	Y	Y	Y	selected	R1 stated that “Client may tend to subcontract some specialized works. With the appointment of the sub-contractor the resistance between contractor and sub-contractor will begin due to the spaces, machinery movements, forcing to comply other’s program, etc. The disputes may arise will be ended up with cost and EOT claims”
52	opportunistic behaviour	N	Y	N	-	
53	other organizations	Y	Y	Y	selected	R3 stated that “Road construction projects are regularly involved with many of other third-party organizations. Some are utility providers such as electricity, telecom, water. On the other hand, government offices for removal of trees, borrow material approvals, blasting material approvals, licenses for operating of plants and quarries, etc”. Further R2 stated “ By nature, road construction projects are always needed to keep coordination with such third party through the client. As per the conditions of contract, clearances from third parties for utility shifting to be one of obligation of the Client. This may lapse due to client’s staff or the third parties’ staff attention / contribution. Such delays will be affected to the project time and hence the contractor is able to make claim on same and may lead to dispute”.
54	parties’ expectations	N	N	Y	-	

55	payment delays and deductions	Y	Y	N	selected	R1 stated that “The contractors cash flow is an important factor for the smooth execution for the project. The conditions of contract have specified the duration the application for payment can keep with Engineer and Employer. But due to some circumstances, the payment may get delayed”.
56	political pressure	N	N	Y	-	
57	Poor communications between project participants	Y	Y	Y	selected	R1 stated that “The efficiency and effectiveness of the construction process strongly depend on the quality of communication. The poor communications led which to misunderstanding between the parties hence led to dispute situation”.
58	postponement of part of the project.	Y	Y	Y	selected	R1 stated that “The contractor may failure to deliver his obligations under the contract by failing to release the site or part of it. Postponement is usually issued due to the cost and time implications due to prolongation are not able to bear by the employer.”
59	pre-award design review	N	Y	N	-	
60	pre-construction conference proceedings	N	N	N	-	
61	professional negligence	Y	N	N	-	
62	project management	Y	N	N	-	
63	Project management procedure	N	Y	N	-	
64	project performances	N	N	Y	-	
65	psychology of people in construction	Y	N	N	-	
66	quality	Y	N	N	-	
67	quality assurance	Y	Y	N	selected	R2 stated that “Time, Cost and Quality are the triple constraints for a project. For the road construction project this scenario is valid. If one constraint is varied, the other two will be get affected. Hence it is very important to have proper quality control or quality assurance plan which address the forecasted issues, before the commencement of the road construction works. Any shortfalls in those plans will create conflicts between the parties”.
68	residents’ influences	N	N	N	-	

69	safety considerations	N	N	N	-	
70	scheduling	N	Y	N	-	
71	scope of work for the contractor is not well defined	Y	Y	Y	selected	R1 stated that “All the tender documents are prepared in enormous rush to catch the time frame for tendering. Mostly the site conditions are much differing from contract documents. Further realize there are very few site visits by the client to evaluate the site conditions, before the tender documents are issued to the contractor. Accordingly, define the exact scope of the contractor may be difficult task or almost impossible”.
72	shortage of materials	Y	N	Y	selected	R3 stated that “Material procurement and availability at site is one of critical factor for successful completion of project. Shortage of material can cause cost overrun and time extension. The claim on same may lead to disputes between parties”.
73	site management	N	N	Y	-	
74	site overhead	Y	N	N	-	
75	substitution of material and procedure	N	N	Y	-	
76	technology change	Y	N	N	-	
77	Termination	N	Y	Y	selected	R3 stated “Consequences of termination are very much lead to dispute situation”.
78	The required tools and equipment are not available	Y	Y	N	selected	R1 stated that “Availability of contractor’s equipment and its working condition is paramount factor for road construction project. Currently almost all the construction activities at the roads are carried out by heavy machines. Shortage of such equipment’s or regular breakdown of such important equipment will result to have delay in completion of the project. The road constructions have schedule of activities where some of the subsequent activities cannot move before the execution of precedent activity. Hence the delay of such activity will affect the project completion date”.
79	The site and execution of work	N	N	Y	-	
80	Tort related	N	N	N	-	

81	unavailability of skills (shortage of skilled manpower)	Y	Y	N	selected	R1 stated that “Unavailability of skilled labour is one of the most critical factors faced by the contractor. This will affect to the project duration. Due to the lack of skilled people and increasing of construction sites will make case worst. Due to such situations site may be affected with slow progress or extension of time for completion which may lead to have disputes between the parties”.
82	unforeseen site conditions	Y	Y	Y	selected	R2 stated that” The underground details are unenforceable for a contractor, if the pretender investigations are not properly concluded, the changes at latter part of the contract may lead to dispute situation”.
83	unrealistic contract durations imposed by client	Y	Y	N	selected	<p>R2 stated that “Most of the road projects are funded by banks such as ADB, JICA, WB, UNDB, etc. At the negotiation stage of the banks there is time limitation imposed for the execution / construction period which mostly to be at grace period of the loan.</p> <p>At the preliminary evaluation, the tendering teams try to comply with the loan negotiation periods, without much considerations to the actual time period required for the contract. Further to fixing the time frame for a contract as per the site conditions and scope of the works, client try to fix the contractor for the time frame imposed with contractor’s financial and construction capacity. Accordingly, the contract documents specify minimum requirement of the financial and other resources. But in actual conditions, there is practical limitation which cannot execute even the contractor is fully qualified.</p> <p>Hence at the construction stage, all the parties will get hampered with these limitations and when they found the time limitations are not realistic, it become a matter of earning time for completion. Theses “requests” and “rejections” tends to damage the driving moods of the parties and hence to call on ADR.”</p>
84	unrealistic expectations	Y	Y	Y	selected	R3 stated that “From the beginning of the project, the time duration and budget allocation, the Employers expectation to complete the project with such budget and time frame without having proper analysis. Further to that, additional works may include to the original budget without having much concern on the impact to the project.”
85	value engineering	N	N	N	-	

86	variations due to client changes	Y	N	N	-	
87	variations due to design errors	Y	N	N	-	
88	variations due to external events	Y	N	N	-	
89	weather conditions	Y	Y	Y	selected	R1 stated that “Hence the exceptionally adverse weather is beyond the adverse pattern expected from past experience have with records. Where the contractor loses his time and cost due to such adverse weather, the contractor is eligible to claim the time and at very limited grounds for cost”
90	workmanship	N	N	Y	-	
91	workmanship or material not meeting requirement of specifications	N	N	N	-	
92	Employers risk and force majeure situation	Y	Y	N	selected	No specific statement made by respondents
93	Re nominations	Y	Y	N	selected	R1 stated that “Due to the lack of performance or at the failure of the nominated sub-contractor, the Employer needs to re-nominate a new contractor to complete the works. It has bind with the main contractor to specified works to be get through nominated sub-contractor.”
94	non appointment of DAB at the early stage of the project	Y	Y	N	selected	R2 stated that “the appointment of DAB, will helps to project to resolve the dispute as it arrives without wasting on other ADRs or litigations. The method of appointment of DAB is specified at the Condition of Contract at cl 20.2 of the contract. Failing to appoint such DAB timely, will make the dispute to be dragged until end of the project. Finally, this situation will lead to dispute situation”
95	Lack of proper cooperation & support by sureties, insurance companies and contractor's bankers	Y	Y	Y	selected	R3 stated that “Surety bonds, insurance covers are assuring project owners that contractors will perform the work and pay specified subcontractors, laborers, and material suppliers in accordance with the contract documents. The insurance companies and contractor’s bankers are insisting additional conditions, exclusions or deductible to mitigate their risk. When the actual claim will arrive, the disputes will arrive with those conditions”

4.4 Statistics of Responses

The questionnaire was distributed among 98 professionals, those who actively participate in road construction projects. 34 number of responses received and recorded. The responses percentage was 34.7%. The received responses summarized by their profession and experience.

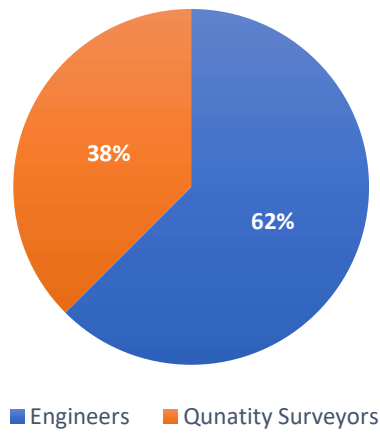


Figure 4. 1: Profession of Respondents

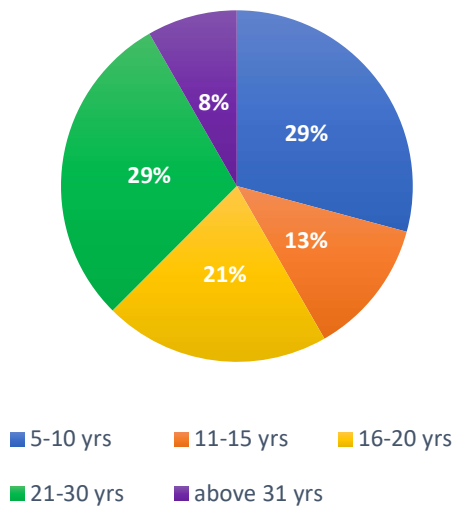


Figure 4. 2: Respondent's experience

4.5 Lack of perfection or ambiguities in the contract documents

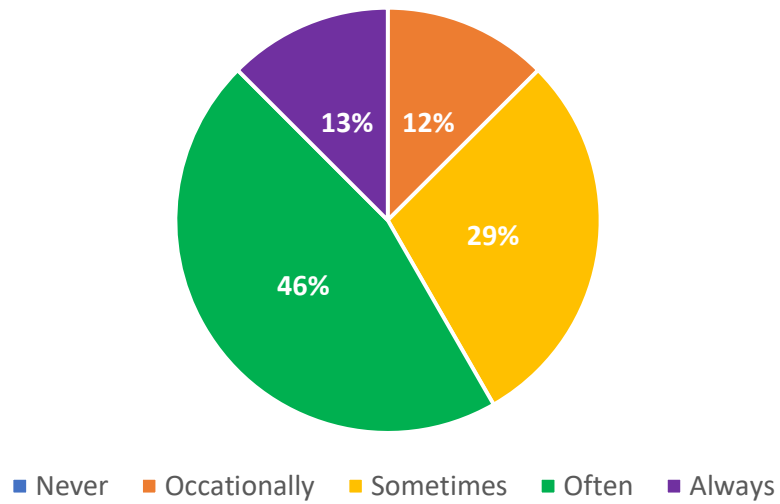


Figure 4. 3: Lack of perfection or ambiguities in contract documents

Out of the respondents, 13% stated lack of perfection or ambiguities in contract documents are always leads to disputes and 46% are often. Further 29% stated on with sometimes and 12% stated occasionally. But no one stated never.

4.6 Failure to account real cost of the contract

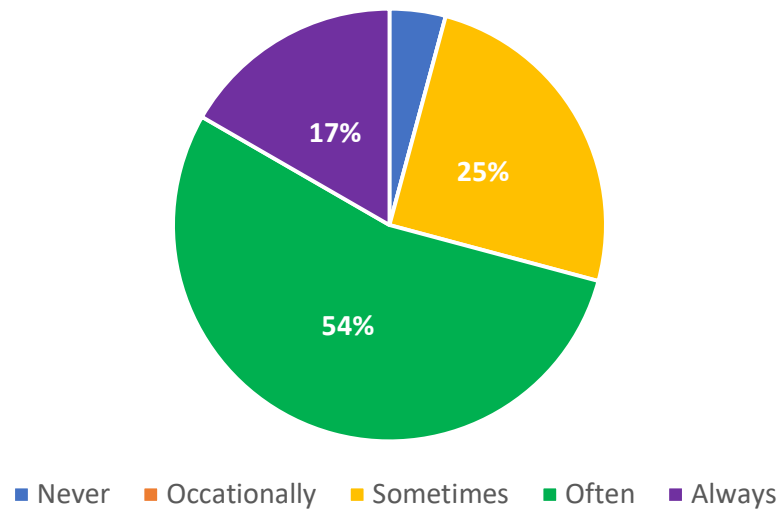


Figure 4. 4: Failure to account real cost of the contract

Out of the respondents, 17% stated failure to account real cost of the contract always leads to disputes and 54% stated often. Further 4.2% are on with never.

4.7 Unrealistic contract duration imposed by client

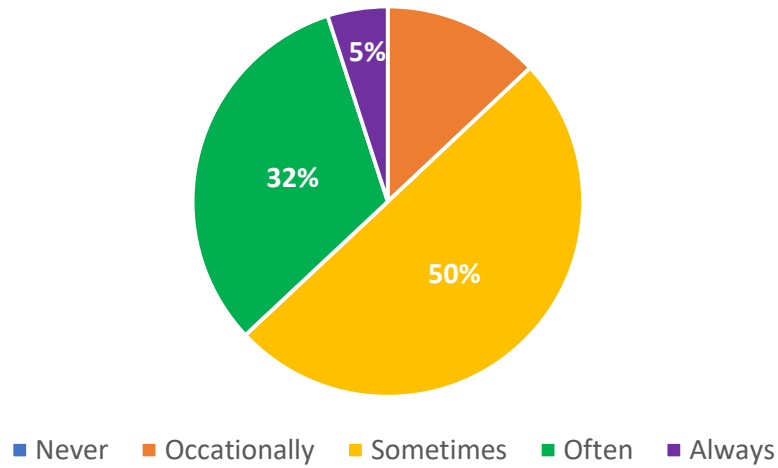


Figure 4. 5: Unrealistic duration imposed by client

Out of respondents, 5% stated unrealistic duration imposed by client is always led to disputes whereas 32% stated often. 50% of the respondents stated sometimes it will lead to disputes and 13% stated as occasionally. But no one stated “never”.

4.8 Faulty negotiation attempts

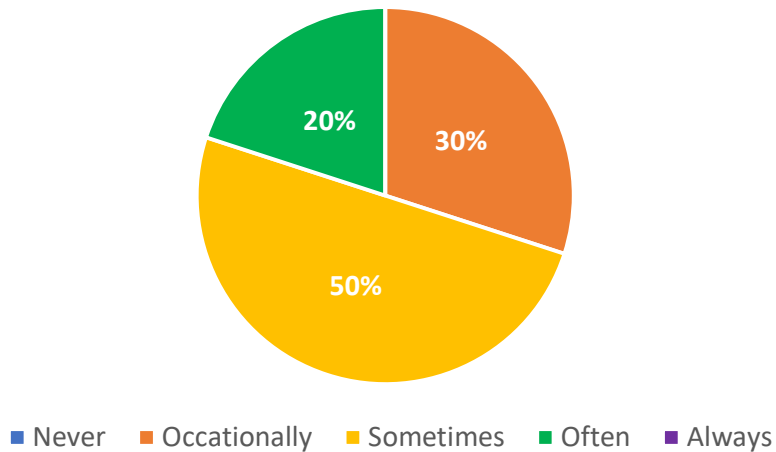


Figure 4. 6: Faulty negotiation attempts

Out of respondents, 20% stated that often for “faulty negotiation attempts” are led to disputes whereas 50% of the respondents stated sometimes and 30% stated as occasionally. But no one stated “never”.

4.9 Scope of the contractor is not well defined

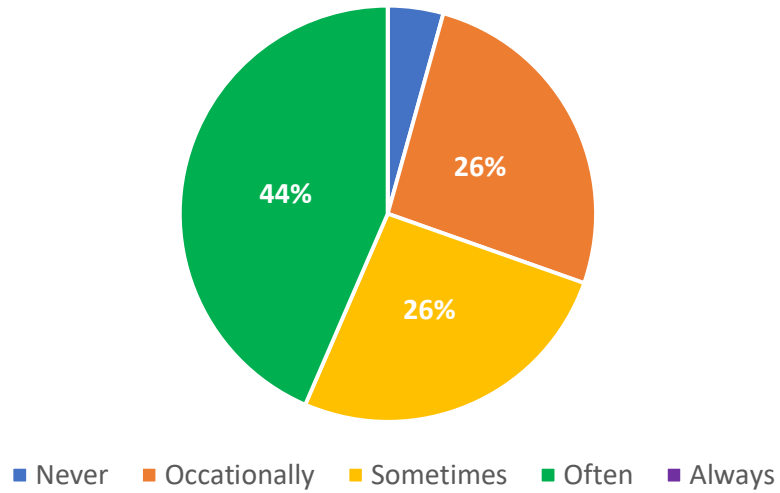


Figure 4. 7: Scope of the contractor is not well defined

Out of respondents, 44% stated that often this led to disputes whereas 26% of the respondents stated sometimes and 26% stated as occasionally.

4.10 Site Possession / right of access delayed

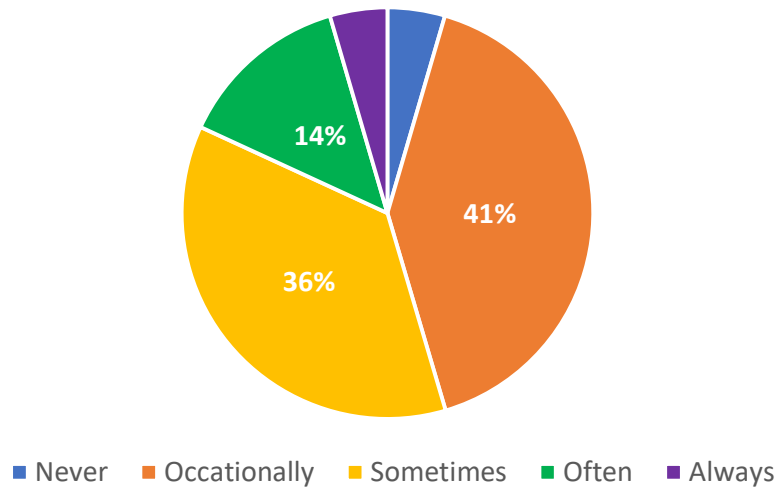
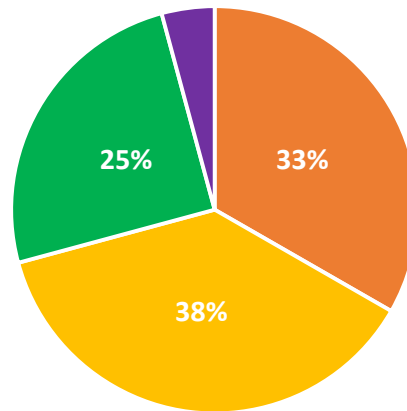


Figure 4. 8: Site possession / right to access delayed

5% of respondents states the situation always led to disputes and 14% stated very often this is moving towards the disputes. Further 41% stated occasionally and 5% stated it will never led to disputes.

4.11 Change in economic conditions / Government policies

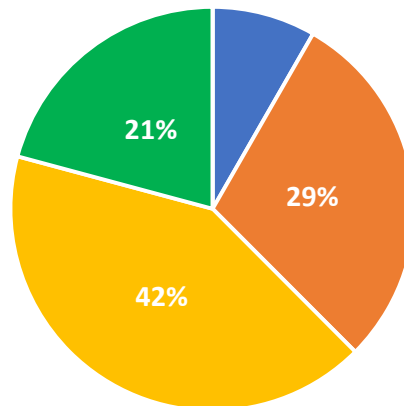


■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always

Figure 4. 9: Change of economic conditions / government policies

Out of respondents, 4% stated that always changes in economic conditions / government policies are led to disputes whereas 25% of the respondents stated often and 38% stated as sometimes. Further noticed that no one stated for never.

4.12 Erroneous interpretation of the contract done by the Engineer



■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always

Figure 4. 10: Erroneous interpretation of the contract done by the Engineer

Out of respondents, 8% stated that always the facts led to disputes whereas 21% of the respondents stated often and 42% stated as sometimes while 29% stated it happened occasionally. Further noticed that no one quoted for never.

4.13 Nomination of sub-contractors

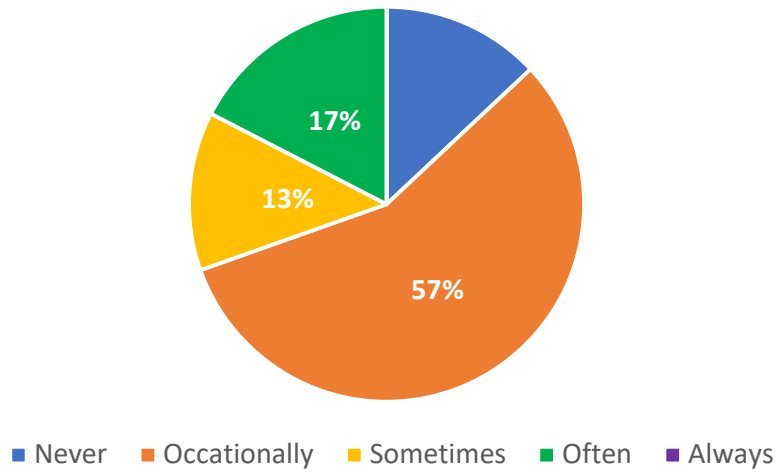


Figure 4. 11: Nomination of subcontractors

Out of respondents, 17% stated that often nominated subcontractor led to disputes whereas 13% stated as sometimes while 57% stated it happened occasionally. Further noticed that 13% quoted for never.

4.14 Involvement of third-party organizations

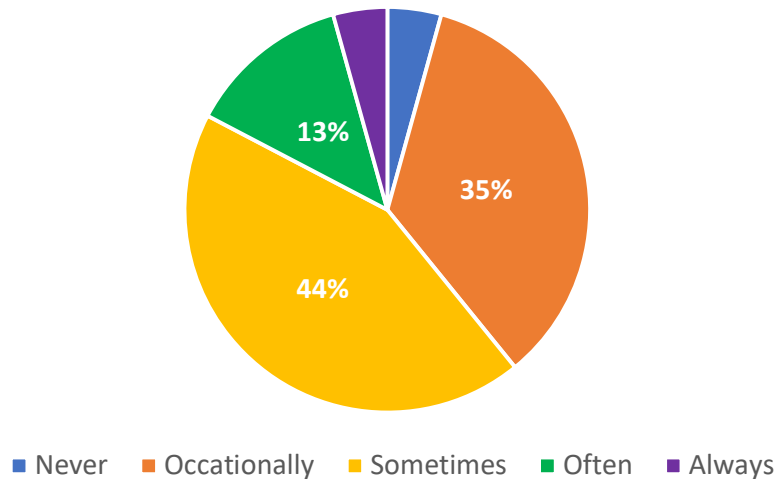


Figure 4. 12: Involvement of third-party organizations

Out of respondents, 4% stated as always and 13% stated that often involvement of third-party organizations are led to disputes. 44% stated as sometimes while 35% stated it happened occasionally. Further noticed that 4% quoted for never.

4.15 Delay in final certificate and final payment

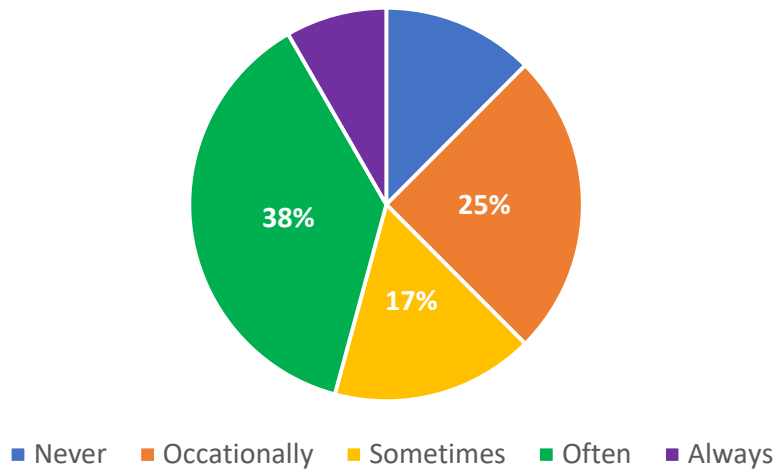


Figure 4. 13 : Involvement of third-party organizations

From the respondents, 8% stated always while 38% stated often “delay in final certificate” is led to disputes. Further, 17% stated sometime and 12.5% stated occasionally. Its noted that 13.5% stated this never ended up with disputes.

4.16 Termination of Contract

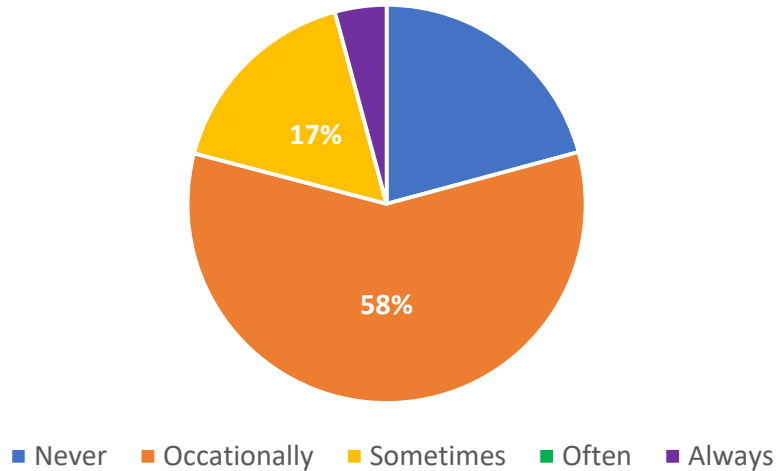


Figure 4. 14: Termination of contract

Only 4% stated the termination of contract leads to disputes while no one comment on often. But 17% stated as sometimes, 58% stated as occasionally and 21% stated termination will never lead to disputes.

4.17 Underground and subsurface problems or lack of site investigations

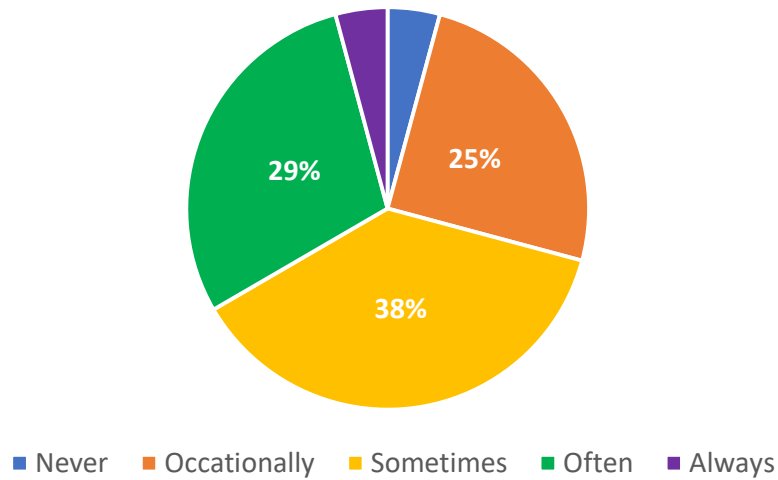


Figure 4. 15: Underground and subsurface problems

From the respondents, 4% stated always and 29% stated often “Underground and subsurface problems” are led to dispute situation. Further, 38% stated sometime and 25% stated occasionally while 4% stated never for this source.

4.18 Delay in interim payments

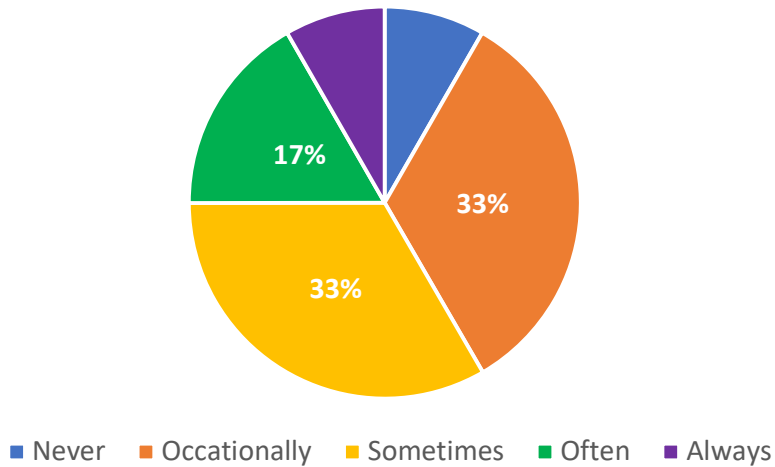


Figure 4. 16: Delay in interim payments

8% of the respondents stated always and 17% agreed on often “delay in interim payments” are led to dispute situations. Further, 33% stated sometimes and 33% stated occasionally while 8% stated this source is not relevant for the disputes.

4.19 Poor communication/dialogue between project participants

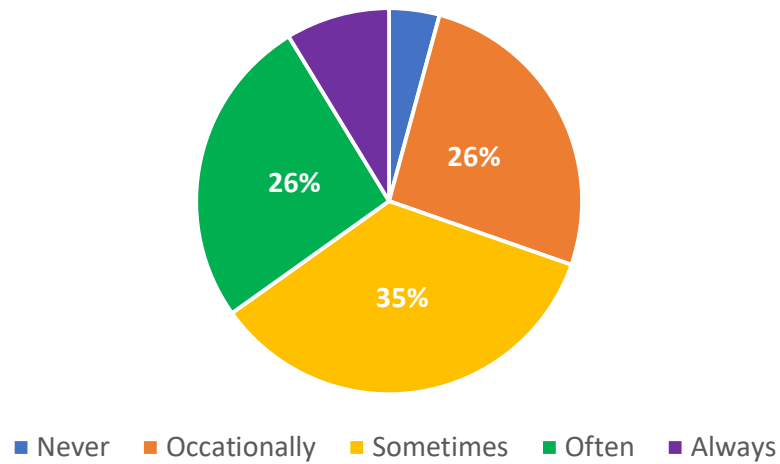


Figure 4. 17: Poor communication/dialogue between project participants
9% are strongly agreed on the situation “Poor communication/dialogue between project participants” are led to dispute situation while 35% stated often. 34.8% mentioned as sometimes and 26% stated occasionally and 4% stated never for this source.

4.20 Unavailability / shortage of skilled manpower

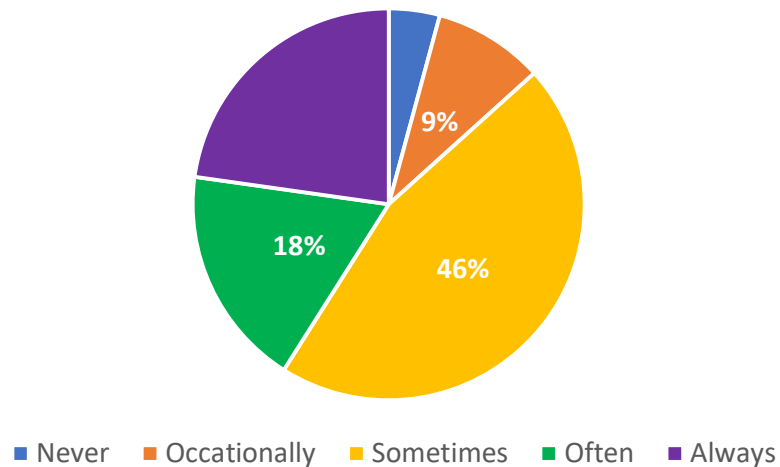


Figure 4. 18: Unavailability / shortage of skilled manpower
23% stated it has affected and led to dispute situation always and 18% stated often. 46% stated sometimes and 9% stated occasionally while 4% stated as never.

4.21 Shortage of materials

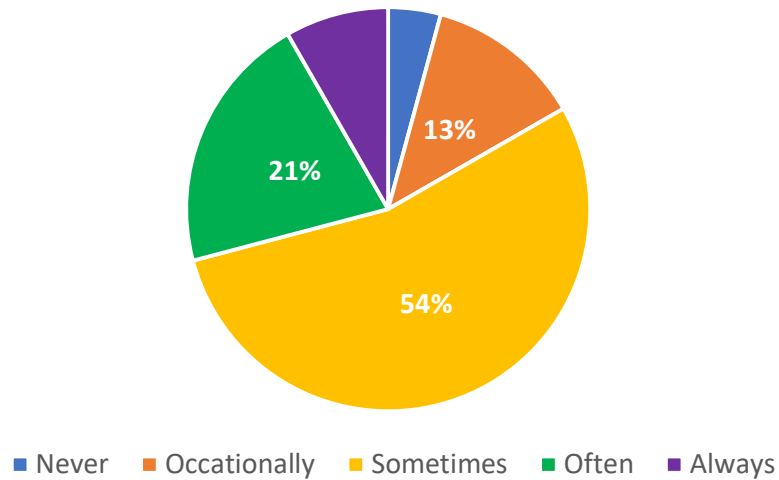


Figure 4. 19: Shortage of materials

8.3% of the participants stated as always and 21% stated as often the “shortage of material” led to dispute between the parties. 54% stated as sometimes and 13% stated as occasionally while 4% stated as never for this source.

4.22 Non availability or lack of serviceability of contractor’s equipment’s

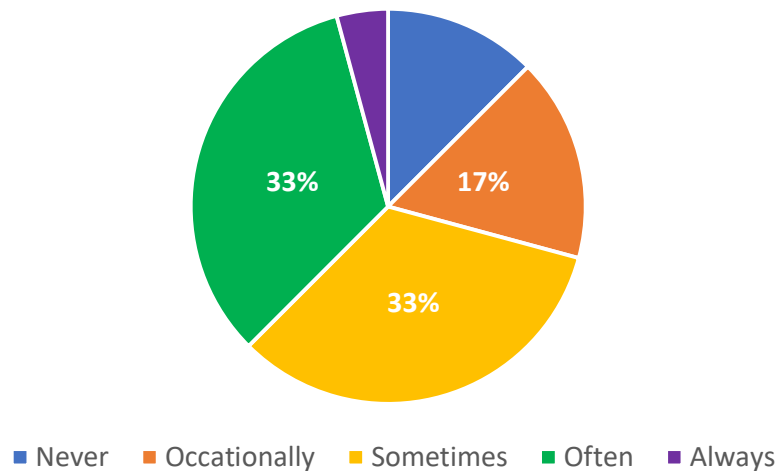


Figure 4. 20: Non availability or lack of serviceability of contractor’s equipment’s

4% of the respondents always on “non availability or lack of serviceability of contractor’s equipment’s” and stated as always where 33% stated often. 33% stated as sometimes and 17% mentioned occasionally while 13% stated as never to this contribute to disputes.

4.23 Inadequacy planning / project management procedure

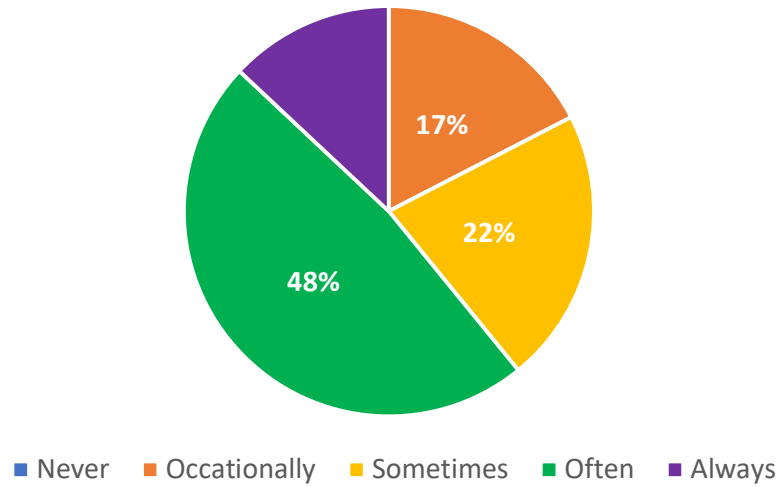


Figure 4. 21: Inadequacy planning / project management procedure
Accordingly, 13% of the respondents stated always and stated that “inadequacy planning / project management procedure” have always impacts on the disputes and 48% stated often. 22% stated sometimes and 17% mentioned as occasionally. It is noted that no respondents stated never.

4.24 Shortfalls in quality control / quality assurance systems

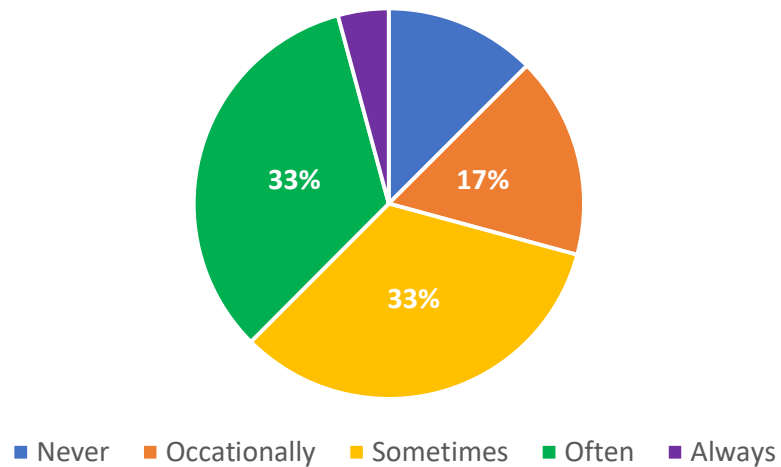


Figure 4. 22: Shortfalls in quality control / quality assurance systems
Out of the respondents 4% stated always and 33% stated often, those shortfalls at the QA and QC documents will be led to disputes. Further, 33% stated sometimes and 17% stated occasionally while 4% stated never.

4.25 Contractor financial difficulties

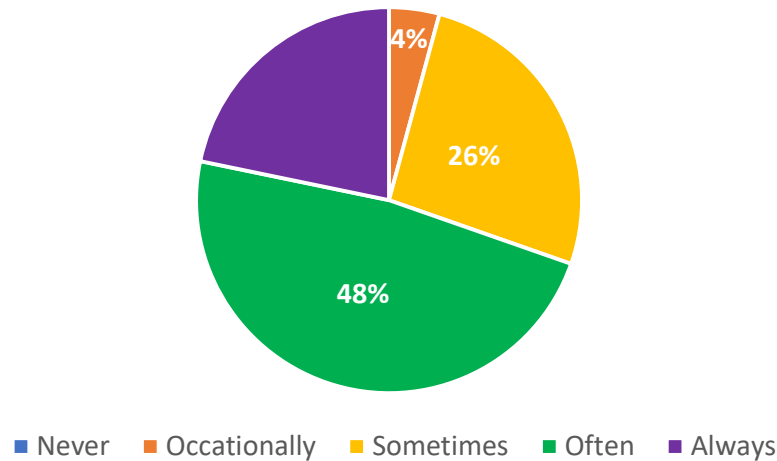


Figure 4. 23: Contractor financial difficulties

According to the responses received, 22% stated always and 48% stated often the financial difficulties of the contractor will affect to the project hence lead to disputes. Further 21% stated sometimes and 4% stated occasionally. It has noted no response found on never.

4.26 Shortfalls in contractor's financial management

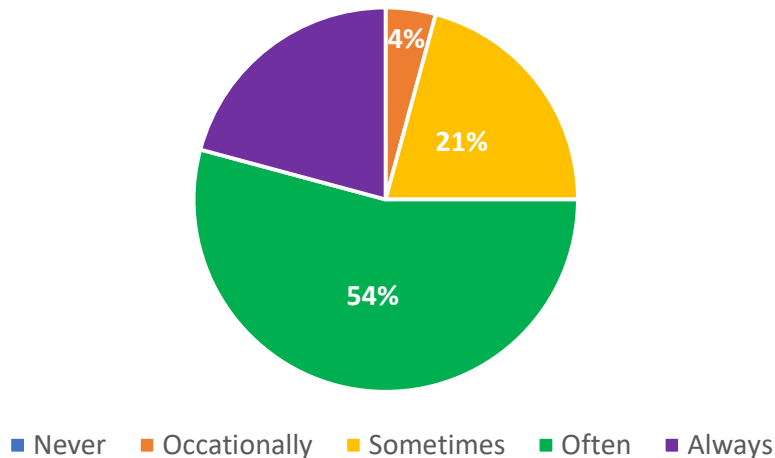


Figure 4. 24: Shortfalls in contractors financial management

21% of the respondents stated always and 54% stated often "Shortfalls in contractors financial management" is led to disputes. 21% stated sometimes and 4% stated occasionally contribute for the dispute situation. No respondent stated on never.

4.27 Lack of proper cooperation by insurances companies and bankers

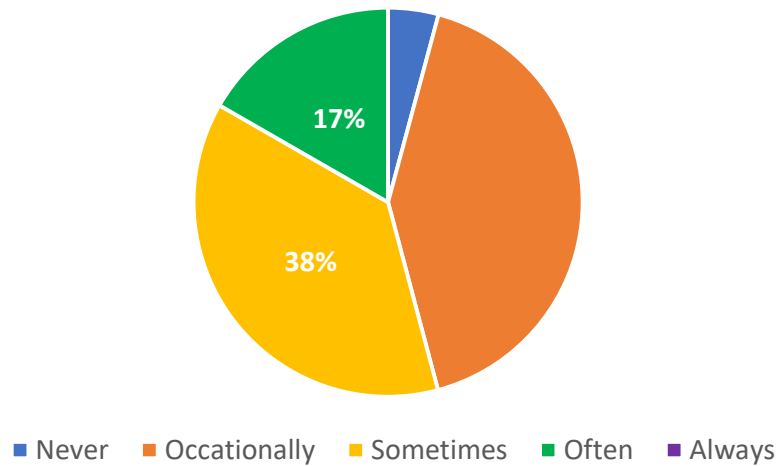


Figure 4. 25: Lack of proper cooperation by insurances companies and bankers

17% of the respondents stated often and 38% stated sometimes “lack of proper cooperation by insurances companies and bankers” are led to disputes. 42% stated occasionally and 4% stated never this source.

4.28 Non appointment of Dispute adjudication Board (DAB) at initial stage

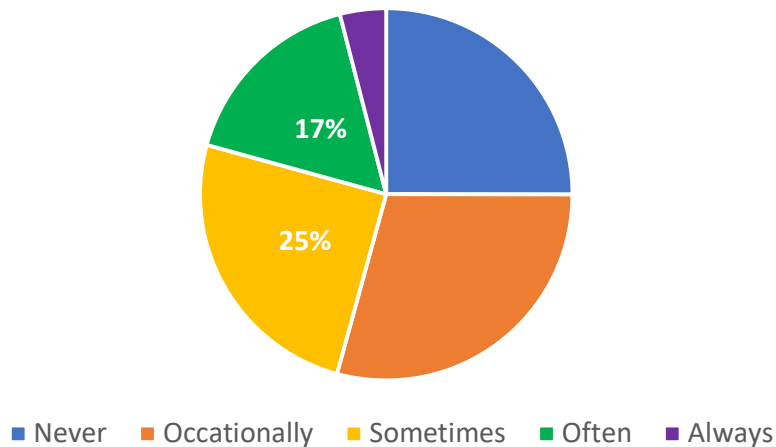


Figure 4. 26: Non appointment of Dispute adjudication Board (DAB)

From total responses, 4% stated always and 17% stated often that non appointment of DAB at the initial stage of the project will be led to the dispute situation at the end of the project. Further 25% stated sometimes and 30% stated occasionally for this source. 25% stated it will never be affected.

4.29 Change in design by the Engineer

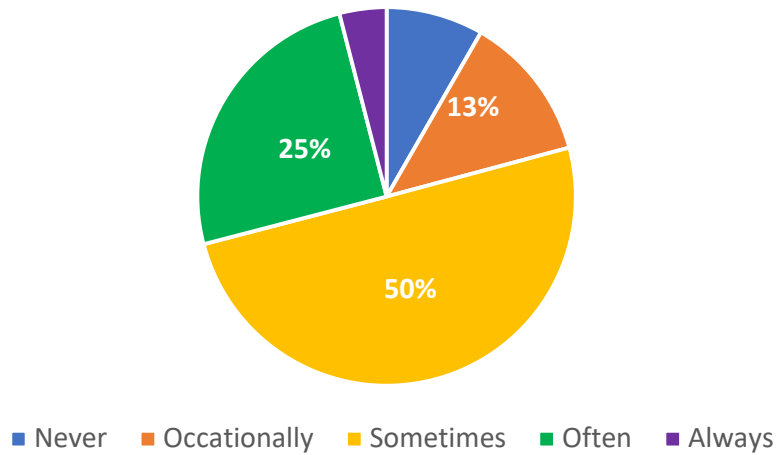


Figure 4. 27: Change in design by the Engineer

Out of all responses 4% stated as always and 25% stated often the facts are led to disputes while 50% stated as sometimes and 13% stated occasionally. Its noted that 8% stated never for the facts discussed.

4.30 Delays in approval / approval with conditions

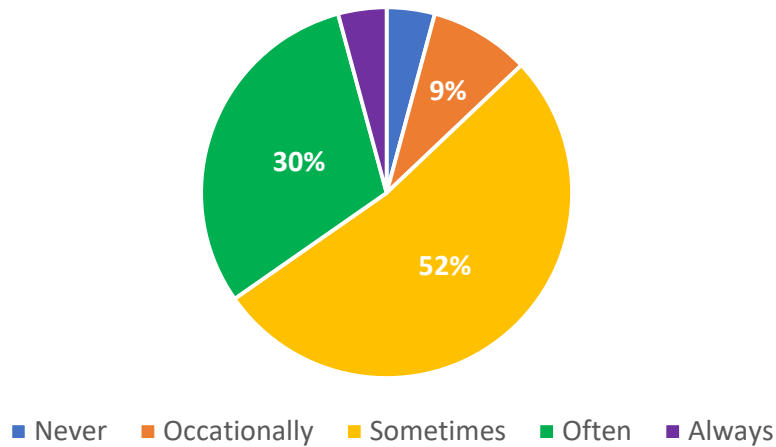


Figure 4. 28: Delays in approval / approval with conditions

Out of all responses 5% are stated as always and 30% stated often “ Delays in approval / approval with conditions “ are led to disputes while 52% stated as sometimes and 9% stated occasionally. Its noted that 4% stated never for this source discussed.

4.31 Late issue in design information / instructions

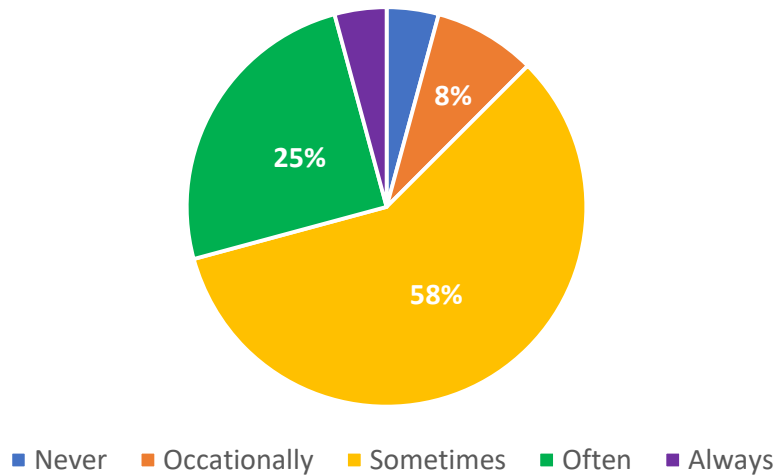


Figure 4. 29: Late issue in design information / instructions

Out of all responses 5% stated as always and 25% stated often the facts are led to disputes while 58% stated as sometimes and 8% stated occasionally. Its noted that 4% stated never for this siurce discussed.

4.32 Delays beyond the control of the contractor and EoT claims

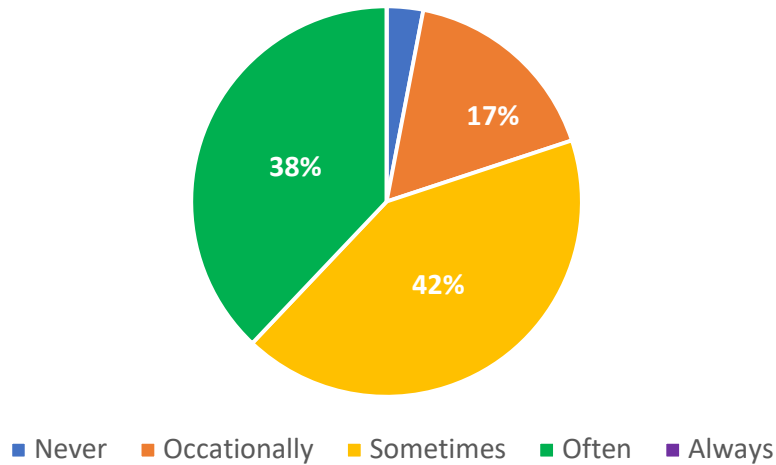


Figure 4. 30: Delays beyond the control of the contractor and EoT claims

Out of all responses 38% stated often “Delays beyond the control of the contractor and EoT claims” are led to disputes while 42% stated as sometimes and 17% stated occasionally. Its noted that 3% stated never.

4.33 Accelerations

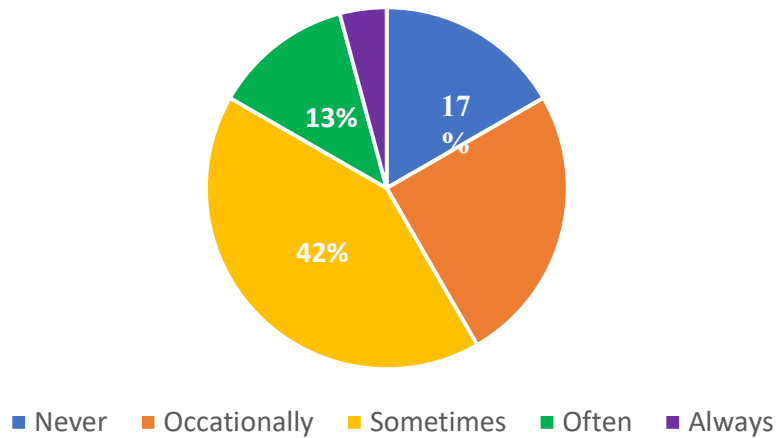


Figure 4. 31: Accelerations

Out of all responses 3% stated always and 13% stated often accelerations are led to disputes while 42% stated as sometimes and 25% stated occasionally. Its noted that 17% stated never.

4.34 Employer's risk and force majeure situations

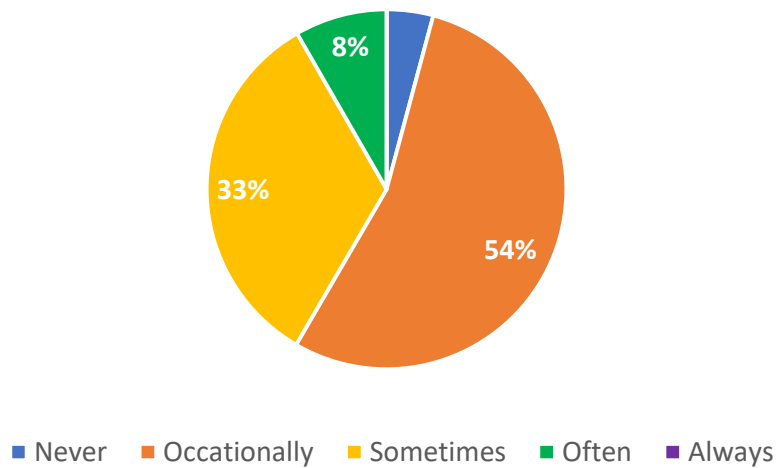
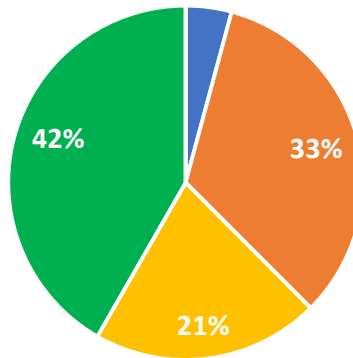


Figure 4. 32: Employer's risk and force majeure situations

Out of all responses 8% stated often “ employer's risk and force majeure situations” are led to disputes while 33% stated as sometimes and 54% stated occasionally. Its noted that 5% stated never.

4.35 Adverse weather conditions

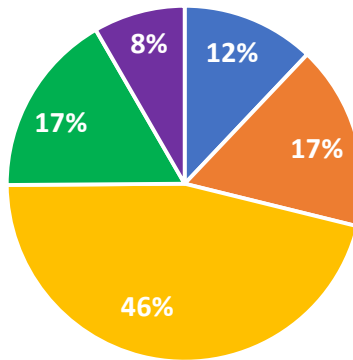


■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always

Figure 4. 33: Adverse weather conditions

42% of the respondents stated often and 21% stated sometimes adverse weather conditions are led to disputes. 33% stated occasionally and 4% stated never this contribute for the dispute situation.

4.36 Unrealistic expectations



■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always

Figure 4. 34: Unrealistic expectations

Out of all responses 8%stated as always and 17% stated often unrealistic expectations are led to disputes while 46% stated as sometimes and 17% stated occasionally. Its noted that 12% stated never.

4.37 Tendering pressure

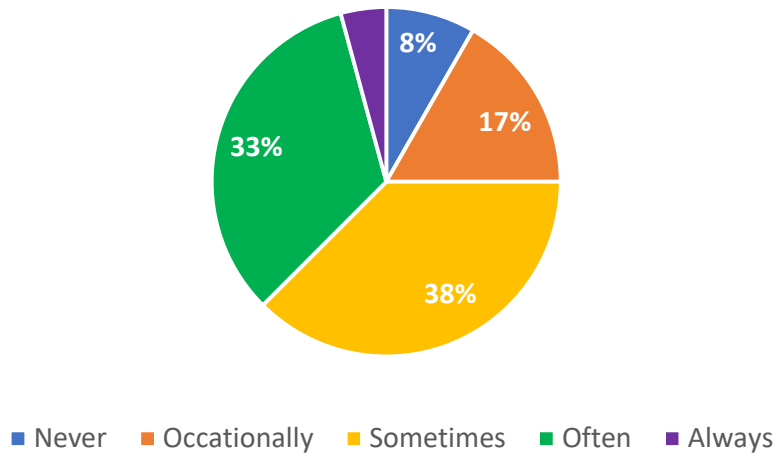


Figure 4. 35 : Tendering pressure

Out of all responses 4% stated as always and 33% stated often tendering pressure led to disputes while 38% stated as sometimes and 17% stated occasionally. Its noted that 8% stated never.

4.38 Client initiated variations

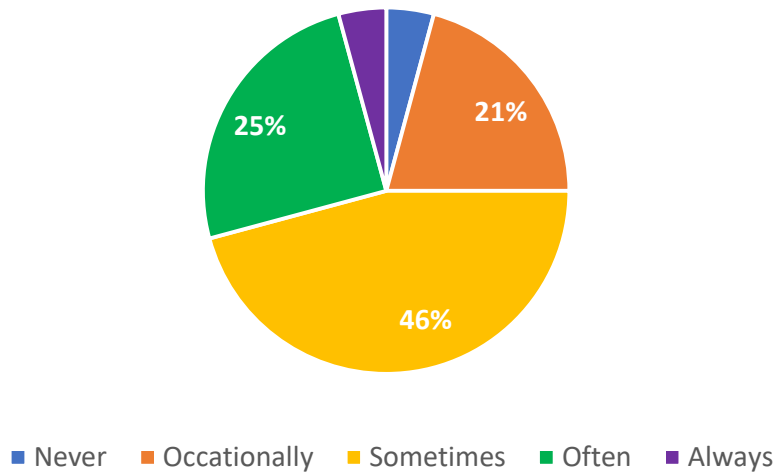


Figure 4. 36: Client initiated variations

Out of all responses 4% stated as always and 25% stated often “client-initiated variations” are led to disputes while 46% stated as sometimes and 21% stated occasionally. Its noted that 4% stated never for the source discussed.

4.39 Re-nominations

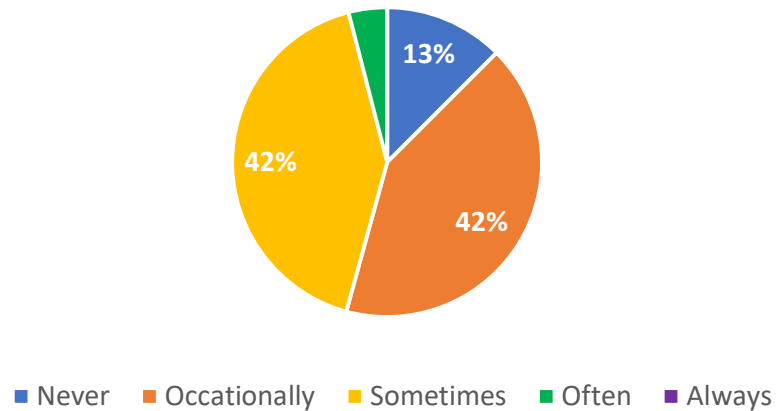


Figure 4. 37: Re-nominations

Out of all responses 4% stated often re-nominations are led to disputes while 42% stated as sometimes and 42% stated occasionally. Its noted that 13% stated never for the source discussed

4.40 Delay caused by other contractors employed by the Employer

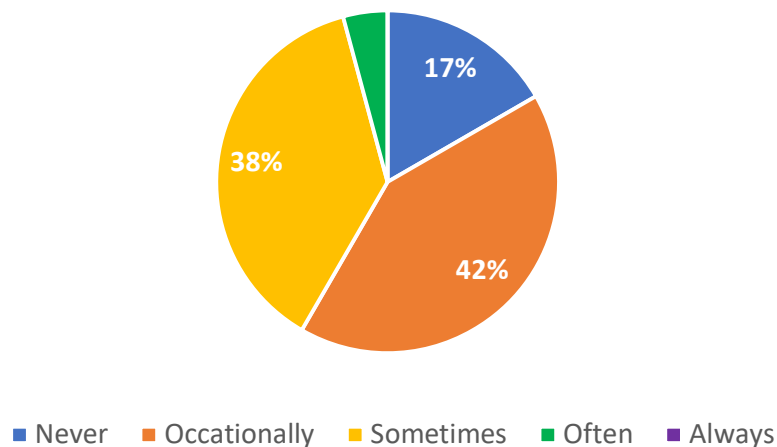
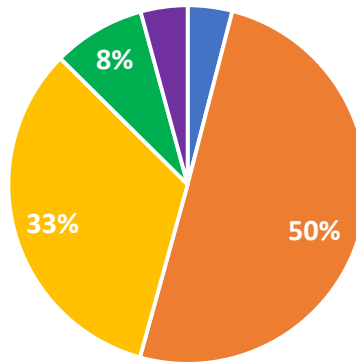


Figure 4. 38: Delay caused by other contractors employed by the Employer

Out of all responses 4% stated often “delay caused by other contractors employed by the Employer “ are led to disputes while 42% stated as sometimes and 38% stated occasionally. Its noted that 17% stated never for the source discussed.

4.41 Postponement of part of the project



■ Never ■ Occasionally ■ Sometimes ■ Often ■ Always

Figure 4. 39: Postponement of part of the project

Out of all responses 4% stated always and 8% stated often “postponement of part of the project “ are led to disputes while 33% stated as sometimes and 50% stated occasionally. Its noted that 4% stated never for the source discussed

4.42 Research Findings

By analysing the all responses with the weighted average, following results obtained

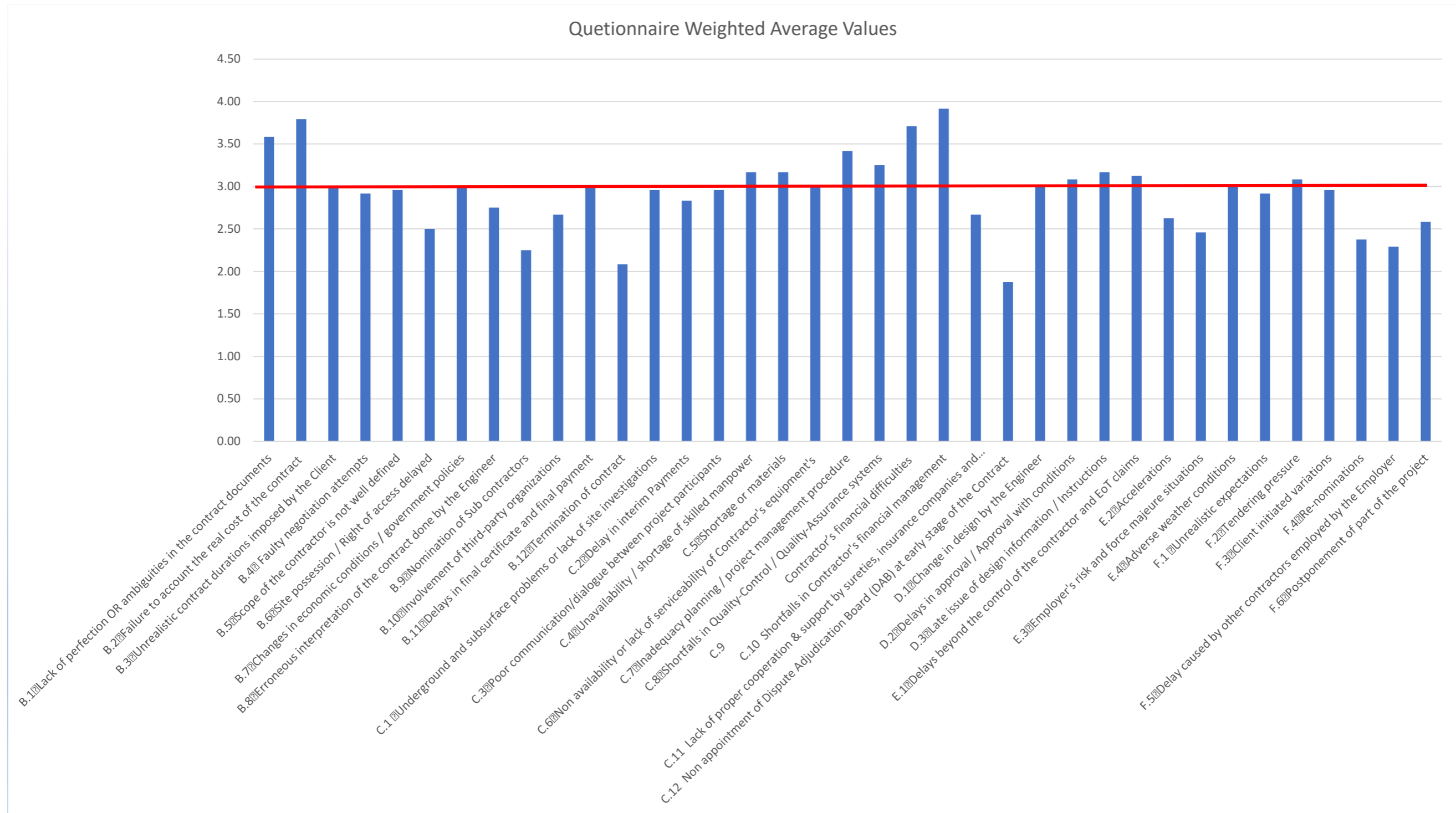


Figure 4. 40: Summery of Questionnaire Results

As per the results obtained from the road construction experts, following sources of disputes has been identified as the most common occurrences at the road construction projects,

1. Lack of perfection or ambiguities in the contract documents
2. Failure to account real cost of the contract
3. Unavailability / shortage of skilled manpower
4. Shortage of materials
5. Inadequate planning / project management procedure
6. Shortfalls in quality control / quality assurance systems
7. Contractor's financial difficulties
8. Shortfalls in contractor's financial management
9. Delay in approval / approval with conditions
10. Late issue of design information / instructions
11. Delay beyond the control of contractor and EOT claims
12. Tendering pressure

Hence the identified list of sources of disputes are needed to to minimize their occurrences.

This research considers the sources of disputes arise through the road construction projects. The minimization the same will help to the run the road construction project smoothly. The research was initiated through the road projects experts such as contract specialists, team leaders, contract administrators, arbitrators, project managers, quantity surveyors, senior engineers. The recommendations for the research findings were taken with the selected road projects experts such as Contract Specialists, Team Leaders, Arbitrators.

The profile of the experts who were involved with the research recommendations can be summarized in the table 4.1

4.43 Possible remedies for the identified most common sources of disputes

With this research, tried to minimize the occurrence of most common disputes in road construction projects by recommending the possible steps can be taken to avoid such sources of disputes.

The listed below sources of disputes are presented and discussed with field experts at table 4, and possible remedies can be taken into action to minimize their occurrence at the road construction projects. The possible remedies are listed below at table 4.4,

Table 4. 3 : Possible remedies to minimize the occurrences of common sources of disputes

No	Sources of Disputes	Possible action can be taken to minimize
1	Lack of perfection or ambiguities in the contract documents	<ul style="list-style-type: none">• The contract documents to be prepared through experienced consultant• Documents to be reviewed through Engineer or document reviewer (if Engineer not available) before issued for tender• Establish a one monitoring unit for reviewing and preparation of the documents for government tenders
2	Failure to account real cost of the contract	<ul style="list-style-type: none">• Engineer to conduct regular review of cash flow forecasts and update contract accounts and forecast final cost on a regular basis with cooperation of inputs of the contractor.

3	Unavailability / shortage of skilled manpower	<ul style="list-style-type: none"> • The skilled manpower requirement to be forecasted for next considerable years to be done at national level. The same to be addressed by Vocational training institutes • Engineer to monitor, the contractor's resources, manpower, machinery, skilled and unskilled labour and highlight any shortfalls actual and forecast • Any specific skilled personnel requirements to be specified at the tender documents • Level of skill to be established in national level with minimum remuneration
4	Shortage of materials	<ul style="list-style-type: none"> • Engineer to monitor the contractor's resources including materials and goods and highlight ant shortfalls in actual and forecast • Encourage alternatives (which are fit for the purpose) and make alternation for specification with involvement of experts. • Use of material available at the site vicinity • Any tax or government relaxation for the material to bring from overseas due to scarcity of materials.

		<ul style="list-style-type: none"> • National level material forecast for future major projects
5	Inadequacy of planning / project procedure	<ul style="list-style-type: none"> • Engineer to conduct regular reviews of contractor's program and monitor work progress, issue rate of progress notices where necessary and instructions to correct or update works program as necessary • Long-term and Short-term industrial trainings to be held to increase the capacity of the project managers and such trainings should have credibility at the tender evaluations.
6	Shortfalls in quality control / Quality assurance system	<ul style="list-style-type: none"> • Provide QA/QC guideline at the tender stage for the contractor • Engineer to review the contractor's proposal on quality control / Quality assurance with regards to the project requirements • Engineer to review results of routine tests and remedial works as and where necessary if tests failed • Engineer ensure contractor has quality system establishment and system is complying with the contract requirement • Engineer to audit on regular basis the contractor's quality management / assurance system.

7	Contractor's Financial Difficulties	<ul style="list-style-type: none"> • Its noted that, most of the advance payments are not directly utilized for site activities. Hence it is proposed to create escrow account at the beginning of projects • Advance payments to be done at project phases / clusters / milestone basis. BY this contractor's financial capacity not exhausted (due to bond submission). On the other hand, Employer in ease situation when its need to encash the bond • Short term borrow-facilities with low interests from financial institutions • Engineer to encourage contractor to report as early as possible any foreseen cash flow problems or forecasted difficulties which may affect the project and progress
8	Shortfalls in contractor's financial management	<ul style="list-style-type: none"> • The financial program which is based on the master program to be developed at the beginning of the project • Select the priorities for payments based on the said cash flow program • Training programs for Project Managers on financial management • To make up for shortfalls in contractor's financial management, the Engineer should manage claims for additional cost and / or time efficiently and

		effectively and take prompt action to determine contractor's entitlement in each case to minimise the delays in any payment due
9	Delay in approval / approval with conditions	<ul style="list-style-type: none"> • Appropriate quantity of professional staff to be allocated for the Engineer according to the scale of the project. • Prepare preliminary design program • Engineer to ensure that the contractors program includes detailed approval activities within the program including latest date for approvals and milestones
10	Late issue design information / instructions	<ul style="list-style-type: none"> • Initiate communication protocol and instruction issuing system at the beginning of the project • Engineer to manage design changes including the control of drawing amendments and their early issue to contractor including design alternatives in overall program. • Produce detailed design schedules with delivery dates coordinated with construction
11	Delay beyond the control of the contractor and EOT claims	<ul style="list-style-type: none"> • Engineer to ensure regular reviews of the progress and any impacting delays, which are not the responsibility of the contractor, are raised at progress meetings and discussed with contractor and employer as necessary for

		determining solutions and extensions of time where applicable
12	Tendering Pressure	<ul style="list-style-type: none"> • Provide fair time for the contractor to go through all documents before bid submission with minimum assumptions. • Careful reviews of all sections of the tender documents and should be checked thoroughly for inconsistencies, errors and ambiguities on submitted tenders. This process to be done through independent document reviewer if the Engineer is not involved at tendering stage. • Encourage smart submissions for Contractors (ie. Less documents and e-submission of supporting documents) • Set up standard formalities for tender submission in Sri Lankan context

4.44 Framework

Based on the possible remedies identified with the road construction experts, a framework has developed for the most common occurrence source of disputes and attached in the page 78.

In this research, has discovered twelve number of critical sources disputes which very frequently occur in road construction projects. The sources of disputes may generate at any stage of the project life cycle. It may be at the initiation, planning, execution or at closing cycle of the project. Therefore, it may need to give attention for the possible errors or special points to be attended to avoid or reduce the common disputes in road construction projects.

The developed framework can assist to the road construction developers or the executors as a tool to concentrate on possible disputes. The framework identifies common sources of disputes that can occur in a road construction project and the remedial action to be taken (options) for respective dispute.

The framework itself describes the possible sources of disputes which can be affected to a road construction project (inner circle) and the remedies to be taken beforehand to avoid or minimize its occurrence at road construction projects. Therefore, the attached framework can be used for the future road construction projects as guide to minimize or reduce the occurrences of common sources of disputes.

FRAMEWORK

4.45 Summary

37 sources of disputes are identified through the literature review and experts' opinions. The same has tested with the road construction experts and out come with 12 number of significant sources of disputes which are affect the road construction projects regularly were identified through the analysis of questionnaires responds.

The identified significant source of disputes were present with a framework at page 78 with the possible remedies discussed with road construction experts.

CHAPTER 05

Conclusions & Recommendations

5.1 Introduction

The aim of this chapter is to present the conclusions of the research findings by suggesting solutions for the most occurring sources of disputes in road construction projects to minimize their occurrences at the project life. The achievement of the objectives of the research are identified by the conclusions of the research. In addition, the limitations of the research and further research areas are discussed in this chapter

5.2 Conclusions

Road construction projects are usually implemented by local or foreign funds. Therefore, much important to utilize the allocated funds in the project rather seeping through out due to the disputed situation or the claim situations. Hence by identification the such sources of disputes help to treat the root cause of the disputes hence minimize the disputed situation. By these proactive actions can be save the time and funds to be wasted under the dispute claims.

The achievement of each objective is discussed below,

Objective 01

By scrutinizing the research papers, journals, conference proceedings and web publications at the literature review, this research has identified ninety-six number of different types of sources of disputes in construction projects. Accordingly, the objective-1 was achieved.

Objective 02

The identified sources of disputes were reviewed with road construction experts and shortlisted for thirty-seven number of sources which are more relevant for the road construction projects. Hence the objective-2 of this research is achieved.

Objective 03

The shortlisted sources of disputes were tested through questionnaire survey by get involving road construction professionals. The responses were analysed and picked twelve number of most common sources of disputes in road construction projects which affected frequently. In this research, twelve (12) number of sources of disputes such as, lack of perfection or ambiguities in the contract documents, failure to account real cost of the contract, unavailability / shortage of skilled manpower, shortage of materials, inadequacy planning / project management procedure, shortfalls in quality control / quality assurance systems, contractor's financial difficulties, shortfalls in contractor's financial management, delay in approval / approval with conditions, late issue of design information / instructions, delay beyond the control of contractor and EoT claims, tendering pressure were found as most occurring sources in road construction projects which have very potential to occur in the next projects. By this action, the objective-3 of the research was achieved.

Objective 04

These identified twelve number of sources if disputes were brought to attention of road construction experts and interviewed. Possible remedies or the precautions to mitigate such sources of disputes were noted through the interview. The results were recommended for each sources of dispute, at this research. Therefore, the objective-4 was achieved.

Objective 05

By summarizing the recommendations made by the road construction experts, a framework for easy reference was developed. The framework presents the sources of disputes and the actions to be taken to reduce the most common sources of disputes in road construction projects. Hence the objective-5 was achieved.

5.3 Recommendations

This research aimed to give recommendations to minimize the occurrences of most common sources of disputes in road construction projects. Accordingly, most common sources of disputes found in the research, were addressed with road construction experts to come out with possible remedies that can be taken to avoid or minimize such situations in road construction project life.

Therefore, it can be recommended to use the framework formalized with these experts' views for the future road construction projects to avoid or minimize the occurrences of such source of disputes.

5.4 Limitations of the Research

During the research process I have encountered several limitations. They are discussed under this topic in order to educate the reader with the context in which the research was done. The research mainly consults three no of road construction experts to identify the remedies for the most common sources of disputes which were identified through the research. This is one of limitation for this research. Further this research is limited to the road projects other than the expressways.

5.5 Future Research

This research is mainly focused on the sources of disputes involve in the road construction projects. Further the research was narrowed down to the roads which do not consist of expressways. Therefore, the research can be recommended to have for expressways. The expressways are involved with many sophisticated activities with many additional works and variations due to the physical barriers. Hence it will be much useful to understand the sources of disputes involved with such expressways.

5.6 Summary

This research identified most common sources of disputes which are affecting to the project duration, budget and parties' relationships. A framework has been recommended, which can be used to eliminate or reduce the impact of disputes to the road construction project. Due to the time frame allocated the parties have very compressed time to act on their contribution to the project. Hence the possibility of errors / mistakes is very high which may be a source for disputes raised later. Therefore, elimination of sources which cause for disputes in road construction projects is always beneficial for every party.

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ANNEXURES

1. Questionnaire