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A lessons learned document for disputes in Florida Department of Transportation projects

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

A LESSONS LEARNED DOCUMENT FOR DISPUTES
IN FLORIDA DEPARTMENT OF TRANSPORTATION PROJECTS

A thesis submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

in

CONSTRUCTION MANAGEMENT

by

Cagri Cinkilic

2009

To: Dean Amir Mirmiran
College of Engineering and Computing

This thesis, written by Cagri Cinkilic, and entitled A Lessons Learned Document for Disputes in Florida Department of Transportation Projects, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this thesis and recommend that it be approved.

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ABSTRACT OF THE THESIS
A LESSONS LEARNED DOCUMENT FOR DISPUTES IN FLORIDA
DEPARTMENT OF TRANSPORTATION PROJECTS

by

Cagri Cinkilic

Florida International University, 2009

Miami, Florida

Professor Mehmet Emre Bayraktar

The purpose of this research is to identify, analyze and evaluate the current Florida Department of Transportation (FDOT) reports in DRB database and develop a utilized, user friendly lessons learned document for FDOT and contractor. The analysis of the reports in the DRB database illustrated that, most common disputes in governmental transportation projects in Florida are due to unforeseen conditions. Over the course of this research, lessons were developed according to the recommendations made by DRB agents at the end of each case in 262 reports. Parties involved in a FDOT project can check this document to avoid recurrence of the negative outcomes and promote recurrence of the positive outcomes.

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INTRODUCTION

1.1. Introduction

Over the years the construction industry dealt with the resolution of claims and disputes because of the adversarial nature of this industry. R.B Hellard (1987), D.A Langford (1992), M. Smith (1992), and S.O. Cheung and C.H. Suen (2002) stated that disputes are inevitable in construction because schedule delays, material overruns, unexpected conditions can be the subject of costly and prolonged claims and litigation. These create some trouble for all parties to a construction project.

In transportation business, projects determine where people live and work and how communities evolve. Because of these impacts, great controversy exists around transportation policies and their implementation. Parties involved in the transportation business are finding themselves in need of better ways to identify preferred approaches to solving transportation problems.

1.2. Problem Statement

Dispute in construction industry might be coming in the form of financial, legal or any other. Wahi (2008) stated that disputes most often leads to problems, losses in terms of economic, time, market share and reputation. According to Groton (1997); Mitropoulos and Howell (2001) evidence showed that the amount of disputes on construction projects can be reduced through dispute identification.

Caldas, Gibson, Weerasooriya, and Yohe (2009) stated that repetitive mistakes on big projects are costly for the construction industry; on the contrary, the benefits of repeating the positive outcomes from previous cases are great. It is also stated that an

effective lessons learned system is a great step in the management of knowledge and it will lead a great benefit in the competitive construction industry.

In the field of transportation, lessons learned can be applied at different points in a variety of ways. These processes are helpful for dealing with problems and issues at the local, regional, state, and national levels. They can be used throughout the entire sequence of transportation decision making, from transportation planning to project development.

Lesson learned is well revered in its theoretical state; however, there is a serious disconnect when it comes to real-life application. Lessons learned are under-utilized within transportation industry or mistakenly applied. There are numerous problems faced by practitioners: Many of the available lessons learned (a) are theoretical in nature, (b) are not readily useable for construction applications, and (c) their reliability and benefits are not clear. Therefore, a close examination of the available statements/disputes at Dispute Resolution Board (DRB) database is necessary to be adjusted to help the industry to benefit from past cases.

1.3. Research Objective

The purpose of this research is to identify, analyze and evaluate the current dispute reports in DRB database and develop a lessons learned document for FDOT.

1.4. Research Methodology

The flowchart shown in *Figure 1.1* outlines the phases of this research. A detailed explanation for each phase is presented in the introduction section of its respected chapter.

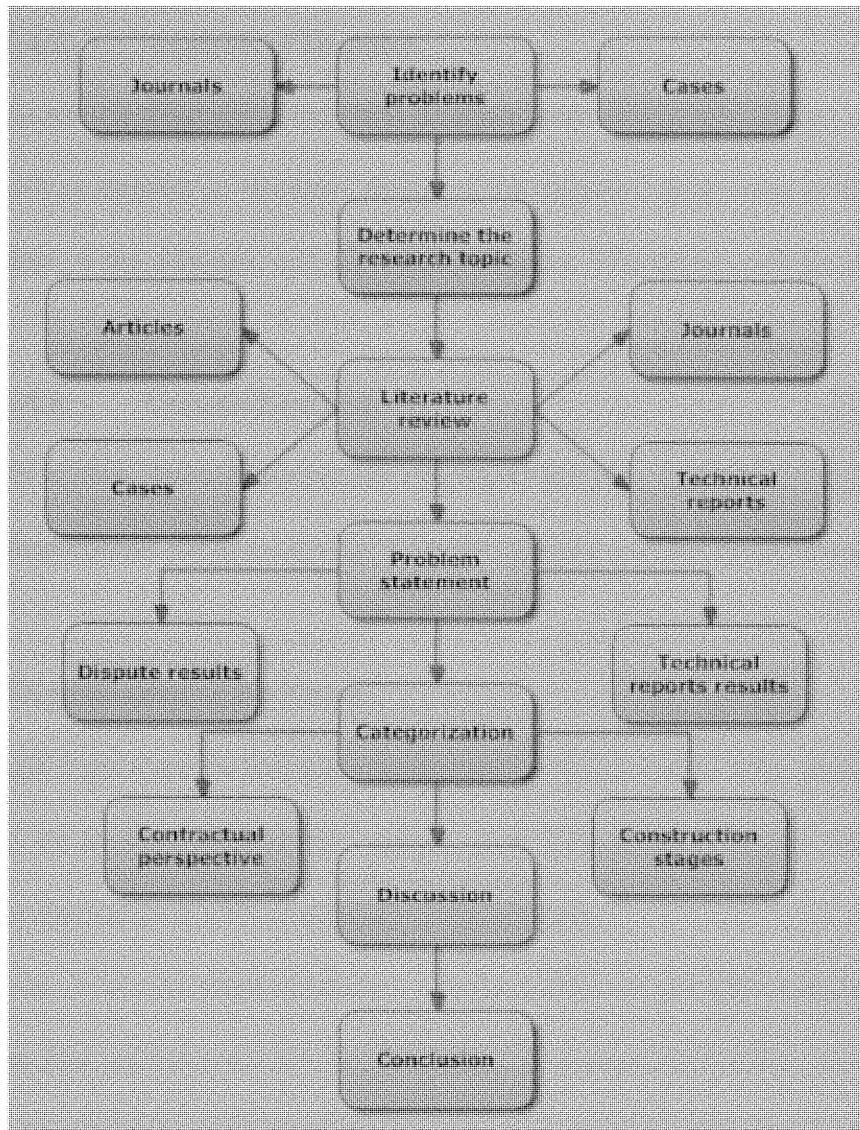


Figure 1: Research Methodology Outline

1.4.1. Literature Review

The first phase of the research methodology included a thorough literature review on disputes and lessons learned. The following resource mediums were used to perform the literature review: academic journals, technical reports, news articles, and online resources.

1.4.2. Analysis of Disputes

In this section, disputes in the DRB database were analyzed by taking into account the topics such as number of disputes, origin of the disputes, time value of the disputes, monetary value of the disputes, and the results of them. The details will be explained in chapter 3.

1.4.3. Lessons Learned

In this section, lessons learned are developed for each problem that may come up in every transportation projects during. Lessons learned will be explained in detail in chapter 4.

1.5. Organization of the Thesis

Chapter 2 presents the literature conducted for this research. This section includes an overview on lessons learned, the impact of lessons learned on the transportation projects. The section ends with a summary of the chapter.

Chapter 3 of the thesis provides categorization of the 262 disputes in DRB database. The first section provides introduction to 262 disputes of DRB cases. The next section provides the first categorization developed about lessons learned by considering contractual documents. The next section explores the modification to first categorization due to being still not user friendly. The next two sections provide the similar studies done in the previous two sections selecting a different perspective; project stages in transportation projects. The last section of the chapter provides a summary for the results.

The focus of Chapter 4 is the lessons learned. The first section is an introduction that provides an overview of lessons learned. The next section provides a detailed account of how the lessons learned were created. The majority of the chapter consists of the

lessons learned and the different elements associated with it. The last section in this chapter is a summary of the results.

Chapter 5 presents a summary of the thesis and a summary of the results. It presents the research contribution to the body of knowledge, provides limitations of the research and then ends with future research possibilities.

LITERATURE REVIEW

2.1. Introduction

H.S Richard (2002) mentioned that the construction business has recently appeared to be one of the most prone to problems and opposing ideas with disputes on construction projects. Schedule delays, material overruns, unexpected conditions can be the subject of expensive and protracted claims and litigation, and create serious risks for all parties to a construction project.

The first task in this research was to conduct a thorough literature review. The objectives of this literature review were to provide an overview of disputes, lessons learned, DRB concept, and solutions applied so far in decision making process of transportation business. Moreover, it targets to focus on evaluation of the impact that lessons learned have on decision making process. The following resources were used to achieve the presented objectives: academic journals, technical reports, news articles, and online resources.

2.2. Definition of Disputes

In the Longman dictionary dispute is defined as a serious argument or disagreement between two parties, either contractual or non contractual. In dictionary of law dispute is defined as a conflict of claims or rights. Dispute appears when one of the parties requests something from the other ones by referring to their contract and the request is not resolved.

Hibberd, Newman (1999) explained that a dispute takes place if there is a certain dissimilarity of opinion regarding the understanding and application of the contract.

In summary, disputes in a simplest way in principle is that it is a disagreement between groups of people of which either one or both of the parties involved in an agreement did not success to deliver the agreed work. The more detailed information about the disputes will be provided in the next chapter.

The strategy that will be used to categorize the disputes focuses on the primary knowledge of memory of stored cases recording specific prior cases. In addition to this, as Ernst and Young (2006) clarified in the survey that 91% believed that lessons learned on projects are critical, remembering what has been learned so far both from mistakes and successes will prevent the industry from repeating mistakes. The method is based on two principles. First, the world is regular: similar problems have similar solutions. Consequently, solutions for similar problems are a useful starting point for other cases. Second, the types of the problems an engineer encounters tend to recur. Therefore, future cases are likely to be similar to current cases. When the two principles hold, it is worth to remember and reuse current reasoning (Leake 1996).

In Case Based Reasoning (CBR), tasks are often divided into two classes, interpretive CBR and problem-solving CBR (e.g., Kolodner, 1993; Rissland, Kolodner, & Waltz, 1989). Interpretive CBR uses prior cases as reference point to classify or characterize new cases. The second class; problem solving CBR uses prior cases to suggest solutions that might be implement to new cases. Since each claim case is unique, prior cases will be used to form a judgment about or classification of a new case, by comparing and contrasting it with new cases that have already been classified (Ashley & Rissland, 1987). Also, Ashley (1990), Bain (1989), Branting (1991), Cuthill (1992) and Sanders (1994) stated that interpretive CBR played a fundamental role in interpreting

legal concepts. The method held in this research is similar to interpretive CBR. Basically, interpretive CBR consists of four steps.

First, the reasoner must perform situation assessment (Kolodner 1993; Owens 1991), to determine which features of the current situation are really relevant. In order to do that, it is necessary to categorize claims in the DRB database in an orderly manner.

Concerning the category for claim source classification there are many studies conducted on different topics; claim nature analysis and industrial experiences, court cases, contractual documents. Fenn et al (1997) summarized these research efforts conducted by some authors between the years 1991 and 1997 in construction business in the following table on the next page:

| Research Author | Sources of Conflicts and Disputes in Construction |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hewit (1991) | <ol style="list-style-type: none"> 1)change of scope 2)change conditions 3)delay 4)disruption 5)acceleration 6) termination |
| Watts and Scrivener (1993) | <ol style="list-style-type: none"> 1) determination of agreement 2) payment related 3) site and execution of work 4)time related 5) final certificate 6) tort |
| Rhys Jones (1994) | <ol style="list-style-type: none"> 1)management 2) culture 3) communication 4) design; 5) economics; 6) tendering pressures 7) law 8) unrealistic expectations 9) contracts 10) workmanship |
| Heath et al. (1994) | <ol style="list-style-type: none"> 1)contract terms 2) payment 3) variations 4) time 5) nomination 6) renomination 7) information. |
| Sykes (1996) | <ol style="list-style-type: none"> 1) misunderstandings 2) unpredictability |
| Semple et al. (1996) | <ol style="list-style-type: none"> 1) acceleration 2) access 3) weather 4) changes |
| Conlin et al. (1996) | <ol style="list-style-type: none"> 1) payment 2) performance 3)delay 4)negligence 5)quality 6) administration. |

Table 1: Claim Resource Classification between 1991 and 1997

After 1997, Kumaraswamy and Yogeswaran (1998), Yate (1998) and Bristow (1998) indicated the reasons of the construction disputes in the following figure:

IMPORTANT REASONS FOR DISPUTES

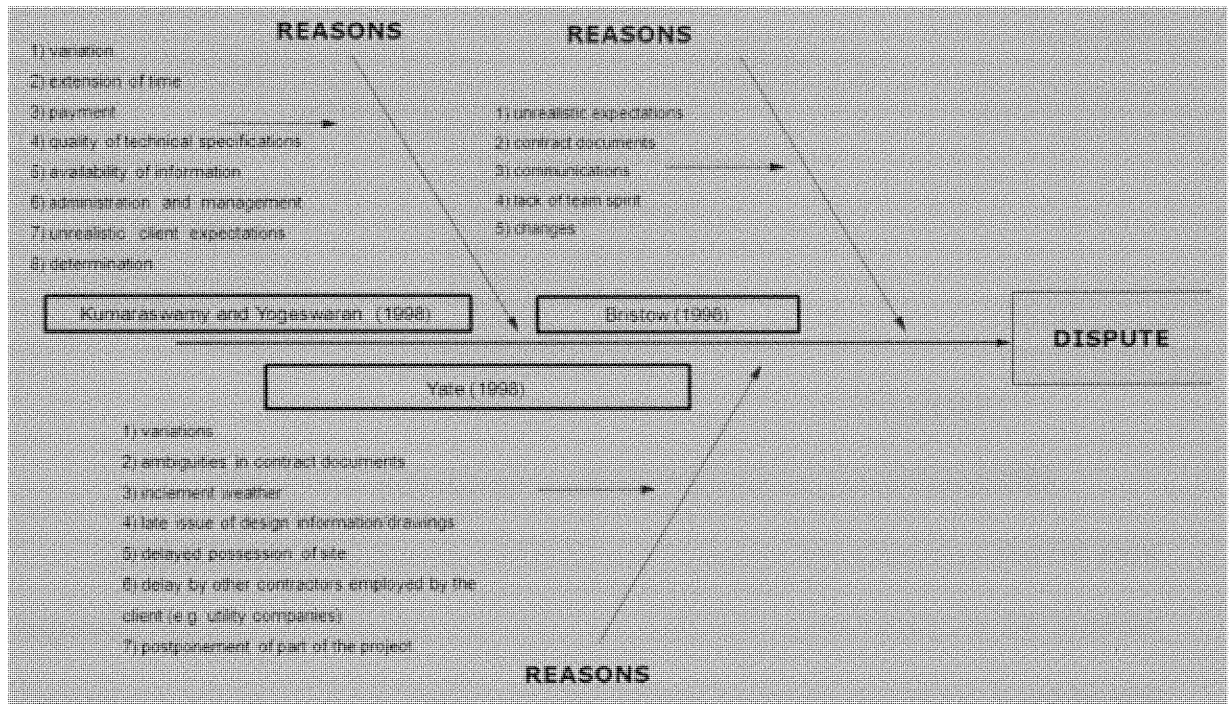


Figure 2: Claim Resource Classification in year 1998

From 2002 to 2006 several researches were conducted to classify the factors that drive the development of the disputes. The following table illustrates these studies:

IMPORTANT REASONS FOR DISPUTES

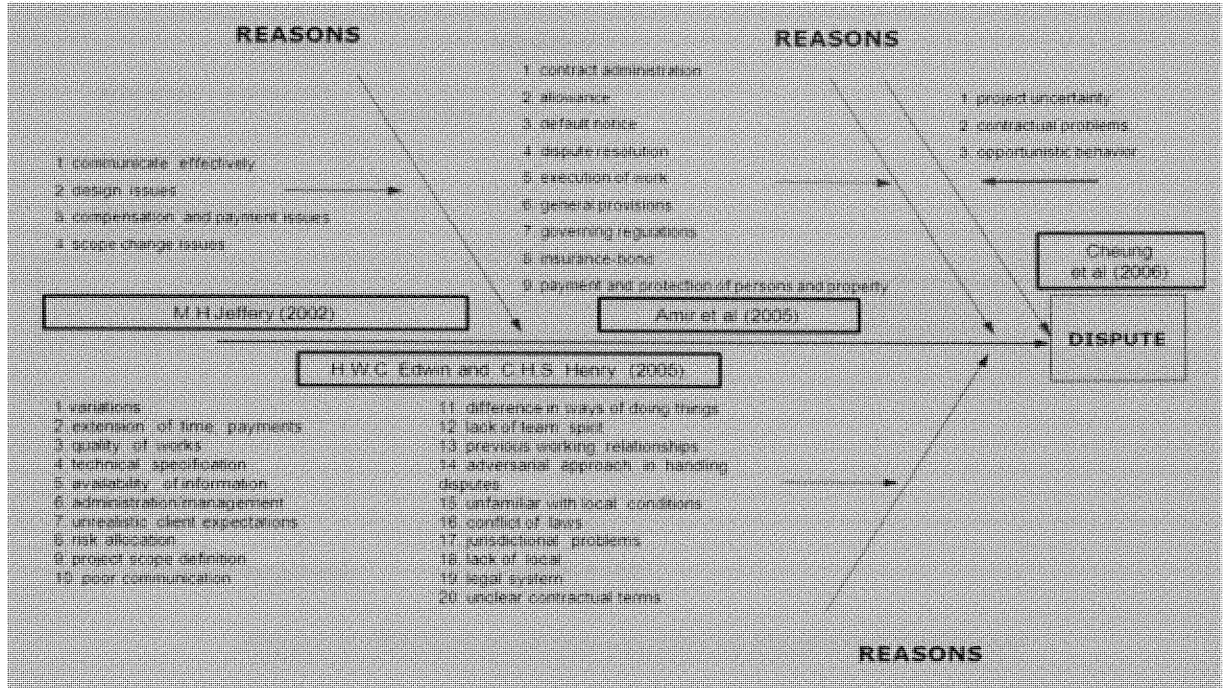


Figure 3: Claim Resource Classification between 2002 and 2006

In addition to those reasons for dispute, some researchers pinpointed that the most important reasons for disputes are observed from the inconsistency in the contract document. Each has different reasons for this dispute, however, in general, it can be said that these group of researchers defend the idea that inconsistencies often are the cause of disputes since each party will favor the interpretation that better suits his or her position. The following table shows the reasons of different researchers for this dispute.

DISCREPANCY IN CONTRACT DOCUMENTS

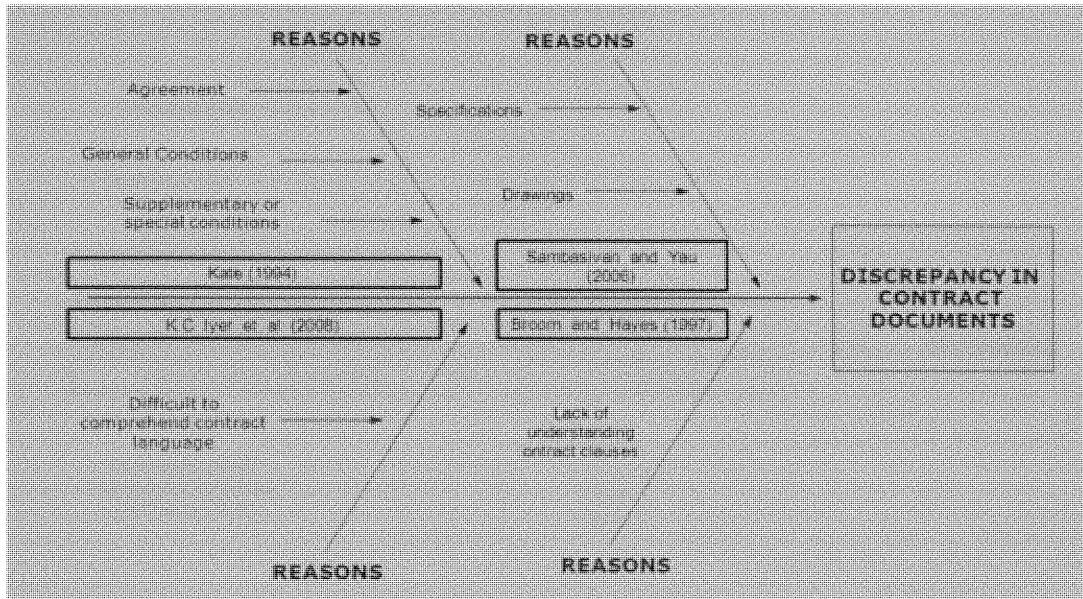


Figure 4: Resources of Discrepancy in Contract Documents

Moreover, Ameer Ali (2005) stated that payment is the lifeblood of the construction projects. The reason for this is because construction projects require a lot of money to be done. In addition to Ameer Ali (2005), Murdoch J and Hughes (2000) stated undoubtedly the most important of all obligations is to pay the Contract Sum. In the following figure, the researchers and their reasons for this payment issue is illustrated.

IMPORTANT REASONS FOR DISPUTES REGARDING PAYMENT

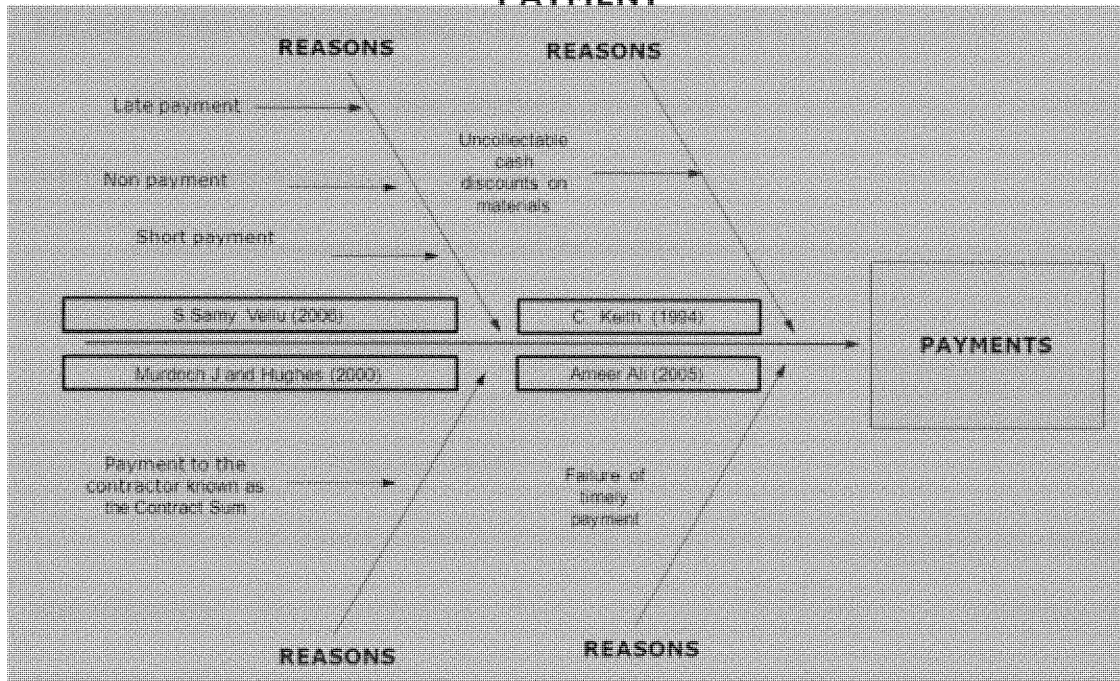


Figure 5: Reasons for Disputes Regarding Payment

Another important item for construction disputes is named as variation. At the time of tender, the design of the project is rarely completed in detail because; it is highly possible to have some changes during the construction. Therefore, items in the contractual documents may be changed means that the design team may not be required to complete their design until a very late phase. K.S Harban Singh (2003) pinpointed that result of such changes both in terms of the financial and the legal aspects can be a major basis of disagreement between the contracting parties.

The second step of CBR is based on the results of situation assessment; the reasoner retrieves a relevant prior case or prior cases. For this step, it should be verified that all cases in the database are included in the CBR system (collectively exhaustive) and each case is to be placed under a specific category (i.e.: stages of construction; foundation

etc.) so all new cases can be compared and most relevant one can be retrieved efficiently. For this, a CBR technique will be used after reviewing all available techniques.

Third, the reasoner then compares those cases to the new situation, to determine which interpretation applies.

Finally, the current situation and the interpretation are then saved as a new case on which to base future reasoning.

2.3. Dispute Resolution Board Concept

2.3.1. What is DRB?

CEOs of profitable construction projects resolve claims and disputes adequately and efficiently. Some participants having the right combination of leadership skills, technical ability, business shrewdness, and interpersonal skills to resolve disputes among themselves take place in some number of projects. Other projects are cursed with problems and claims which are unfriendly and complicated to resolve. Most projects are in these two extremes. Owners beginning a construction project need to develop a technique for resolving the range of claims they might confront during the execution of a project. One of the most effective ways is the DRB. The DRB is a panel of three impartial reviewers formed at the beginning of the project to monitor the progress in the construction site, support to avoid disputes, and help to find solution of the disputes during the execution of the project.

The board provides the parties with a fair environment and an enlightened and rational basis for finding a solution for their disputes. The Board has knowledge and experience with (1) the design and construction steps pertaining to the project, (2) the construction ways and means used on the project, (3) the analysis and application of the

contract documents, and (4) other processes of dispute resolution. Since DRB recommendations are non-bonding, the parties remain in control of the ultimate decision.

2.3.2. How does DRB work?

The Board is formed before site work commences and meets at the jobsite periodically. One of the three impartial professionals is selected by the owner with the confirmation of the contractor, one of them is selected by the contractor with the confirmation of the owner and the last one is selected with the agreed decision of the both the contractor and the owner. The board chooses one as chair with the approval of the contractor and the owner. The contract documents are given to the board in order to make the board familiar with the procedures of the project. The board meets with owner and contractor representatives during regular site visits and encourages the resolution of disputes at the job level. The three professionals in the board help the parties prevent disputes before they lead to major problems.

When a solution cannot be found by the parties for a dispute falling from the job site or the contract, the case can be transferred to the DRB. By the time the DRB comes up with a recommendation, it reviews the hearings received from the parties at which each party explains its position for the case. In arriving at a recommendation, the DRB considers the relevant contract documents, correspondence, other documentation, and the particular circumstances of the dispute.

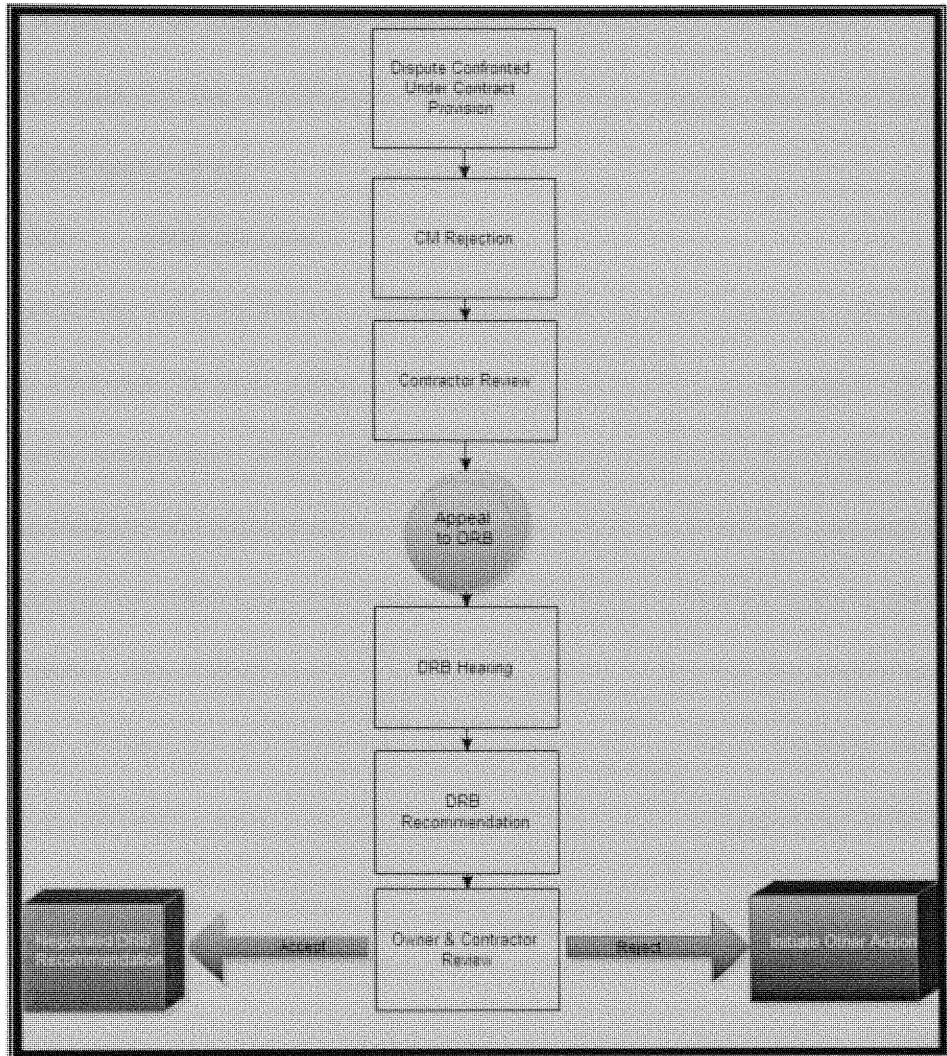


Figure 6: DRB Process

The result includes a written, non-binding recommendation for resolution of the dispute. The DRB report consists of an explanation of the Board's evaluation of the facts, contract provisions and the reasons that led to its conclusion. Depending on the confidence in DRB member's technical knowledge, earliest understanding of the project conditions, and practical judgment; as well as by the parties opportunity to be heard, acceptance or denial of the recommendation can be observed. Although the board recommendation for resolution of a dispute is non-binding excluding the incentive and

disincentive projects, the DRB is the most effective process if the contract language includes a provision for the eligibility of a DRB recommendation into any following arbitration or legal proceeding.

2.3.3. DRB Benefits

All parties on the construction project and to the project itself benefit from the DRB process in terms of both claim avoidance and resolution of disputes. The first benefit is claim avoidance. With the help of selected three professionals that are technically knowledgeable and experienced, the job site is monitored regularly and in case of a disagreement, the DRB team can handle the problem just in time before something serious takes place. The readily accessible dispute resolution process that uses a team of equally chosen, technically well-informed and skilled professionals familiar with the project tends to promote agreement on problems that would otherwise be referred to arbitration or litigation after a long and harsh period of posturing. It is established that the DRB process creates positive relations, open communication, and the trust and collaboration that is essential for the parties to resolve troubles harmoniously. Quite a lot of reasons for this consequence are, counting: (1) the parties are unwilling to posture by taking tenuous or extreme positions, since they do not want to lose their trustworthiness with the DRB members and (2) since the Board encourages the punctual recommendation of disputes and handles disputes on an personal basis, the collection of claims is minimized, therefore avoiding accumulation of unresolved claims that can generate an ambiance which fosters acrimony.

The second benefit is that the Board encourages the parties to resolve claims and disputes without delay, professional way. The Board members request for the possible

problems and the status report of claims during the meetings held periodically. The Board encourages the parties to center on early identification and resolution of problems. Many cases illustrated that the parties resolve the problems and disputes by referring to the Board in an informal way.

It is found that the DRB process is more successful than any other technique of alternative dispute resolution for construction disputes. Success rate is very high (98% until 2007) in resolving disputes without appealing to litigation (DRB Manual, 2007). There are numerous factors for this statistic. First, the Board consists of members having knowledge and experience with (a) relevant design and construction processes to the project, (b) means and methods engaged on the project, (c) the appliance of contract documents, and (d) additional processes of dispute resolution. Since recommendation of the Board is non-binding excluding incentive and disincentive projects, the parties stay in control of the final decision. Next, when compared with the other dispute resolution techniques such as litigation and arbitration, the DRB process is extremely cheap. Next, The Board addresses the disputes as soon as a deadlock appears between the parties. Early resolution of disputes permits the parties to avoid the high expense and unpredictability of post project litigation. In addition to this, owners and contractors will avoid unproductive moments in the project lifecycle. While other methods for resolving disputes exist, none of them have the advantage of independent, knowledgeable professionals who visit the site during performance of the project.

2.3.4. DRB Limitations

Sometimes, there are some restrictions for the Board to control technical issues as different from matters requiring the application or understanding of the general and

supplementary items and special provisions of the contract. The DRB team can deal with all problems if they are allowed to do so in the contract. In other words, the team can not go beyond the contract provisions.

2.4. Lessons Learned

2.4.1. What are Lessons Learned?

Throughout the construction of any facility knowledge is obtained and lessons are learned both from positive experiences and negative experiences through several resources; passive collection, reactive collection, after action collection, action collection, anonymous collection etc. As time passes, those people involved in construction life cycle have the chance to collect a plenty of knowledge, some of which is hardly gained. Purpose of using lessons learned is to support promoting recurrence of successful outcomes, and precluding the recurrence of unsuccessful outcomes. However, how many of these lessons, learned at great human or financial cost, are transferred in between projects and in between persons? Unluckily, very few organizations can claim they have an effective Lessons Learned process that spans their global project operations. Survey done by Ernst and Young (2006) revealed that, although 91% of the respondents believed Lessons Learned reviews on projects were important, only 13% said their organizations performed them on all projects and only 8% believed the primary objective of the reviews was to understand the benefits that would accrue to the organization.

2.4.2. Lessons Learned Barriers

In the field of transportation, the lessons learned from claims are kept in DRB database. The application of lessons learned gained from previous cases to other/new cases is rare, supporting the survey results conducted by Ernst and Young (2006). It can

be seen that, there are some barriers that prevent effective implementation of lessons learned. These barriers are: (i) too general to be passed from one case to another, (ii) ambiguous, not mutually exclusive and collectively exhaustive to implement, (iii) not typically linked to project stage, (iv) lacking of a meaningful classification system, (v) difficulty in integrating new systems into existing procedures and operations, (vi) unmanageable format that limits access, retrieval, and updating of the potentially enormous volume of lessons etc. (Marlin, 2008).

2.4.3. Lessons Learned Benefits

To overcome these problems mentioned in the barriers part, traditional (existing) methods to implement lessons learned to projects will be edited to help the industry benefit from them more effectively. Spilsbury, Perch, Norgbey, Rauniyar, and Battaglino (2007) stated that lessons learned provide many benefits if used effectively. These benefits can be mentioned as follows; lessons learned allow other practitioners to learn from previous experience and avoid reinventing the wheel. They help stakeholders at different levels understand the relevance of other activities, and achievements, thus improving collaboration and co-ordination. Moreover, lessons inform decision-makers to help avoid common mistakes and help promote a more enabling environment.

2.4.4. Review of Lessons Learned

Professional evaluators in United Nations Environmental Programme (UNEP, January, 2007) developed 'minimum quality criteria' for evaluation of lessons. A quality lesson must concisely capture the context from which it is derived, must be applicable in a different context (generic), have a clear 'application domain'.

Approximately two hundred and sixty two reports from DRB database produced between 1994 and 2008 were reviewed against the above criteria. The main aim while developing lessons is to match these criteria. This categorization will be explained in the next chapter.

2.4.5. Who Are the Users of Lessons Learned?

The lessons learned targets a wide range of users. From automotive industry, to marketing, from construction industry to agriculture industry, lessons can be learned from the large-scale marshalling of people both from positive or negative moments. The lessons learned collected from the diverse perspectives of different projects can help the parties to promote the recurrence of successful outcomes and preclude the recurrence of unsuccessful outcomes in the future.

2.5. Parties: Florida Department of Transportation (FDOT) and The Contractor

Fenn et al. (1997) stated that for years there are disagreements between the owners and the contractors. For transportation business in Florida, for government projects Florida Department of Transportation (FDOT) is the owner. The Florida Department of Transportation is established to serve the Florida state of United States by guaranteeing a fast, safe, efficient, accessible and convenient transportation system that meets critical national interests and improves the quality of life of the people. With the responsibility for shaping and administering policies and programs to protect and improve the safety, suitability, and efficiency of the transportation system and services, FDOT is one of the capital agencies in the federal government.

Predictably, each party's priorities are at conflict with the others, establishing a recurring cycle of fighting. Howard et al. (1997) stated the differences in between the parties. In owner's perspective, the aim in the project is to obtain maximum quality, functionality and capacity while keeping the cost at minimum. On the contractor's side, the purposes are to build up a satisfied client, to achieve financial goals in long run which can be established by keeping the resources used in the site minimum to meet the minimum required scope of work.

2.6. Summary

The literature review provided the basics for understanding the rest of the thesis content. The review covered the following areas: overview of disputes, lessons learned, dispute resolution board (DRB) and the parties involved in the project. The following resources were used to achieve the presented objectives: academic journals, technical reports, news articles, and online resources.

Two facts that form the basis of the thesis were revealed after completing the literature review: the lack of organization of the disputes, related reasons and results causes inefficient use of lessons learned from these experiences in construction industry. In addition to this, a research about lessons learned especially in transportation projects has not been studied yet. The state-of-practice of lessons learned usage in the transportation business is needed. There were two major shortcomings with this research as it related to construction practitioners: 1) the categorization of disputes did not have a certain form for users to place the new cases in future and 2) the lessons learned were not studied to help the industry promote the recurrence of the successful outcomes and prohibit the unsuccessful outcomes.

DISPUTE CHARACTERISTICS

3.1. Introduction

In this chapter, a detail analysis of 262 DRB disputes and results will be shown and elaborated by using frequency analysis, tables, and pie chart for each district. Data is analyzed and interpreted as presented to achieve the objectives of the study.

3.2. Characteristics of Disputes

3.2.1. Data & Information

Relevant data and information are gathered to establish the connections between broad ranges of subjects in this research. DRB database is used to collect the relevant information for the disputes. In this section 262 disputes in DRB database will be analyzed. All disputes are issued by the contractors to DRB to be resolved except one. The following table illustrates the number of disputes coming from each dispute.

| | <i>Number of Disputes</i> |
|-------------------|---------------------------|
| <i>District 1</i> | 75 |
| <i>District 2</i> | 14 |
| <i>District 3</i> | 8 |
| <i>District 4</i> | 19 |
| <i>District 5</i> | 40 |
| <i>District 6</i> | 2 |
| <i>District 7</i> | 58 |
| <i>District 8</i> | 46 |

Table 2: Number of Disputes in Each District

As it can be seen from the table, District 1 has the most number of the disputes in the DRB data base with 75 disputes. The second one is District 7 and the third one is District 8 with the numbers 58 and 46 respectively.

The subsequent table shows the number of disputes under general characteristics of material, quality, safety, plans & specifications, construction methods, equipment, third party hindrance, quantity variation, unforeseen conditions and the permit issues.

| <i>Characteristics</i> | <i>Number of Disputes</i> |
|------------------------|---------------------------|
| Material | 32 |
| Quality | 3 |
| Safety | 4 |
| Plans & Specifications | 43 |
| Construction Methods | 22 |
| Equipment | 2 |
| Third Party Hindrance | 21 |
| Quantity Variation | 58 |
| Unforeseen Conditions | 67 |
| Permit | 10 |
| <i>TOTAL</i> | <i>262</i> |

Table 3: Number of Disputes under General Characteristics

FDOT (Owner) often tries to utilize construction contract language to assign responsibility for unforeseen conditions among themselves, contractors, and designers. However, here, it can be observed that sixty seven disputes (%26) are under unforeseen conditions. Using the data from several recent studies, it is revealed that the actual contract language used is for the most part unrelated to the actual costs borne by FDOT and contractors. To avoid disputes related with unforeseen conditions, interpretive approach and early resolution of disputes are required (Halligan et al. 1987). To do so, lessons learned can be used to resolve similar disputes by comparing with the previous cases and results. The detailed information about unforeseen conditions and related lessons learned will be provided in the next chapter. Quantity variation is the second most encountered dispute characteristic with fifty eight disputes (%22). The third dispute is plans and specifications with forty three disputes (%16).

In the following tables the analysis of the disputes are shown. The first analysis is based on the party that issued the case to DRB. As it can be seen from the table all disputes were issued to DRB by the contractors besides one. There was not a big gap between the parties that won the cases after DRB results. Out of 262 disputes, the contractors won 119 (% 45.42) times while FDOT won 133 (% 50.76). In addition to these numbers, ten times (% 3.82) the disputes were concluded in negotiation.

| <i>Claimer</i> | |
|-------------------|------------|
| <i>Contractor</i> | 261 |
| <i>Owner/FDOT</i> | 1 |

| <i>Winner</i> | |
|----------------------------------------|-----------------|
| <i>Contractor</i> | 119 |
| <i>Owner/FDOT</i> | 133 |
| <i>Negotiate</i> | 10 |
| <i>% of Winning (FDOT perspective)</i> | 50.76336 |
| | 45.41985 |
| <i>% of Negotiation</i> | 3.816794 |

Table 4: Analysis of Disputes Regarding Claimer and Winner

In the next table the monetary value and time value of the disputes are shown. As it can be seen from the table, all disputes did not have a specified monetary value or time value on the dispute reports. Therefore, most of the disputes could not be analyzed for these aspects. The monetary value of the disputes revealed that 188 disputes (%72) did not have any monetary specified. The remaining seventy four reports were placed under the ranges from \$0-\$49,999 to \$150,000 & above. On the other hand, the time value of the disputes shown that 185 disputes (%71) did not have a specific time value. The remaining seventy seven disputes are located under the ranges from 0-25 days to 76 day & above. The results are as follows:

| <i>Monetary Value of Disputes</i> | |
|-----------------------------------|------------|
| <i>0-\$49,999</i> | 39 |
| <i>\$50,000-\$99,999</i> | 13 |
| <i>\$100,000-\$149,000</i> | 7 |
| <i>\$150,000 & above</i> | 15 |
| <i>N/A</i> | 188 |

| <i>Time Value of Disputes</i> | |
|-------------------------------|------------|
| <i>0-25days</i> | 43 |
| <i>26days-50days</i> | 9 |
| <i>51days-75 days</i> | 12 |
| <i>76 days & above</i> | 13 |
| <i>N/A</i> | 185 |

Table 5: Analysis of Disputes Regarding Monetary and Time Value

The next Venn diagram shows information about the disputes in terms of monetary and time values. The results are as follows:

| | <i>Time</i> | <i>Money</i> | <i>Time&Money</i> | <i>Not Specified</i> |
|---------------------------|-------------|--------------|-----------------------|----------------------|
| <i>Number of Disputes</i> | 77 | 74 | 51 | 162 |

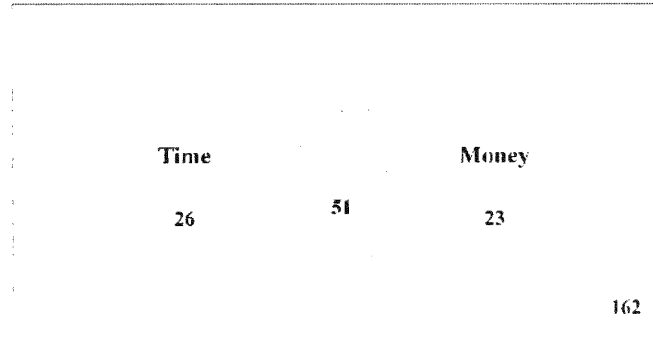


Figure 7: Analysis of Disputes Regarding Monetary and Time Value

3.2.2. Data Analysis

The data were categorized under different variables to represent the result of the research objectives. Analysis of data according to different objectives was done by statistical method; frequency analysis. For graphic result presentation, tables, and pie

charts are used as summaries. In addition to this, money and time claimed in these disputes are studied and the results of these studies are provided in the pie-chart in the following pages.

3.2.2.1. District 1

This district consists of sixty six disputes. All of the disputes are numbered. This will help the user to find more detail in the dispute document for a desired type of dispute. Number fifty six and fifty seven are the expanded version of number fifty five. Therefore these two documents are excluded from district one so as not to be counted twice.

3.2.2.1.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #1.

| Characteristics | Number | % |
|------------------------|---------------|------------|
| Material | 3 | 4 |
| Quality | | 0 |
| Safety | | 0 |
| Plans & Specifications | 13 | 17.333 |
| Construction Methods | 2 | 2.6667 |
| Equipment | 1 | 1.3333 |
| Third Party Hindrance | 10 | 13.333 |
| Quantity Variation | 13 | 17.333 |
| Unforeseen Conditions | 30 | 40 |
| Permit | 3 | 4 |
| TOTAL | 75 | 100 |

Table 6: Frequency Analysis Result for District 1

3.2.2.1.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| | |
|----------------|-----------|
| Claimer | |
| Contractor | 75 |
| Owner/FDOT | 0 |

| | |
|---------------------------------|----------------|
| Winner | |
| Contractor | 43 |
| Owner/FDOT | 32 |
| | |
| % of Winning (FDOT perspective) | 42.6667 |
| | 57.3333 |

| | |
|------------------------------|-----------|
| Money Claimed | |
| 0-\$49,999 | 18 |
| \$50,000-\$99,999 | 4 |
| \$100,000-\$149,000 | 3 |
| \$150,000 & above | 2 |
| N/A | 48 |

| | |
|--------------------------|-----------|
| Time Claimed | |
| 0-25days | 18 |
| 26days-50days | 3 |
| 51days-75 days | 7 |
| 76 days and above | 0 |
| N/A | 47 |

Table 7: Winner-Loser, Money-Time Results for District 1

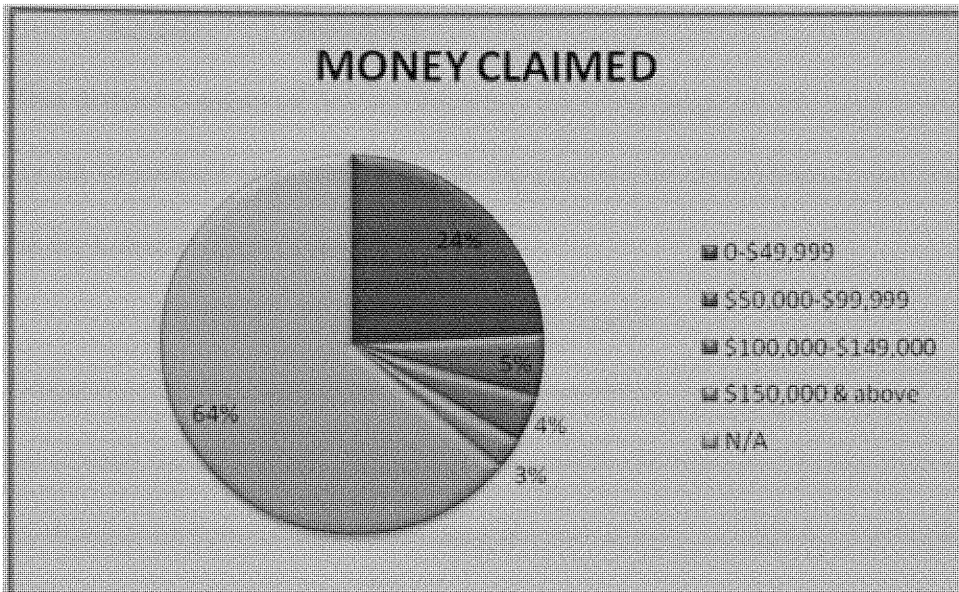


Figure 8: Money Claimed for District 1

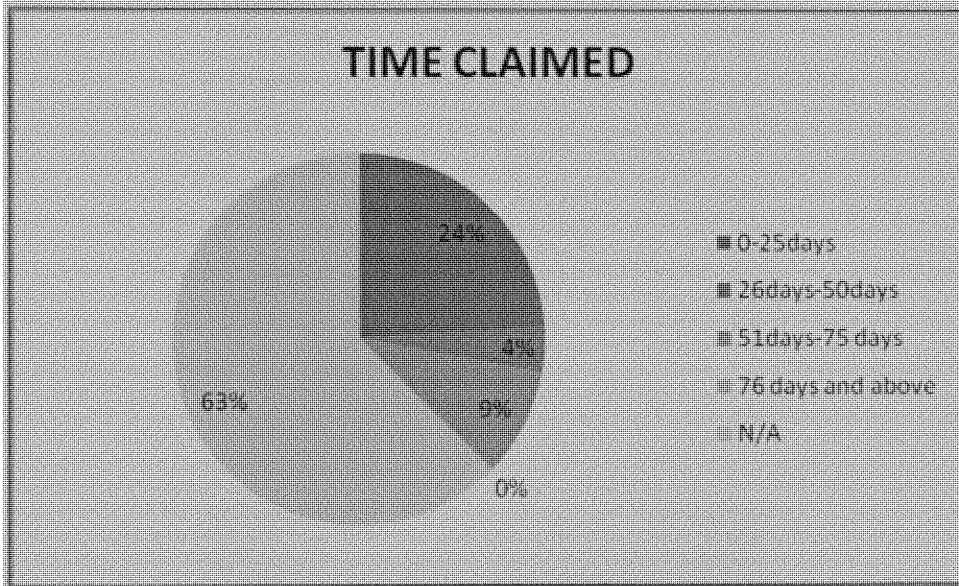


Figure 9: Time Claimed for District 1

3.2.2.2. District 2

This district consists of thirteen disputes. All of the disputes are numbered starting from sixty six to seventy nine. This will help the user to find more detail in the dispute document for a desired type of dispute.

3.2.2.2.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #2.

| <i>Characteristics</i> | <i>Number</i> | <i>%</i> |
|-------------------------------|----------------------|---------------------|
| Material | <i>3</i> | 4 |
| Quality | | 0 |
| Safety | | 0 |
| Plans & Specifications | <i>1</i> | 1.3333 |
| Construction Methods | <i>4</i> | 5.3333 |
| Equipment | | 0 |
| Third Party Hindrance | | 0 |
| Quantity Variation | <i>4</i> | 5.3333 |
| Unforeseen Conditions | <i>1</i> | 1.3333 |
| Permit | <i>1</i> | 1.3333 |
| TOTAL | <i>14</i> | <i>18.67</i> |

Table 8: Frequency Analysis Result for District 2

3.2.2.2.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and

time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|----------------|-----------|
| Contractor | 14 |
| Owner/FDOT | 0 |

| <i>Winner</i> | |
|---------------------------------|--------------------|
| Contractor | 10 |
| Owner/FDOT | 4 |
| | |
| % of Winning (FDOT perspective) | 28,57142857 |
| | 71,42857143 |

| <i>Money Claimed</i> | |
|------------------------------|----------|
| <i>0-\$49,999</i> | 2 |
| <i>\$50,000-\$99,999</i> | 1 |
| <i>\$100,000-\$149,000</i> | 1 |
| <i>\$150,000 & above</i> | 1 |
| <i>N/A</i> | 9 |

| <i>Time Claimed</i> | |
|--------------------------|-----------|
| <i>0-25days</i> | 1 |
| <i>26days-50days</i> | 1 |
| <i>51days-75 days</i> | 1 |
| <i>76 days and above</i> | 0 |
| <i>N/A</i> | 11 |

Table 9: Winner-Loser, Money-Time Results for District 2

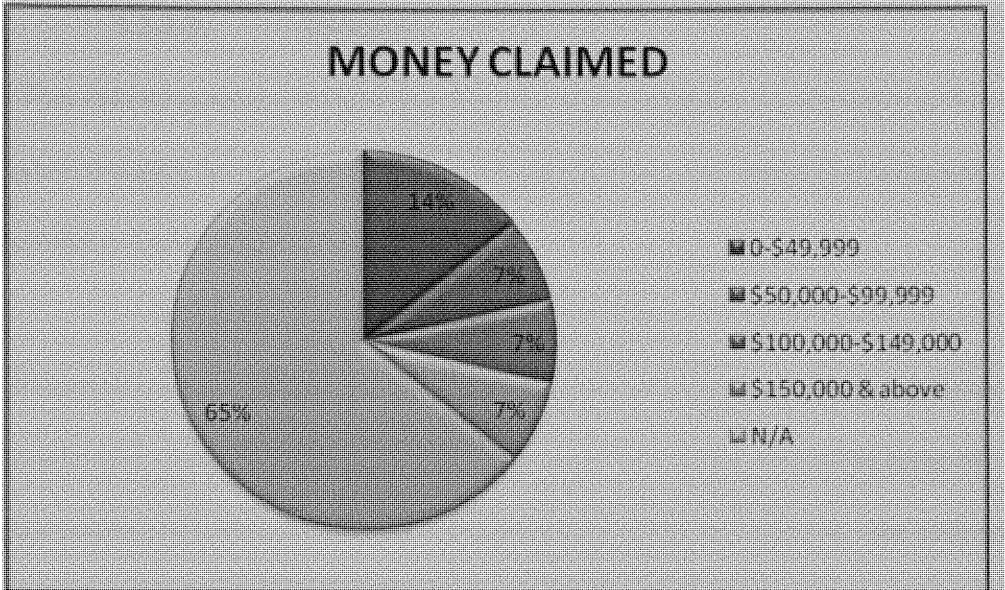


Figure 10: Money Claimed for District 2

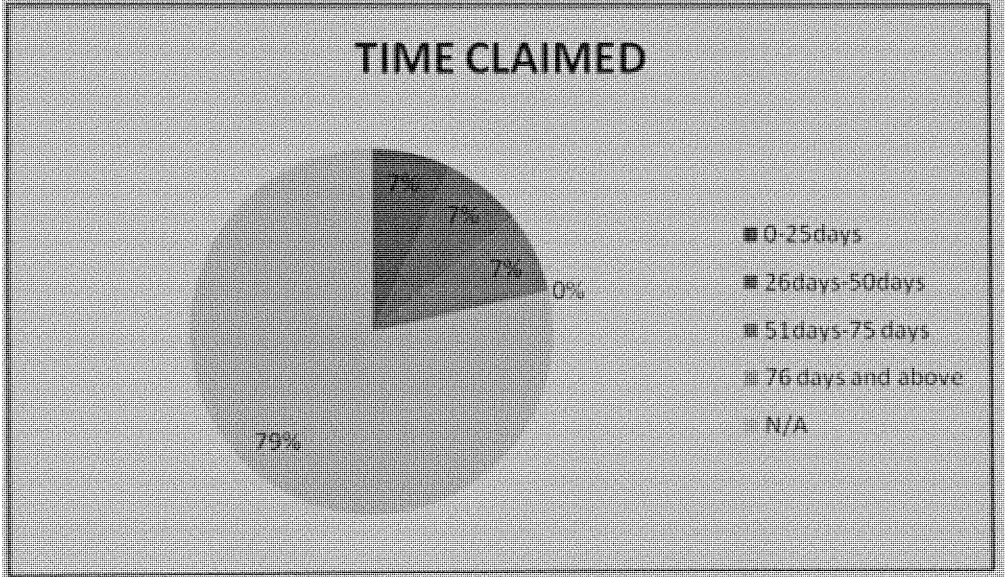


Figure 11: Time Claimed for District 2

3.2.2.3. District 3

This district consists of eight disputes. All of the disputes are numbered starting from eighty to eighty seven. This will help the user to find more detail in the dispute document for a desired type of dispute.

3.2.2.3.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #3.

| Characteristics | Number | % |
|------------------------|-----------------|-------------------|
| Material | <i>1</i> | 12.5 |
| Quality | | 0 |
| Safety | | 0 |
| Plans & Specifications | <i>1</i> | 12.5 |
| Construction Methods | | 0 |
| Equipment | | 0 |
| Third Party Hindrance | <i>1</i> | 12.5 |
| Quantity Variation | <i>2</i> | 25 |
| Unforeseen Conditions | <i>3</i> | 37.5 |
| Permit | | 0 |
| TOTAL | <i>8</i> | <i>100</i> |

Table 10: Frequency Analysis Result for District 3

3.2.2.3.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and

time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|-------------------|----------|
| <i>Contractor</i> | 7 |
| <i>Owner/FDOT</i> | 1 |

| <i>Winner</i> | |
|----------------------------------------|--------------------|
| <i>Contractor</i> | 6 |
| <i>Owner/FDOT</i> | 1 |
| | 1 |
| <i>% of Winning (FDOT perspective)</i> | 14.28571429 |
| | 85.71428571 |

| <i>Money Claimed</i> | |
|------------------------------|----------|
| <i>0-\$49,999</i> | 1 |
| <i>\$50,000-\$99,999</i> | 0 |
| <i>\$100,000-\$149,000</i> | 0 |
| <i>\$150,000 & above</i> | 3 |
| <i>N/A</i> | 4 |

| <i>Time Claimed</i> | |
|--------------------------|----------|
| <i>0-25days</i> | 0 |
| <i>26days-50days</i> | 1 |
| <i>51days-75 days</i> | 1 |
| <i>76 days and above</i> | 2 |
| <i>N/A</i> | 4 |

Table 11: Winner-Loser, Money-Time Results for District 3

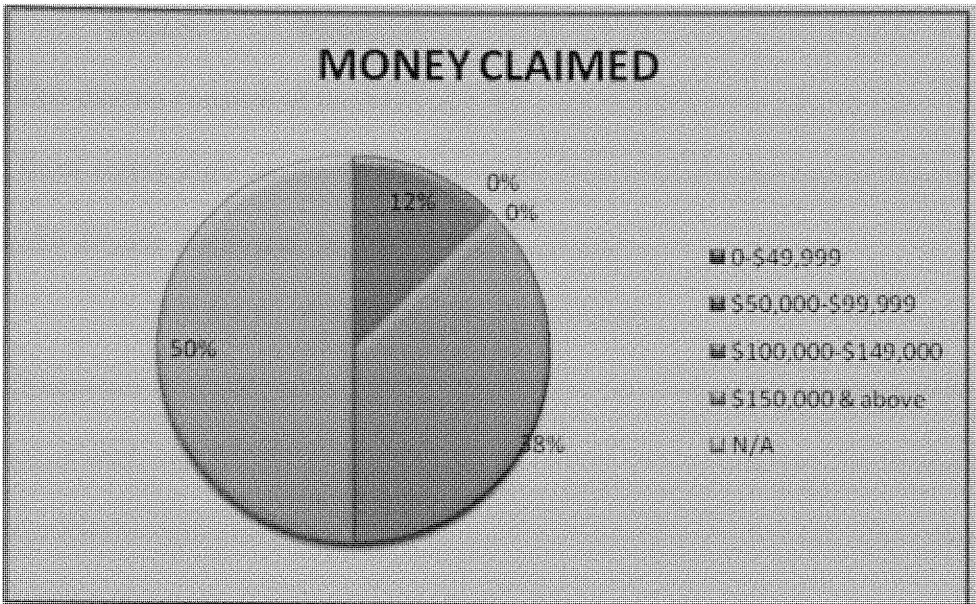


Figure 12: Money Claimed for District 3

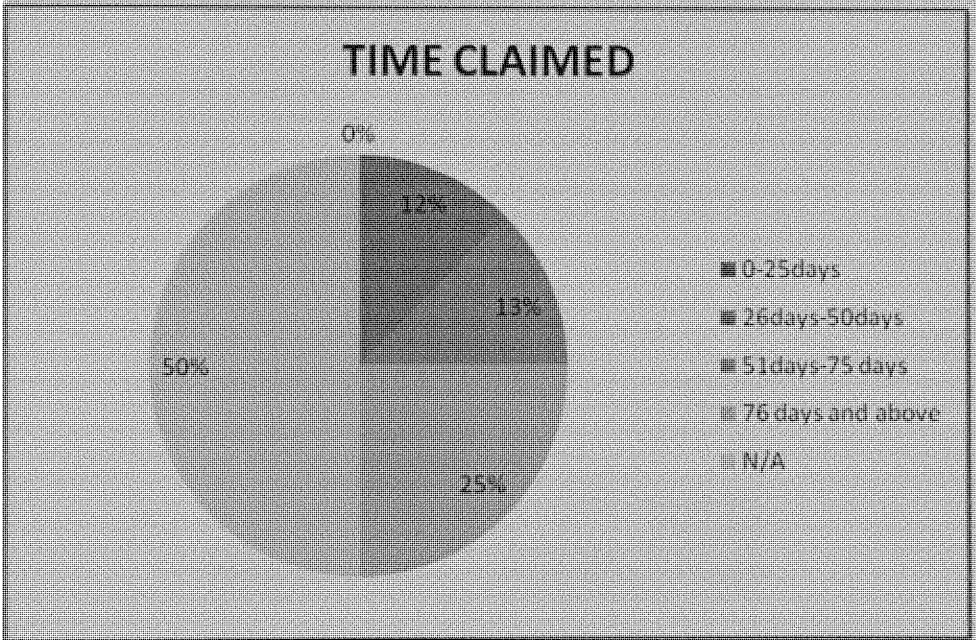


Figure 13: Time Claimed for District 3

3.2.2.4. District 4

This district consists of fourteen disputes. All of the disputes are numbered starting from eighty eight to one hundred and one. This will help the user to find more detail in the dispute document for a desired type of dispute.

3.2.2.4.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #4.

| Characteristics | Number | % |
|------------------------|---------------|------------|
| Material | 2 | 10.526 |
| Quality | | 0 |
| Safety | 2 | 10.526 |
| Plans & Specifications | 2 | 10.526 |
| Construction Methods | | 0 |
| Equipment | | 0 |
| Third Party Hindrance | 1 | 5.2632 |
| Quantity Variation | 7 | 36.842 |
| Unforeseen Conditions | 4 | 21.053 |
| Permit | 1 | 5.2632 |
| TOTAL | 19 | 100 |

Table 12: Frequency Analysis Result for District 4

3.2.2.4.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and

time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|-------------------|-----------|
| <i>Contractor</i> | 19 |
| <i>Owner/FDOT</i> | 0 |

| <i>Winner</i> | |
|----------------------------------------|--------------------|
| <i>Contractor</i> | 4 |
| <i>Owner/FDOT</i> | 15 |
| <i>% of Winning (FDOT perspective)</i> | 78,94736842 |
| | 21,05263158 |

| <i>Money Claimed</i> | |
|------------------------------|-----------|
| <i>0-\$49,999</i> | 2 |
| <i>\$50,000-\$99,999</i> | 0 |
| <i>\$100,000-\$149,000</i> | 0 |
| <i>\$150,000 & above</i> | 1 |
| <i>N/A</i> | 16 |

| <i>Time Claimed</i> | |
|--------------------------|-----------|
| <i>0-25days</i> | 0 |
| <i>26days-50days</i> | 0 |
| <i>51days-75 days</i> | 0 |
| <i>76 days and above</i> | 1 |
| <i>N/A</i> | 18 |

Table 13: Winner-Loser, Money-Time Results for District 4

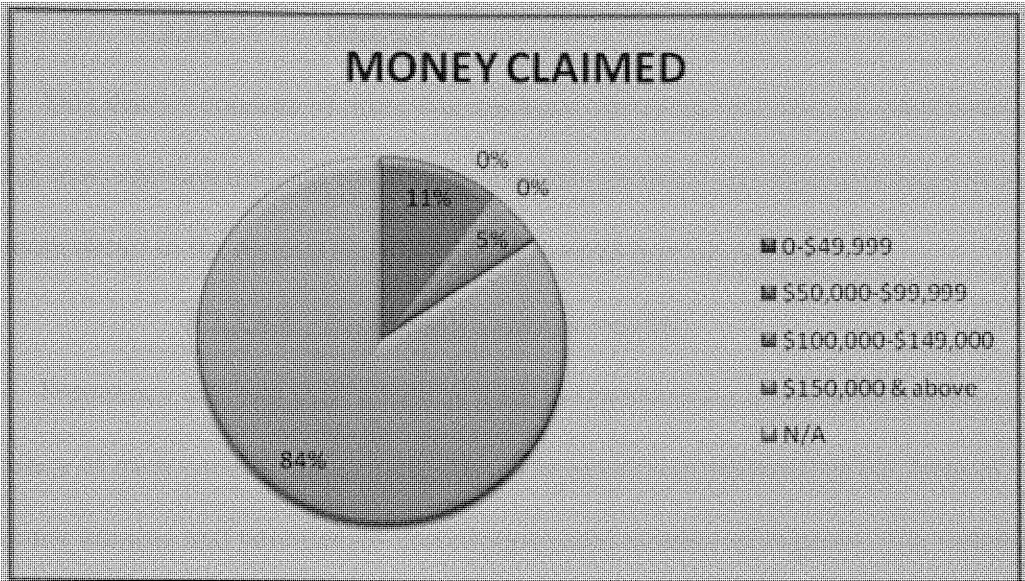


Figure 14: Money Claimed for District 4

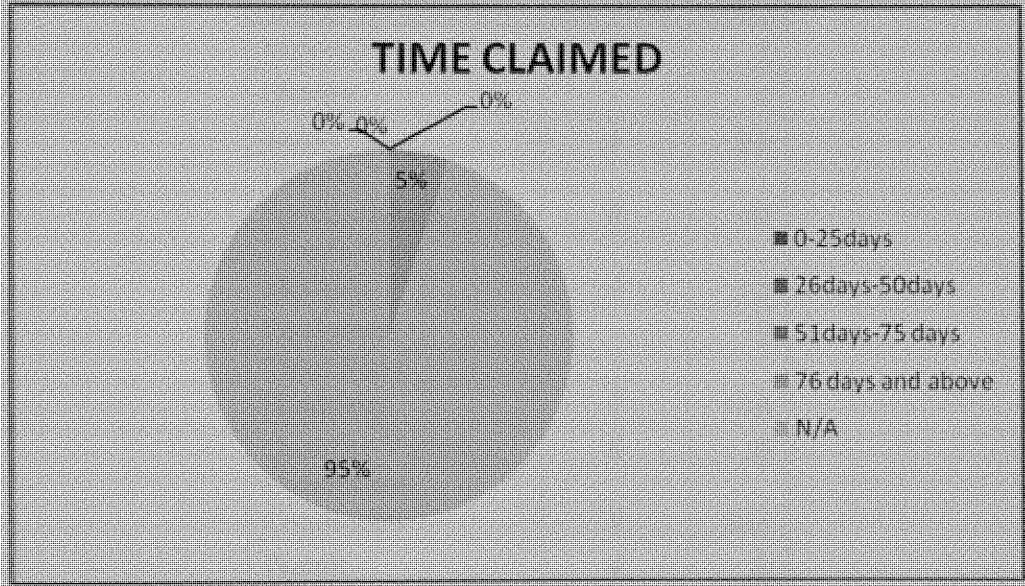


Figure 15: Time Claimed for District 4

3.2.2.5. District 5

This district consists of thirty five disputes. All of the disputes are numbered starting from one hundred and two to one hundred and thirty six. This will help the user to find more detail in the dispute document for a desired type of dispute.

3.2.2.5.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #5.

| Characteristics | Number | % |
|------------------------|---------------|------------|
| Material | 2 | 5 |
| Quality | | 0 |
| Safety | 1 | 2.5 |
| Plans & Specifications | 8 | 20 |
| Construction Methods | 3 | 7.5 |
| Equipment | | 0 |
| Third Party Hindrance | 7 | 17.5 |
| Quantity Variation | 6 | 15 |
| Unforeseen Conditions | 9 | 22.5 |
| Permit | 4 | 10 |
| TOTAL | 40 | 100 |

Table 14: Frequency Analysis Result for District 5

3.2.2.5.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and

time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|-------------------|-----------|
| <i>Contractor</i> | 40 |
| <i>Owner/FDOT</i> | 0 |

| <i>Winner</i> | |
|----------------------------------------|-----------|
| <i>Contractor</i> | 14 |
| <i>Owner/FDOT</i> | 26 |
| <i>% of Winning (FDOT perspective)</i> | 65 |
| | 35 |

| <i>Money Claimed</i> | |
|------------------------------|-----------|
| <i>0-\$49,999</i> | 3 |
| <i>\$50,000-\$99,999</i> | 4 |
| <i>\$100,000-\$149,000</i> | 0 |
| <i>\$150,000 & above</i> | 1 |
| <i>N/A</i> | 32 |

| <i>Time Claimed</i> | |
|--------------------------|-----------|
| <i>0-25days</i> | 4 |
| <i>26days-50days</i> | 2 |
| <i>51days-75 days</i> | 3 |
| <i>76 days and above</i> | 3 |
| <i>N/A</i> | 28 |

Table 15: Winner-Loser, Money-Time Results for District 5

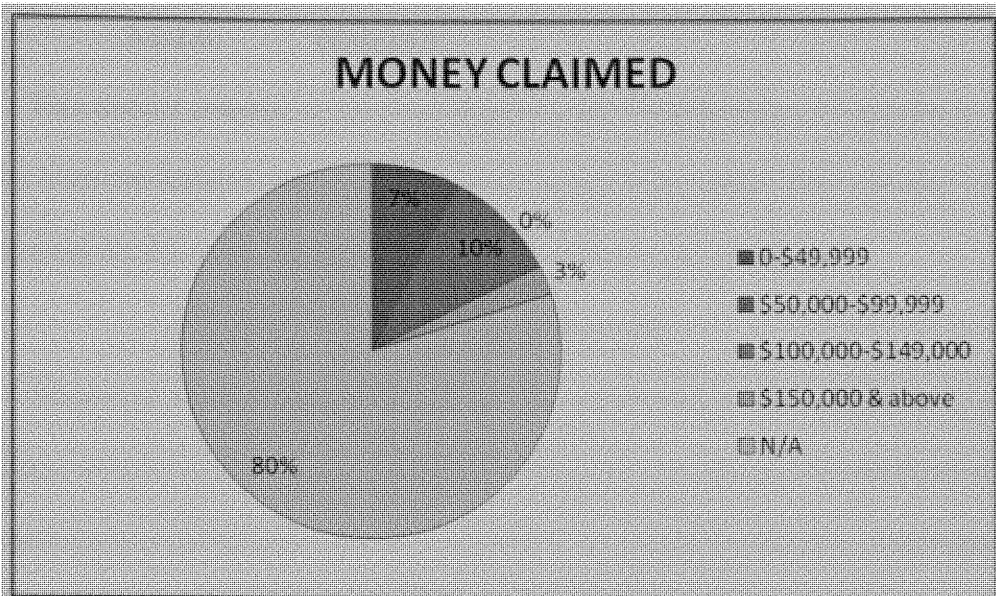


Figure 16: Money Claimed for District 5

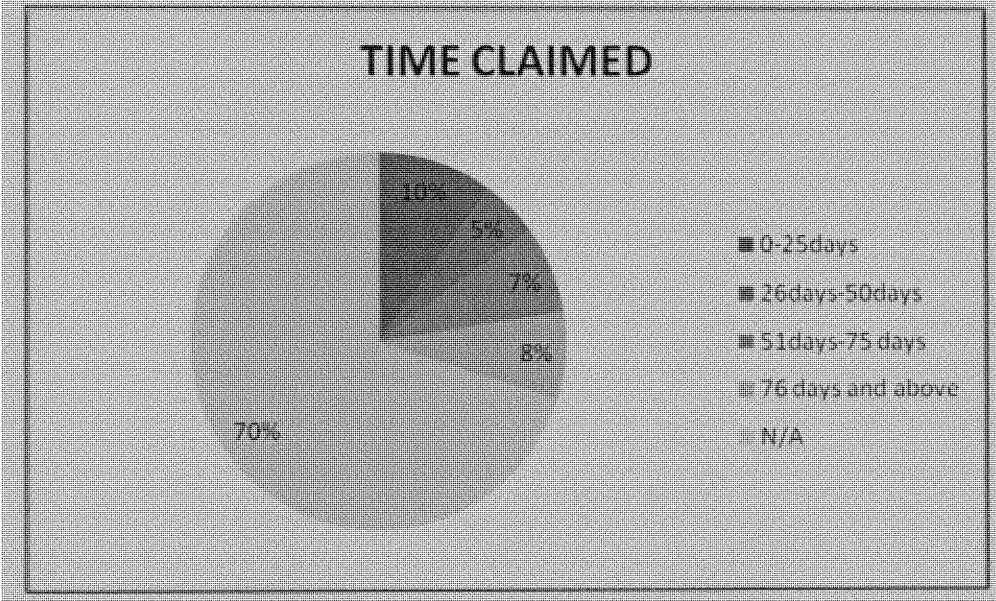


Figure 17: Time Claimed for District 5

3.2.2.6. District 6

This district consists of only two disputes. All of the disputes are numbered starting from one hundred thirty seven to one hundred thirty eight. This will help the user to find more detail in the dispute document for a desired type of dispute.

3.2.2.6.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #6.

| Characteristics | Number | % |
|------------------------|---------------|------------|
| Material | | 0 |
| Quality | | 0 |
| Safety | | 0 |
| Plans & Specifications | 2 | 100 |
| Construction Methods | | 0 |
| Equipment | | 0 |
| Third Party Hindrance | | 0 |
| Quantity Variation | | 0 |
| Unforeseen Conditions | | 0 |
| Permit | | 0 |
| TOTAL | 2 | 100 |

Table 16: Frequency Analysis Result for District 6

3.2.2.6.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and

time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|-------------------|----------|
| Contractor | 2 |
| Owner/FDOT | 0 |

| <i>Winner</i> | |
|---------------------------------|----------|
| Contractor | 1 |
| Owner/FDOT | 0 |
| Negotiate | 1 |
| | |
| % of Winning (FDOT perspective) | 0 |

| <i>Money Claimed</i> | |
|------------------------------|----------|
| 0-\$49,999 | 0 |
| \$50,000-\$99,999 | 0 |
| \$100,000-\$149,000 | 0 |
| \$150,000 & above | 0 |
| N/A | 2 |

| <i>Time Claimed</i> | |
|--------------------------|----------|
| 0-25days | 0 |
| 26days-50days | 0 |
| 51days-75 days | 0 |
| 76 days and above | 0 |
| N/A | 2 |

Table 17: Winner-Loser, Money-Time Results for District 6

In this district, the dispute reports did not contain any information about the monetary and time values. Therefore, the money claimed and time claimed results are unknown.

3.2.2.7. District 7

This district consists of fifty five disputes. All of the disputes are numbered starting from one hundred thirty nine to one hundred ninety three. This will help the user to find more detail in the dispute document for a desired type of dispute.

3.2.2.7.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #7.

| <i>Characteristics</i> | <i>Number</i> | <i>%</i> |
|-------------------------------|----------------------|-------------------|
| Material | <i>15</i> | 25.862 |
| Quality | <i>2</i> | 3.4483 |
| Safety | | 0 |
| Plans & Specifications | <i>9</i> | 15.517 |
| Construction Methods | <i>9</i> | 15.517 |
| Equipment | | 0 |
| Third Party Hindrance | | 0 |
| Quantity Variation | <i>9</i> | 15.517 |
| Unforeseen Conditions | <i>14</i> | 24.138 |
| Permit | | 0 |
| TOTAL | <i>58</i> | <i>100</i> |

Table 18: Frequency Analysis Result for District 7

3.2.2.7.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and

time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|-------------------|-----------|
| <i>Contractor</i> | 58 |
| <i>Owner/FDOT</i> | 0 |

| <i>Winner</i> | |
|---------------------------------|--------------------|
| Contractor | 25 |
| Owner/FDOT | 28 |
| Negotiate | 4 |
| Indecision | 1 |
| % of Winning (FDOT perspective) | 48,27586207 |
| | 51,72413793 |

| <i>Money Claimed</i> | |
|------------------------------|-----------|
| <i>0-\$49,999</i> | 3 |
| <i>\$50,000-\$99,999</i> | 1 |
| <i>\$100,000-\$149,000</i> | 2 |
| <i>\$150,000 & above</i> | 1 |
| <i>N/A</i> | 51 |

| <i>Time Claimed</i> | |
|--------------------------|-----------|
| <i>0-25days</i> | 6 |
| <i>26days-50days</i> | 1 |
| <i>51days-75 days</i> | 0 |
| <i>76 days and above</i> | 5 |
| <i>N/A</i> | 46 |

Table 19: Winner-Loser, Money-Time Results for District 7

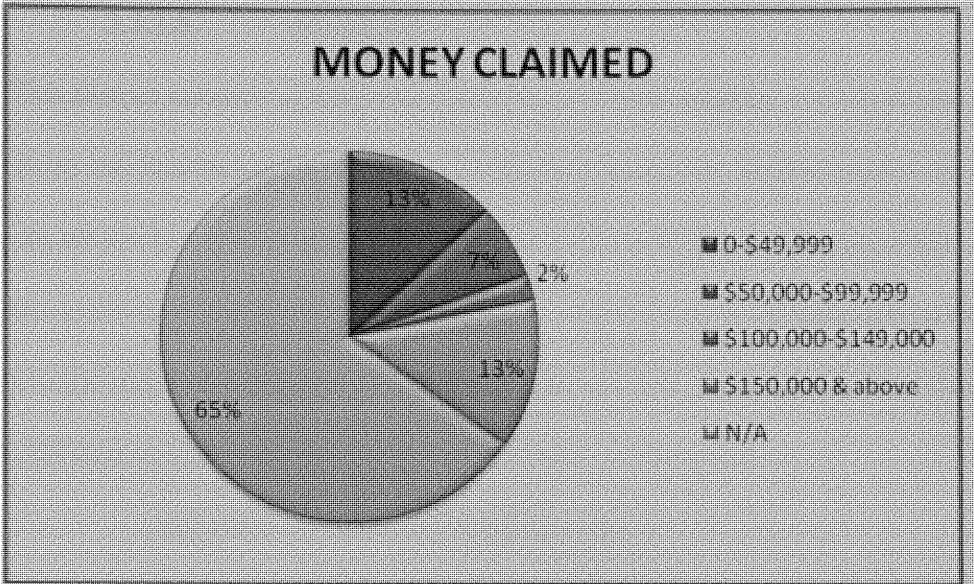


Figure 18: Money Claimed for District 7

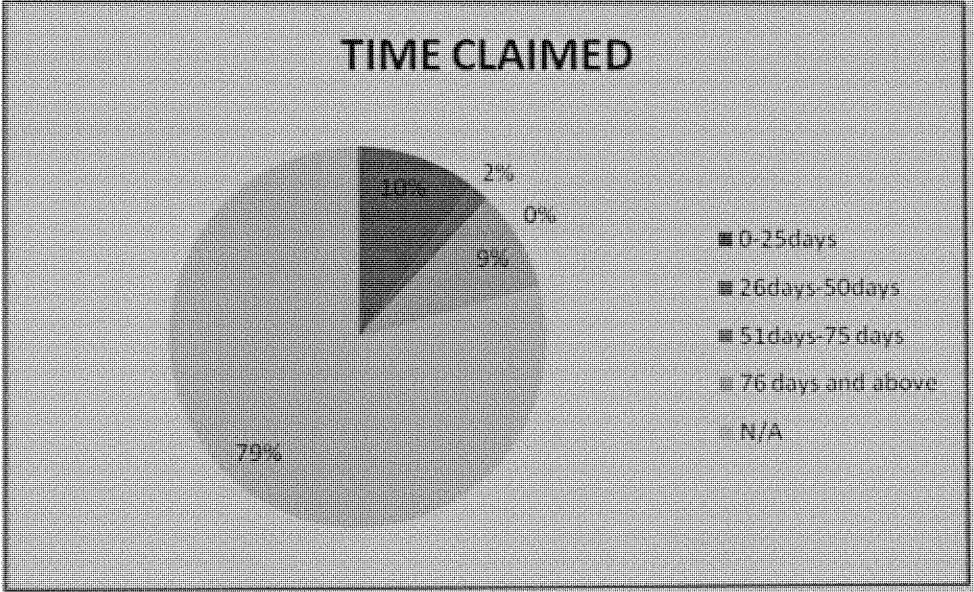


Figure 19: Time Claimed for District 7

3.2.2.8. District 8

This district consists of forty one disputes. All of the disputes are numbered starting from one hundred ninety four to two hundred thirty four. In this section two documents are excluded from total. The reason for this exclusion is that one of the documents is notice of termination not a dispute. Other document, number 231 in the district 8 is the same one with number 199. Therefore they were excluded. Moreover, number 189 does not have sufficient information to be categorized.

3.2.2.8.1. Frequency analysis results

Frequency analysis used a tabular form to represent the result of data analysis of frequency of each variable under categories. The result was tabulated in the form of frequency number and percentages according to total number of disputes. The following table illustrates the results of district #8.

| Characteristics | Number | % |
|------------------------|---------------|------------|
| Material | 3 | 6.5217 |
| Quality | 2 | 4.3478 |
| Safety | 2 | 4.3478 |
| Plans & Specifications | 7 | 15.217 |
| Construction Methods | 4 | 8.6957 |
| Equipment | 1 | 2.1739 |
| Third Party Hindrance | 2 | 4.3478 |
| Quantity Variation | 17 | 36.957 |
| Unforeseen Conditions | 6 | 13.043 |
| Permit | 2 | 4.3478 |
| TOTAL | 46 | 100 |

Table 20: Frequency Analysis Result for District 8

3.2.2.8.2. Winner-Loser, Money-Time Table

The following table gives information about who opened the case, who won the case, what is the percentage rate of winning in this district. In what amount money and time the parties claimed, and finally it provides at what percentage the claimed time and money is won.

| <i>Claimer</i> | |
|-------------------|-----------|
| Contractor | 46 |
| Owner/FDOT | 0 |

| <i>Winner</i> | |
|---------------------------------|--------------------|
| Contractor | 16 |
| Owner/FDOT | 26 |
| Negotiate | 4 |
| Indecision | 0 |
| % of Winning (FDOT perspective) | 56,52173913 |
| | 43,47826087 |

| <i>Money Claimed</i> | |
|------------------------------|-----------|
| 0-\$49,999 | 6 |
| \$50,000-\$99,999 | 3 |
| \$100,000-\$149,000 | 1 |
| \$150,000 & above | 6 |
| N/A | 30 |

| <i>Time Claimed</i> | |
|--------------------------|-----------|
| 0-25days | 12 |
| 26days-50days | 1 |
| 51days-75 days | 0 |
| 76 days and above | 2 |
| N/A | 31 |

Table 21: Winner-Loser, Money-Time Results for District 8

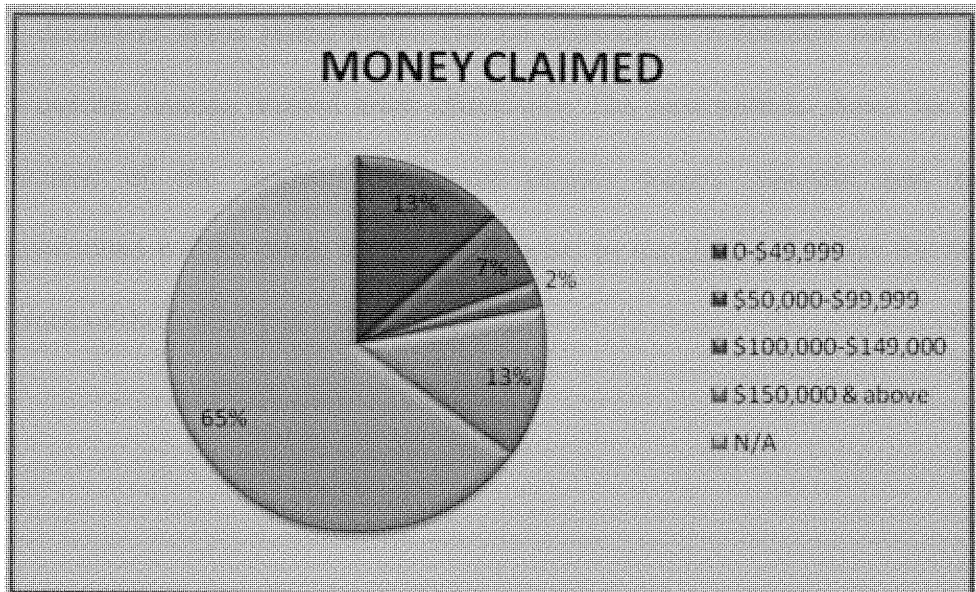


Figure 20: Money Claimed for District 8

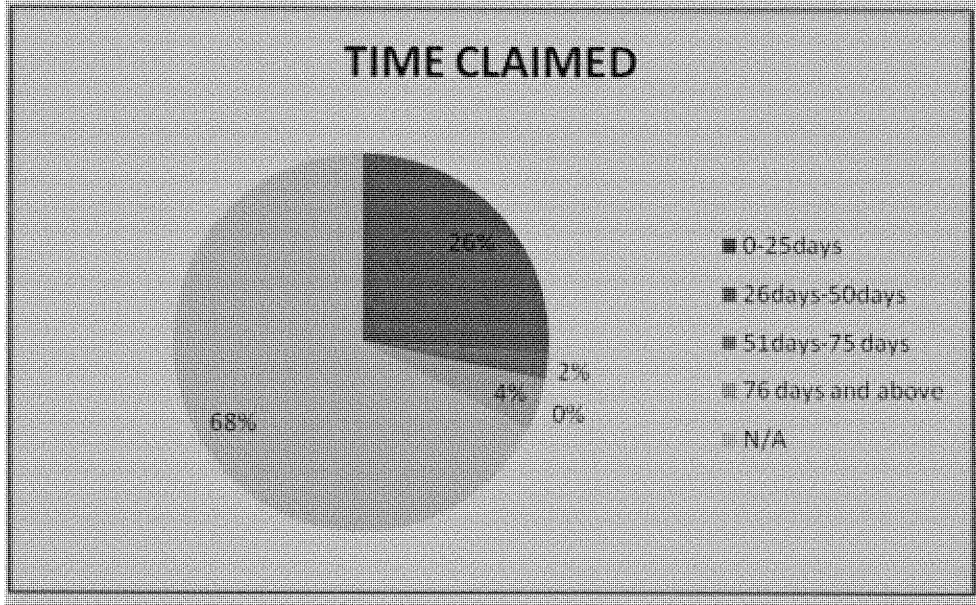


Figure 21: Time Claimed for District 8

3.3. Results and Recommendation

Based on the results obtained, conclusions and recommendations were developed. Conclusions are drawn based on the findings and analysis of the results in accordance with the research objectives. To get benefit from the lessons learned,

contract document items stated above can be adjusted in a detailed way to help the industry use the lessons learned more effectively. The next section shows the detailed categorization of the disputes by using project stages. Specific and practical recommendations will be made in the next chapter to handle the disputes for the better performance of the industry in future.

LESSONS LEARNED DOCUMENT

4.1. Introduction

In this chapter, the detailed categorization is explained. Each single dispute is placed under one of the main categories: Permit, site work, foundation, construction, landscaping, and other. These categories are developed by conducting a great deal research on many types of project stages. In addition to this, for making situation assessment (checking old cases and comparing them with the new cases) easy for the user, each main category stated above has sub-categories. For category permit, there are four sub categories including ten disputes in total (%4): Environmental permit, lane closure, site access and other. For site work, there is only one sub category which is fence. Foundation category has fifty two disputes (%20). It has defective specifications/plans, base material/other, base material/shortage, earth wall, footing, sheet pile, excavation, bridge joints, additional unforeseen work, and hauling as sub categories. For construction, the number of disputes is 153 (%58). Sub categories for this heading can be listed as follows: Concrete work, concrete/asphalt/slab, concrete side walk, truncated domes, utility work, insulation, material, restriction, bridge deck, defective specifications/plan, control of work, maintenance of traffic, additional unforeseen work, equipment, tests, noise ordinance suspension, changed site conditions, non-payment, workers compensation cost. Landscaping consists of twenty disputes (%8). The sub categories of landscaping are; driveways, sod installation/ seeding/ fertilizing/ mulching/ mowing, pond, additional unforeseen condition, and other. For the main category “other”, it collects all items which can not be placed under one of main categories stated above, in total twenty four disputes (%9). The sub categories are as follows: Specialty engineer,

contractual document, change in scope of work, delay, fire hydrant, discharge of superintendant, overhead expense, liquated damage, incentive-disincentive, stand-by cost of crew, off duty law enforcement, traffic accident, bridge clearance, schedule interpretation, vandalism/stolen, changed market price. More detailed information is provided in the next sections of this chapter.

4.2. Project Stages

4.2.1. Permit

In this category there are ten disputes found in the DRB database. Most confronted dispute is related with environmental permit issues (50%). The following table illustrates the findings under this category. The numbers in the cells represent number of disputes found under specified district. D1 to D8 are the abbreviations of the district numbers i.e.: district one is D1.

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | SUM |
|----------------------|----|----|----|----|----|----|----|----|------------|
| Permit | | | | | | | | | 10 |
| Environmental Permit | 3 | 1 | | | 1 | | | | 5 |
| Lane closure | | | | 2 | | | 1 | | 3 |
| Site Access | | | | | | | | 1 | 1 |
| Other | | | | | 1 | | | | 1 |

Table 22: Number of Disputes for Permit Stage

4.2.2. Site Work

The following table provides information about the number of disputes under each district for this category.

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | SUM |
|-----------|----|----|----|----|----|----|----|----|------------|
| Site Work | | | | | | | | | 3 |
| Fence | 1 | 1 | | | | | 1 | | 3 |

Table 23: Number of Disputes for Site Work Stage

4.2.3. Foundation

The following table illustrates the disputes for the foundation category. The top three types of dispute issues observed for this category can be listed as: sheet pile (%23), bridge joints (%15), and the final one is additional unforeseen condition (%12).

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | SUM |
|---------------------------------|----|----|----|----|----|----|----|----|-----------|
| Foundation | | | | | | | | | 52 |
| Defective Specifications/Plan | 3 | | | | | | | | 3 |
| Base Material/Other | 1 | 1 | | | 2 | | 3 | 1 | 8 |
| Base Material/Shortage | | | | 1 | 1 | | 1 | | 3 |
| Earth Wall | | | | | 1 | | | 3 | 4 |
| Footing | | | | | | | | | |
| Replacement | | | | | 1 | | | | 1 |
| Shaft | | | | | | 1 | 1 | | 2 |
| Sheet Pile | | 2 | 2 | 2 | 3 | | 1 | 2 | 12 |
| Excavation | | | | 2 | | | 1 | 1 | 4 |
| Bridge Joints | | | 2 | | 1 | | 3 | 2 | 8 |
| Additional Unforeseen Condition | 3 | | | | | | 1 | 2 | 6 |
| Hauling | | | | | | | 1 | | 1 |

Table 24: Number of Disputes for Foundation Stage

4.2.4. Construction

The following table illustrates the disputes for the construction category. The top three types encountered for this category can be listed as: additional unforeseen conditions (%17), utility conflict (%8), and the concrete/slab/asphalt (%8).

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | SUM |
|-----------------------------------------|----|----|----|----|----|----|----|----|------------|
| Construction | | | | | | | | | 153 |
| Concrete Work | 1 | 1 | | | 2 | | 2 | 3 | 9 |
| Concrete/Asphalt/Slab | 2 | 3 | 1 | | 1 | | 2 | 3 | 12 |
| Concrete Side Walk | 1 | | | | 1 | | | | 2 |
| Truncated Domes | 2 | | | | | | | | 2 |
| Utility Work | | | | | | | | | |
| Electrical Rough-in | 3 | | 1 | | | | 1 | 3 | 8 |
| Water Rough-in | 3 | | | 1 | 3 | | | | 7 |
| Specialty Rough-ins | | | | | | | | | |
| Phone | 1 | | | | | | | | 1 |
| Cable Tv Service | 2 | | | | | | | | 2 |
| Gas Utility | 2 | | | | | | | | 2 |
| Relocation | | | | | 2 | | 1 | | 3 |
| Conflict | 5 | | 1 | | 4 | 1 | | 2 | 13 |
| Drainage Utility/Sanitary Sewer Utility | 5 | 1 | | | 1 | | 2 | | 9 |
| Insulation(Coating) | | | | | 2 | | 1 | 2 | 5 |
| Material | | | | | | | | | |
| Unsuitable Material | | | | 2 | | | 1 | | 3 |
| Extra | | 1 | | | 1 | | 1 | | 3 |
| Shortage | | | | | 1 | | 2 | | 3 |
| Traffic Signals | 2 | | | | | | 2 | 1 | 5 |
| Repair/Replace | 1 | | | | | | 1 | | 2 |
| Restriction | | | 1 | | | | | | 1 |
| Bridge Deck | | 1 | | | | | | | 1 |
| Defective Specifications/Plan | | 1 | | | | | 1 | 1 | 3 |
| Control of Work | 1 | | 1 | | | | | | 2 |
| Maintenance of Traffic | 1 | 1 | | 1 | 1 | | 1 | 2 | 7 |
| Additional Unforeseen Work | 7 | 1 | 2 | 3 | 3 | | 3 | 7 | 26 |
| Equipment | | | | | | | | | |
| Idle | 1 | | | | | | | | 1 |
| Other | 1 | | | 1 | | | 1 | 1 | 4 |
| Tests | | | | | 1 | | | 1 | 2 |
| Noise Ordinance Suspension | | | | 1 | | | | | 1 |
| Changed Site Conditions | 2 | | | 1 | 1 | 1 | 1 | 2 | 8 |
| Non-Payment | | | | | | | 1 | 3 | 4 |
| Workman compensation cost | | | | | 1 | | | 1 | 2 |

Table 25: Number of Disputes for Construction Stage

4.2.5. Land Scaping

Land scaping has six disputes in the top three categories; driveways (%30), sod installation/seeding/fertilizing/mulching/mowing (%30), and additional unforeseen condition (%30).

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | SUM |
|----------------------------------------------------------|----|----|----|----|----|----|----|----|-----------|
| Landscaping | | | | | | | | | 20 |
| Driveways | 2 | | | | 2 | 1 | 1 | | 6 |
| Sod Installation, Seeding, Fertilizing, Mulching, Mowing | 1 | | | | 1 | | 3 | 1 | 6 |
| Pond | | | | | | | 1 | | 1 |
| Other | 1 | | | | | | | | 1 |
| Additional Unforeseen | 6 | | | | | | | | 6 |

Table 26: Number of Disputes for Land Scaping Stage

4.2.6. Other

This category includes items that could not be placed under one of the categories stated above. Most frequently seen one in this category is delay problem (%33).

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | SUM |
|-----------------------------|----|----|----|----|----|----|----|----|-----------|
| Other | | | | | | | | | 24 |
| Speciality Engineer | 1 | | | | | | | | 1 |
| Contractual Document | | | 1 | | | | | 1 | 2 |
| Change in Scope of Work | | | | | | | 1 | | 1 |
| Delay | | 2 | 1 | | 1 | | 2 | 2 | 8 |
| Fire Hydrant | 1 | | | | | | | | 1 |
| Discharge of Superintendant | 1 | | | | | | | | 1 |
| Overhead Expense | | 1 | | | | | | | 1 |
| Liquated Damage | | | 1 | | | | | | 1 |
| Incentive-Disincentive | | | | | | | 1 | | 1 |
| Stand-by cost of crew | | | | | 1 | | | | 1 |
| Off duty law enforcement | | | | | 1 | | | | 1 |
| Traffic accident | | | | | | | 1 | | 1 |
| Bridge Clearance | | | | | | | | 1 | 1 |
| Schedule Interpretation | | | | | | | | 1 | 1 |
| Vandalism/Stolen | | | | | | | | 1 | 1 |
| Changed Market Price | 1 | | | | | | | | 1 |

Table 27: Number of Disputes for Other Stage

4.3. Lessons Learned

4.3.1. Introduction

The lessons learned documents and disseminates in the fields of project stages; permit, site work, foundation, construction, landscaping, and other. Through participatory monitoring, evaluation and documentation techniques, it aims to build a strong

knowledge base and serve to provide lessons learned documented and recommendations from the previous cases.

Since each project is unique, lessons learned for each project is also different and unique from each other. However, they can be collected in a general way that users get benefit from the lessons learned and can adjust the previous cases to match new cases accordingly. To illustrate, one contractor is in a project with the FDOT to construct asphalt road. He wants to check the lessons learned to get benefit from the past cases to avoid the same mistakes regarding the material. The materials that were used in the previous cases may vary depending on the location, climate and other factors from project to project. However, lessons learned provided in this section are developed saying that “make sure that contract documents defines the scope of work about materials, and also defines how the payment will be made for the work.” So the user can understand that in the past, there were some problems about this item. So, by taking into consideration, the user can apply lessons learned by carefully checking the contract documents and making sure that it defines scope of the work about the materials and the payments related. The user can adjust the lessons according to his/her project to promote recurring of the positive outcomes and discourage the recurrence of the negative outcomes. The next sections of this chapter will provide a better understanding of lessons learned.

4.3.2. Lessons Learned-PERMIT

In the following table the lessons learned for the permit section are provided. C1 and C2 are abbreviations of category 1 and category 2 respectively. In the description tab, the reasons of the disputes are explained. In the lessons learned tab, suggestions are made in a broad perspective allowing the user to adjust the lessons to their projects.

| C1 | C2 | Description | Lessons Learned |
|-------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Permit | Environmental permit | Permit/Environmental Permit-Night-time work | Make sure to make the Department procure all environmental permits required by Federal, State, county and local regulatory agencies |
| | | US Coast Guard-Construction Work Permit | |
| | | Permit/Environmental Permit-Water System Connection Permit between Different Counties | FDOT was the party responsible for the procurement of the proper Water Permits to cover all the necessary project work on site |
| | Lane Closure | Permit/Lane Closure-Traffic Control-Safety Officers | Define clearly Payment items (Traffic Control Officers) in the contract documents |
| | | Permit/Lane Closure-Requirements | Define clearly the requirements for lane closure in the plans for each specific activity |
| Site Access | Permit/Site Access- Allowance | It is the DEPT's responsibility to provide access to site. | |
| Other | Permit/Other-Restrictions on other construction activities such as :Burning operations of clearing and grubbing debris etc. | Define clearly the restrictions and permits at the time of bidding to the contractor, and no change is allowed after the time of bidding unless the DEPT. accepts to compensate the contractor for this change | |

Figure 22: Lessons Learned for Permit

4.3.3. Lessons Learned-SITE WORK

This section provides lessons learned for the site work. In this section, fence is the only subsection under the site work category.

| C1 | C2 | Description | Lessons Learned |
|-----------|-------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Site Work | Fence | Site Work/Fence-Change in Character of work in building fence due to some reasons; supplier, contractor, weather etc. | Engineer is the responsible person determining that the character of the work as altered differs materially in kind or nature. |

Figure 23: Lessons Learned for Site Work

4.3.4. Lessons Learned-FOUNDATION

In the following table the lessons learned for the foundation section are provided.

| C1 | C2 | Description | Lessons Learned |
|----|--------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Additional Unforeseen Work | Foundation/Additional Unforeseen Work-Unexpected soil condition while excavation | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this. |
| | | Foundation/Additional Unforeseen Work-Unexpected Water Table Height | Make sure that all parties are being informed about the changes in the schedule in advance with a notice of claim. |
| | | Foundation/Additional Unforeseen Work-Impact to the Schedule beyond the control of the Contractor | Contractor should follow all the "contractor's responsibilities" section in the contract to avoid the additional unforeseen conditions if applicable. |
| | | Foundation/Additional Unforeseen Work-Unexpected failure of Erosion Control System | |
| | Base Material (Shortage&Other) | Foundation/Base Material (Shortage&Other)-Area-wide shortage of BaseMaterial | Define the specifications regarding base material clearly in the contractual documents. |
| | | Delay in placement of the bedding material | Define clearly Contract Time Extensions in the contractual documents. |
| | | Foundation/Base Material (Shortage&Other)-Collapse of the previous base while placing new base on top of it | |

Figure 24: Lessons Learned for Foundation a

| E | Q | Description | Lessons Learned |
|------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Foundation | Bridge Joints | Foundation/Bridge Joints- Change in Character of work in placing the bridge joints due to some reasons; dimension difference, repair, renewal, supplier related issues, contractor related issues, weather, etc. | Perform all necessary repairs or renewals, on any section of the roadway or bridge thus opened to traffic under instructions from the Engineer, due to defective material or work or to any cause other than ordinary wear and tear, pending completion and the Engineer's acceptance of the roadway or bridge or other work, at no expense to the Department. |
| | Defective Specification | Foundation/Defective Specification-Specification statement error; unremovable pile, geotechnical test results, noxious weed, etc. | <p>the DEPT. and should Have early and multiple site visits by regulatory entities; this proved extremely valuable from information and cost estimating perspectives and at the end provide correct information to the people in the bidding stage</p> <p>It is the DEPT's responsibility to conduct the site surveys, related geotechnical tests about the site.</p> |
| Foundation | Earth Wall | Foundation/Earth Wall-Repair: Fractured Coating, Additional Coating | DEPT. Should provide a clear description of how coating will be applied to fractured surface in the plans |
| | | Foundation/Earth Wall-Plan Errors:Details, dimensions not shown | State dimensions, details of the existing wall in the plans clearly |
| | | Foundation/Earth Wall-Removal and Replacement | Define the means and method of the removal and replacement to be done clearl in the plans |
| Foundation | Excavation | Foundation/Excavation-Removal, disposal and replacement of unexpected material | The typical wall sections provide sufficient information for the contractor to estimate the volume of material to be included in the unit price for the walls. |
| | | Foundation/Excavation-Tree roots | Watch for the snapping roots from felled trees. |
| | | Foundation/Excavation-Electrical Cable | Watch for underground electrical cables. |

Figure 25: Lessons Learned for Foundation b

| C1 | C2 | Description | Lessons Learned |
|------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Foundation | Footings (Replacement&Shaft) | Foundation/Footing (Replacement&Shaft)- Replacement is needed due to bad concrete pouring and curing. | FOOT is the responsible party to take care of the curing and pouring processes. |
| | | Foundation/Footing (Replacement&Shaft)-Removal of the obstructions from Drilled shafts | Define removal of the any material from the shafts clearly in the specifications. |
| | Hauling | Foundation/Hauling-Muck Materials | The DEPT. and should Have early and multiple site visits by regulatory entities; this proved extremely valuable from information and cost estimating perspectives and at the end provide correct information to the people in the bidding stage |
| Sheet Pile | | Foundation/Sheet Pile-Problem to divert and maintain flow and prevent the flow of the turbid water into the canal during construction within the canal | Contractor is required to submit a notice of intent to claim prior to beginning work on which the claim is based. |
| | | Foundation/Sheet Pile-The requirement for edge drains | All DOT manuals, specifications and indexes must show that edge drain is needed in all area |
| | | Foundation/Sheet Pile-The maximum permissible length to deliver by truck | The maximum permissible pile length delivered by truck is 120 lf. Superior Construction had to order the 144 lf piling in two pieces to accommodate delivery, but payment can not be made for the splicing. |

Figure 26: Lessons Learned for Foundation c

4.3.5. Lessons Learned-CONSTRUCTION

In the following table the lessons learned for the construction are provided.

| C1 | C2 | <i>Description</i> | <i>Lessons Learned</i> |
|---------------|----|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Concrete Work | | Construction/Concrete Work- Thrie-Beam Repair | It is obvious that Thrie Beam will be damaged by the traveling public during the life of the project. State clearly in the plan that the contractor is responsible for first 500 feet of repair, above the first 500 feet of repair FDOT should compensate him. |
| | | Construction/Concrete Work- Omission of the Conduit in Pedestrian barrier wall by the contractor | Contractor should include the conduit in the bidding process for the pedestrian barrier wall |
| | | Construction/Concrete Work- Different material used by the contractor (bond breaker) | It is the DEPT.'s position that the furnishing and installation of an approved material (bond breaker) is included in the contract price which price shall be full compensation for all work specified and shall include all materials and incidentals necessary to complete the work. |
| | | | Specifications require that materials proposed by the contractor must be submitted and approved by the DEPT. |
| | | | Construction/Concrete Work- Prestressed Beams-late payment |

Figure 27: Lessons Learned for Construction a

| C1 | Q | Description | Lessons Learned |
|----|-----------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Concrete Work | Construction/Concrete Work-Temporary Barrier-glare screen-payment problem | Make sure that the contract document defines the scope of work to include providing glare screen in conjunction with the temporary barrier wall and also defines how the payment will be made for the work |
| | Concrete/Asphalt/Slab | Construction/Concrete/Asphalt/Slab-Removal of asphalt material | Make sure that the contract document defines the scope of work to remove asphalt material also defines how the payment will be made for the work |
| | | Construction/Concrete/Asphalt/Slab-Weather caused problem | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this |
| | | Construction/Concrete/Asphalt/Slab-Quantity Change | Make sure that the contract document defines the quantities to be used and also defines how the payment will be made for this |
| | Concrete Side Walk | Construction/Concrete Side Walk Removal and replacement | Contractor should follow all the "contractor's responsibilities" section in the contract, the Contractor is responsible to establish all layout work necessary to construct the work in conformity with the Contract Documents |

Figure 28: Lessons Learned for Construction b

| C1 | C2 | Description | Lessons Learned |
|----|-----------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Truncated Domes | Construction/Truncated Domes- Removal and replacement | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this |
| | Utility Work | Construction/Utility Work- Different Installation system- Ambiguous Plan | If the installation of the utility system (WATER HEATER) has more than one options to apply, it should be made clear before beginning the construction in the plan. |
| | | Construction/Utility Work/Water Rough-in Unclear statement to supply landscape irrigation | Make sure that the contract document defines the scope of work to supply landscape irrigation also defines how the payment will be made for the work |
| | | Construction/Utility Work/Water Rough-in removal of water main | The DEPT. and should Have early and multiple site visits by regulatory entities; this proved extremely valuable from information and cost estimating perspectives and at the end provide correct information to the people in the bidding stage |
| | | Construction/Utility Work/Gas Rough-in-delay problem | Make sure to request additional time adjustment in time or file a notice of delay in time |

Figure 29: Lessons Learned for Construction c

| C1 | Q | Description | Lessons Learned |
|----|--------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Utility Work | Construction/Utility Work/Gas Rough-in-pipe problem | Explain the problem encountered with the pipes (struck,rupture) clearly to the DEPT. to get compensation |
| | | Construction/Utility Work/Electrical Rough-in-conduit | Make sure that the contract document defines the scope of work about conduit system and also defines how the payment will be made for the work |
| | | Construction/Utility WorkElectrical Rough-in-sealing | Make sure that the contract document defines the scope of work to seal the electrical items and also defines how the payment will be made for the work |
| | Utility Work | Construction/Utility Work/Electrical Rough-in-lighting | Make sure that the contract document defines the scope of work about lighting and also defines how the payment will be made for the work |
| | | Construction/Utility Work/Electrical Rough-in-replacement | Make sure that the contract document defines the scope of work to replace the materials and also defines how the payment will be made for the work |
| | Utility Work | Construction/Utility Work/Electrical Rough-in-delay | Make sure to request additional time adjustment in time or file a notice of delay in time |
| | | Construction/Utility Work/Speciality Rough-in-(Phone system)-delay | All utilities around the site should be checked before starting the construction because they may create utility conflict. |

Figure 30: Lessons Learned for Construction d

| C1 | C2 | <i>Description</i> | <i>Lessons Learned</i> |
|----|--------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Utility Work | Construction/Utility Work/Speciality Rough-in-(Cable system)-Plan error | Make sure that the contract document is explained clearly |
| | | Construction/Utility Work/Relocation-delay | Make sure to request additional time adjustment in time or file a notice of delay in time |
| | | Construction/Utility Work/Relocation-missing items in the plans | Make sure to include all utility items in the plans |
| | | Construction/Utility Work/Conflict-damage to existing utility systems | <p>The DEPT. and should Have early and multiple site visits by regulatory entities; this proved extremely valuable from information and cost estimating perspectives and at the end provide correct information to the people in the bidding stage</p> <p>Make sure the plans explain everything accurately and thoroughly about the site</p> |
| | | Construction/Utility Work/Conflict-delay | Make sure to request additional time adjustment in time or file a notice of delay in time |

Figure 31: Lessons Learned for Construction e

| C1 | C2 | Description | Lessons Learned |
|--------------|------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Utility Work | Construction/Utility Work/Conflict-third party | Construction/Utility Work/Conflict-third party | It is Contractor's responsibility to make the job done by the third party (supplier, etc.). It is beyond the control of the contractor if the material is defective. |
| | Construction/Utility Work/Conflict-damage cost | Construction/Utility Work/Conflict-damage cost | It is contractor's responsibility to keep the daily records. In the absence of daily reports it is difficult to assess the any damages |
| | Construction/Utility Work/Conflict-unforeseen condition | Construction/Utility Work/Conflict-unforeseen condition | Define clearly Unforeseen Work conditions in the contractual documents. |
| | Construction/Utility Work/Drainage-deficiency in the drainage system | Construction/Utility Work/Drainage-deficiency in the drainage system | The appropriate materials should be collected and provided as a proof for the deficiencies |
| Insulation | Construction/Insulation-timing for application | Construction/Insulation-timing for application | Make sure that the contract document defines the timing of coating clearly and also defines how the payment will be made for this |
| | Construction/Insulation-power coating | Construction/Insulation-power coating | Make sure that the contract document defines the scope of work to insulate the materials and also defines how the payment will be made for the work |
| | Construction/Insulation-quantity | Construction/Insulation-quantity | Define the quantity of the materials to be installed. |
| | Construction/Insulation-unclear statement in the contractual documents | Construction/Insulation-unclear statement in the contractual documents | Make sure that the contract document defines the insulations materials to be used and also defines how the payment will be made for this |

Figure 32: Lessons Learned for Construction f

| C1 | Q | Description | Lessons Learned |
|----|-----------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| | Material (Unsuitable) | Construction/Material/Unsuitable-Improperly described in the proposal | Make sure that the contract document defines the quantities to be used and also defines how the payment will be made for this |
| | | Construction/Material/Unsuitable-engineer changed material w/o giving notice to other parties | |
| | Material (Extra) | Construction/Material/Extra-change in the character of the work | Make sure that the contract document defines the change in the character of the work and also defines how the payment will be made for this |
| | Material (Shortage) | Construction/Material/Shortage-local area shortage | Contractor is not the responsible party if there is local area shortage about the planned material |

Figure 33: Lessons Learned for Construction g

| C1 | Q | Description | Lessons Learned |
|----|----------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Material (Traffic Signals) | Construction/Material/Traffic Signals-not qualified for payment | Contractor should follow all the "contractor's responsibilities" section in the contract, the Contractor is responsible to establish all layout work necessary to construct the work in conformity with the Contract Documents |
| | | Construction/Material/Traffic Signals-redesign additional length is required | Make sure that the contract document defines the scope of work about the materials and also defines how the payment will be made for the work |
| | Material/Repair-Replace | Construction/Material/Repair-Replace-change in cost not included in contract | Make sure that the contract document defines the scope of work about the replacement/repair and also defines how the payment will be made for the work |
| | | Construction/Restrictions-Work restrictions-event | Make sure that the contract document defines non-working days clearly and also defines how the payment will be made for this |
| | Construction/Restrictions | Construction/Restrictions-Restrictions on burning operation | Restrictions on burning operations should be clearly defined in the contract documents |

Figure 34: Lessons Learned for Construction h

| C1 | | C2 | | Description | Lessons Learned |
|--------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Construction | Construction/Bridge Deck | Construction/Bridge Deck-unsatisfactory | | Contractor should not use huge amount of water to claim for the deck being unsatisfactory, it is unethical. | |
| | | Construction/Bridge Deck-cracking problem | | Search the cause of the crack, if it is beyond the control of the contractor it should be compensated. | |
| | Construction/Defective Spec Plan | Construction/Defective Spec Plan-significant quantity difference between real work and planned amount | | the DEPT should make necessary calculations and it is responsible for the accuracy of the estimated quantities for lump sum items. | |
| | | Construction/Defective Spec Plan-plans did not follow the specification, contractor changed the way and method to perform the job | | Make sure that if there is a change in the project all the parties are to be informed in the written way | |
| | Construction/Control of Work | Construction/Control of Work-missing controlling item stabilization of subgrade | | Make sure to include the required control of work items in the contract documents | |
| | | Construction/Control of Work-unclear definition of controlling item of work | | Define the specifications regarding controlling item of work clearly in the contractual documents | |

Figure 35: Lessons Learned for Construction i

| C1 | C2 | Description | Lessons Learned |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Construction/Maintenance of Traffic | Construction/Maintenance of Traffic-extra item is included to maintenance of work, the work is doubled. | Provide the calculations for the extra work in order to assess the compensation | |
| | Construction/Maintenance of Traffic-intersection control is not included in the contract | Make sure that the contract document defines the scope of work about maintenance of the intersections and also defines how the payment will be made for the work | |
| | Construction/Maintenance of Traffic-Alternative traffic control plan | FDOT is responsible party to provide alternative traffic control plan and if contractor wants to change the plan all parties should be informed in a written way and FDOT's final approval to apply. | |
| | Construction/Maintenance of Traffic-cost | The calculation should be explained in detail for the compensation. | |
| Construction/Additional Unforeseen Work | Construction/Additional Unforeseen Work-unforeseen, unexpected weather conditions;rain, hurricane, wind, cold, etc. | It should be stated clearly in the contract that the Engineer will determine the effects of inclement weather and grant time extensions when justified. | |
| | Construction/Additional Unforeseen Unforeseen geotechnical conditions | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this | |
| | Construction/Additional Unforeseen Work-unexpected ways and methods applied | Make sure that the contract document defines the scope of work about maintenance of the intersections and also defines how the payment will be made for the work | |
| | Construction/Additional Unforeseen Work-unexpected soil conditions | <p>The DEPT. and should Have early and multiple site visits by regulatory entities; this proved extremely valuable from information and cost estimating perspectives and at the end provide correct information to the people in the bidding stage</p> <p>Make sure the plans explain everything accurately and thoroughly about the site</p> | |

Figure 36: Lessons Learned for Construction j

| C1 | C2 | Description | Lessons Learned |
|----|-----------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Construction/Additional Unforeseen Work | Construction/Additional Unforeseen Work-unexpected water table height | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this |
| | | Construction/Additional Unforeseen Work-unexpected geotextile material coverage | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this |
| | | Construction/Additional Unforeseen Work-sanitary sewer alignment error,wrong hole due to contractor's fault | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this |
| | | Construction/Additional Unforeseen Work-unexpected pavement work | Arising either from the execution or from the nonexecution of the work..The Department may,at its discretion, reimburse |
| | | Construction/Additional Unforeseen Work-unexpected addition of work by contractor | Contractor is responsible for additional work done because of work is performed without approval |
| | | Construction/Additional Unforeseen Work-unexpected dewatering | The DEPT. and should Have early and multiple site visits by regulatory entities; this proved extremely valuable from information and cost estimating perspectives and at the end provide correct information to the people in the bidding stage Make sure the plans explain everything accurately and thoroughly about the site |

Figure 37: Lessons Learned for Construction k

| C1 | C2 | Description | Lessons Learned |
|-----------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction/Additional Unforeseen Work | | Unforeseen Work-unexpected arch culvert work | unilateral supplemental agreements, they cannot be changed if otherwise is not stated in the contract document. |
| | | Construction/Additional Unforeseen Work-unexpected fence repair, damaged by others | Arising either from the execution or from the nonexecution of the work..The Department may,at its discretion, reimburse the Contractor for the repair of such damage due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor |
| | | Construction/Additional Unforeseen Work-unexpected mowing | Contractor is required to submit a notice of intent to claim prior to beginning work on which the claim is based. Arising either from the execution or from the nonexecution of the work..The Department may,at its discretion, reimburse the Contractor for the repair of such damage due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor |
| | | Construction/Additional Unforeseen Work-unexpected pipe repair, work is done without giving a notice of intent to the other parties | Contractor is required to submit a notice of intent to claim prior to beginning work on which the claim is based. |
| | | Construction/Additional Unforeseen Work-unexpected fabriform installation at ramp | Arising either from the execution or from the nonexecution of the work..The Department may,at its discretion, reimburse the Contractor for the repair of such damage due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor |
| | | Construction/Additional Unforeseen Work-unexpected excavation, unforeseen material during excavation | Make sure that the contract document defines unforeseen conditions and also defines how the payment will be made for this |

Figure 38: Lessons Learned for Construction I

| C1 | Q | Description | Lessons Learned |
|----|------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Construction/Equipment/Idle | Equipment/Idle cost | It is Contractor's due to pay the Idle cost of the equipment. |
| | Construction/Equipment/Other | Construction/Equipment/Other, deficiency | Make sure that the contract document defines deficiency of the equipment and also defines how the payment will be made for this |
| | | Construction/Equipment/Other, gas and diesel price | The DEPT. Should provide an estimated quantity for gas and diesel to cover the work specified in the contract |
| | | Construction/Equipment/Other, different maintenance of traffic equipment | Make sure that the contract document defines difference in the the equipment and also defines how the payment will be made for this |
| | | Construction/Equipment/Other, different lift pump, cheaper in cost and same in power | Make sure that the contract document defines difference in the the equipment and also defines how the payment will be made for this |
| | Construction/Test | Construction/Test-Tensile testing anchor bolts | Contractor should follow the requirements according to the contract |
| | | Construction/Test-Pile testing | Make sure that the contract defines clearly that contractor should be according to the authorized list, for any additions or deletions thereof as approved by the engineer |

Figure 39: Lessons Learned for Construction m

| C1 | C2 | Description | Lessons Learned |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| | Construction/Noise Ordinance Suspension | Construction/Noise Ordinance Suspension-night residents complains | Make sure that the Contractor complies with the Contract Documents |
| | Construction/Changed Site Conditions | Construction/Changed Site Conditions-Differing site conditions at pond, Enormous amount of boulders than regular | Make sure that the contract document defines changed site conditons and also defines how the payment will be made for this |
| Construction/Changed Site Conditions-Differing site conditions, additional dewatering than normal, contractor failed to give a notice of intent before beginning to perform the job | | Contractor is required to submit a notice of intent to claim prior to beginning work on which the claim is based. | |
| Construction/Changed Site Conditions-Differing site conditions, change in the location of the sanitary system | | Make sure that Contract documents explain changed site conditons as: conditions differ materially from what is ordinarily encountered and recognized as inherent in the work | |
| Construction/Changed Site Conditions-Differing site conditions, lacking of limerock for the base material, | | Make sure that Contract documents explain the information regarding the compositon of the existing base material on the road | |

Figure 40: Lessons Learned for Construction n

| Q1 | Q2 | Description | Lessons Learned |
|----|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Construction/Changed Site Conditions | Construction/Changed Site Conditions-Differing site conditions, lacking of stabilizing material | Make sure that Contract documents explain changed site conditions as: conditions differ materially from what is ordinarily encountered and recognized as inherent in the work |
| | | Changed site condition-soil conditions, Contract plans greatly differ from what was actually found during the excavation of pond. | It is both the contractor's and FDOT's responsibility to monitor the work and changes. |
| | | Construction/Changed site condition-Effects of high water | Make sure that Contract documents explain changed site conditions as: conditions differ materially from what is ordinarily encountered and recognized as inherent in the work |
| | Construction/Nonpayment | Construction/Nonpayment,high mast lighting, missing pay item in the plans | Make sure that the contract documents include pay items for the all work that are going to be done in the site and also make sure these pay items to be paid fully unless otherwise stated due to some conditons. |
| | | Construction/Nonpayment,cond uit, missing pay item in the plans | Make sure that the contract documents include pay items for the all work that are going to be done in the site and also make sure these pay items to be paid fully unless otherwise stated due to some conditons. |
| | | Construction/Nonpayment,french drain, missing pay item in the plans | Make sure that the contract documents include pay items for the all work that are going to be done in the site and also make sure these pay items to be paid fully unless otherwise stated due to some conditons. |
| | | Construction/Nonpayment,partial payment for the completed work item | Make sure that the contract documents include pay items for the all work that are going to be done in the site and also make sure these pay items to be paid fully unless otherwise stated due to some conditons. |
| | Construction/Worker's Comp | Construction/Worker's Comp-Increase, Decrease or Alteration in the Work, Escalated Workers Compensation Rates | Contractor should follow all the "contractor's responsibilities" section in the contract, the Contractor is responsible to establish all layout work necessary to construct the work in conformity with the Contract Documents,The contractor should have studied the site and the contract documents prior ot bidding |

Figure 41: Lessons Learned for Construction o

4.3.6. Lessons Learned-LAND SCAPE

In the following table the lessons learned for the landscaping are provided.

| C1 | C2 | Description | Lessons Learned |
|-----------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Landscape | Landscaping/Driveway | Landscaping/Driveway-Contract pay items did not include maintaining commercial material for driveway maintenance | Make sure that the contract documents include pay items for the all work that are going to be done in the site and also make sure these pay items to be paid fully unless otherwise stated due to some conditons. |
| | | Landscaping/Driveway-Asphalt driveway delay,sidewalk elevations not being correctly provided in the plans | Make sure that Contract documents provide correctly sidewalk elevations |
| Landscape | | Landscaping/Driveway-driveway material, contractor failed to give a notice of intent before beginning the work | Contractor is required to submit a notice of intent to claim prior to beginning work on which the claim is based. |
| Landscape | | Landscaping/Driveway-Driveway fence, Due to slope of the driveways extended onto the adjacent property temporarily relocation and then permanent reinstall the right of way work was required | Make sure that the contract document defines the scope of work about driveways and also defines how the payment will be made for the work |
| | | Landscaping/Driveway-Driveway extra work is added, FDOT directed contractor to perform the work | FDOT is in the charge for the work done by the contractor because FDOT directed contractor to perform |

Figure 42: Lessons Learned for Land Scape a

| | | Description | Lessons Learned |
|-----------|-----------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Landscape | Landscape | Landscaping/Sod-Seed-Mulch-Mowing-quantity,changed character of work | Engineer determines that the character of the work as altered differs materially in kind or nature. |
| | | Landscaping/Sod-Seed-Mulch-Mowing-quantity,changed character of work Hay bale quantity | contractor should at his expense provide routine maintenance of permanent and temporary erosion control features until the project is completed and accepted |
| Landscape | Landscape | Landscaping/Sod-Seed-Mulch-Mowing-seeding and mulching | Contractor is required to submit a notice of intent to claim prior to beginning work on which the claim is based. |
| | | Landscaping/Sod-Seed-Mulch-Mowing-sodding | Make sure to put the item to the contract saying that contractor maintains the sodded areas in a satisfactory condition until final acceptance of the project |
| Landscape | Landscape | Landscaping/Pond-Additional skimmer for the pond | Make sure that the contract document defines the scope of work and also defines how the payment will be made for the work |
| Landscape | Landscape | Landscaping/Other-Unavailability of landscape trees, Area-wide shortage of plants stated in the plan | Contractor is not the responsible party if there is local area shortage about the planned material |

Figure 43: Lessons Learned for Land Scape b

| Q | Q | Description | Lessons Learned |
|-----------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Landscape | Landscape/Additional Unforeseen Work | Landscaping/Additional Unforeseen Work-extra work-landscape removal and relocation | For extra work make done make sure that contract documents include the item for stating the responsible person to perform the work |
| Landscape | | Landscaping/Additional Unforeseen Work-structure, missing component | Make sure that the contract documents include all items for the work that are going to be done in the site and also make sure these items to be paid fully unless otherwise stated due to some conditons. |
| Landscape | | Landscaping/Additional Unforeseen Work-mowing | Make sure to put the item to the contract saying that contractor maintains the sodded areas in a satisfactory condition until final acceptance of the project |
| Landscape | Landscape/Additional Unforeseen Work | Landscaping/Additional Unforeseen Work-removal of the debris,after contract time had expired on the project, the FDOT directed FPC to perform additional unforeseen work associated | there is no excuse to pay the contractor for the damages. if it is said in the contract document that The Department may, at its discretion,reimburse the Contractor for the repair of such damage due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to Acts of God, of the public enemy, or of governmental authorities |
| Landscape | | Landscaping/Additional Unforeseen Work-Removal of Grass and Weeds | Make sure to put the item to the contract saying that contractor maintains the sodded areas in a satisfactory condition until final acceptance of the project |

Figure 44: Lessons Learned for Land Scape c

4.3.7. Lessons Learned-OTHER

In the following table the lessons learned for the disputes that can not be placed under one of the categories mentioned above are provided.

| C1 | C2 | Description | Lessons Learned |
|-------|----------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| | Other/Speciality Engineer | Other/Speciality Engineer-not required | The contract documents should be clear on what methodology and related engineer should be utilized to construct the project. |
| Other | | | |
| Other | Other/Contractual Document | Other/Contractual Document- Misinterpretation of the contract- delay to final inspection after contract time has passed. | Entitlement should be given after the completion of the punch list (50 days after the request) and no entitlement should be given before that. |
| Other | Other/Contractual Document | Other/Contractual Document- impossible to perform the work within specified contract time, | Make sure to give a notice of delay to all other parties in advance in a written way. |

Figure 45: Lessons Learned for Other a

| C1 | C2 | Description | Lessons Learned |
|-------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Other | Other/ Contractual Document | Other/Contractual Document- missing contract provision | It is FDOT's responsibilities to use and follow the contract provisions. By deleting the contract provisions FDOT can not avoid the responsibilities. |
| Other | Other/ Change in the scope of the work | Other/Change in Scope of Work | Make sure that the contract document defines the scope of work also defines how the payment will be made for this |
| Other | Other/Delay | Other/Delay-denial of time extension which resulted in delay of the project | Make sure that the contract document defines the delay of work also defines how the payment will be made for this |
| Other | Other/Fire Hydrant | Other/Fire Hydrant- relocation, fire hydrant had to be relocated so that planned work could be accomplished | Make sure to request additional time adjustment in time or file a notice of delay in time |

Figure 46: Lessons Learned for Other b

| C1 | C2 | Description | Lessons Learned |
|-------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Other | Other/ Discharge of superintendent | Other/Discharge of superintendent-DEPT.'s discharge: Contractor's superintendent from the project, superintendent was unfaithful while getting the permits | Make sure that superintendant acts within the contract language otherwise DEPT. has the right to remove the personnel from the project for the reasons in the specifications. |
| Other | Other/ Overhead Expense | Contractor requested # compensable days at the rate of \$ X for overhead expenses | Make sure that in the contract there is no condition saying precluding the Contractor from seeking additional compensation with Supplemental Agreement |
| Other | Other/Liquidated damage | Other/Liquidated damage, liquidated savings, contractor completed the work before the contract time so he is eligible for liquidated savings because it was agreed on the contract documents | Make sure that in the contract there is no condition saying precluding the Contractor from seeking liquidated savings in case of early completion of the project |

Figure 47: Lessons Learned for Other c

| C1 | C2 | Description | Lessons Learned |
|-------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Other | Other/Incentive-Disincentive | Other/Incentive-Disincentive- Contractor is seeking to have the milestone incentive completion dates extended for the purposes of calculation of the incentive payment due to the presence of more limestone rock than what was shown in the plans | it would be proper and advisable for the DEPT. to establish reasonable alternate milestones for the results achieved by Contractor. |
| Other | Other/Stand-by cost of the crew | Other/Stand-by cost of crew, Lost production of supplier | it is not the DEPT. Responsibility to inform the supplier that their products met the specifications. This issue should be resolved between the contractor and the supplier |
| Other | Other/Off-law duty enforcement | Other/Off-law duty enforcement- Off duty law officers did not show up for scheduled traffic switch and paving operation | it is contractor's responsibility to request the off duty law officers to appear in the job site for the specified time frame. Contractor should follow all the "contractor's responsibilities" section in the contract |

Figure 48: Lessons Learned for Other d

| Q1 | Q2 | Description | Lessons Learned |
|-----------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Other | Other/Traffic Accident | Other/Traffic Accident- Unforeseen traffic accident took place in the job site. | Make sure to state clearly in the contractual documents that accident is under the responsibility of the contractor to be resolved |
| Other | Other/Bridge Clearance | Other/Bridge Clearance-it was discovered that the required clearance between the columns of this bridge was not available. Written preliminary notice is required within specified (i.e:ten) calendar days after commencement of a delay. | Make sure the preliminary notice is given within the specified time gap by the contractor. Failure to comply results in waiver of entitlement |
| Other | Other/Schedule interpretation items | Other/Schedule interpretation items-contractor wants to know what type of items interpret the schedule of a project | Make sure the contractor confirms the items in the schedule by engineer. Contractor proposes a schedule and if this schedule is approved by the engineer then it becomes the approved working schedule. Then, all dead lines of the related items and the project due date can be determined according to this approved working schedule. |

Figure 49: Lessons Learned for Other e

| Q1 | Q2 | Description | Lessons Learned |
|-------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Other | Other/Vandalism | Other/Vandalism, vandalism was a foreseen case in part of the dade county where the construction was being held. | It is contractor's responsibility to take precautions to avoid this kind of problems in the job site. |
| Other | Other/Changed Market Price | Other/Changed Market Price, delay beyond the control of the contractor, DEPT. delayed the completion of design consequently putting the bidding period into a very unfavorable bidding climate due to the hurricanes and resulting work loads. Material prices increased during this delay period due, in part, to overseas market influences. | It is contractor's responsibility to be aware of the market conditions and bid accordingly. |
| Other | | | |
| Other | | | |

Figure 27.6: Lessons Learned for Other f

4.4. Results and Recommendation

Based on the developed lessons learned, users can find lessons learned for similar cases compared to their problems. There are some repeated lessons learned thorough out the document, however, these are the most common mistakes or causes that disputes are arisen from. Since each lesson has its own cause, it will be easier for the parties to look for a lessons learned at a specific stage of project life cycle. For each stage in the project duration, special headings were developed so that users can check for lessons learned for the new cases.

SUMMARY AND RECOMMENDATIONS

5.1. Introduction

This is the last chapter of the study which will conclude all the study that had been carried out. This section consisted of the literature review and findings of the study that carried out in chapters 3, and 4.

5.2. Summary

From the research, in general terms, recurring mistakes on big projects are costly among parties involved in construction projects (R.B Hellard (1987), D.A Langford (1992), M. Smith (1992), and S.O. Cheung and C.H. Suen (2002)).

Disputes that arise from parties are mainly due to unforeseen conditions, schedule delays, as well as changes and variation in material. To avoid these disputes that occurred in the past, there are some lessons learned. However, many of the lessons learned are under-utilized within transportation industry or mistakenly applied. There are many problems faced by practitioners: Many of the existing lessons learned (a) theoretical, (b) not readily useable, and (c) their reliability and benefits are not clear.

So, a new lessons learned document which is utilized and readily useable was created to help industry benefit lessons learned much easier. First, to develop this document, analysis of the existing disputes in DRB database was to be conducted district by district. The characteristics of the disputes in the database were developed by examining the previous studies done by researchers and disputes in the database. The characteristics can be listed as follows; (1) materials, (2) quality, (3) safety, (4) plans and specifications, (5) construction methods, (6) equipment, (7) third party hindrance, (8) quantity variation, (9) unforeseen conditions, and (10) permit. According to the analysis,

top three characteristics of disputes encountered in DRB database out of 262 disputes are; (i) unforeseen conditions with sixty seven disputes (%26), (ii) quantity variation with fifty eight disputes (%22), and plans & specifications with forty three disputes (%16).

Then, the disputes were analyzed according to the results of the cases. Out of 262 disputes only one dispute was submitted to DRB by FDOT, the remaining 261 disputes were submitted by contractors. When the outcomes of the cases are compared, there is not a huge difference in numbers. Out of 262 disputes, the contractors won 119 (% 45.42) times, while FDOT won 133 (% 50.76) times. Moreover, ten times (% 3.82) the disputes were concluded in negotiation.

Next, monetary value and time value of the disputes were discussed. Since each dispute did not have monetary and/or time value, most of the them were categorized as N/A. Monetary value of the disputes revealed that 188 disputes (%72) did not have any monetary specified. The remaining seventy four reports were placed under the ranges from \$0-\$49,999 to \$150,000 & above. On the other hand, time value of the disputes shown that 185 disputes (%71) did not have a specific time value. The remaining seventy seven disputes are located under the ranges from 0-25 days to 76 day & above.

After analysis of the disputes in terms of characteristics, monetary value, time value, and winner/loser, next step was to develop lessons learned. To develop a more utilized, user friendly lessons learned documents, it was thought if each lesson could be placed under one specific project stage, it would be easier to look for it. Project stages can be listed as follows; permit, site work, foundation, construction, landscaping, and other. Each stage has its own sub-stage or sub-stages. Out of 262 disputes, 153 disputes were

placed under the construction stage (58%). The information about the number of disputes for each stage was shown in detail.

Based on the developed lessons learned, in general it is aimed that users can look for lessons in the document to avoid similar problems occurred in the past. Instead of general lessons learned document, project stages are used as a guidance to help users locate lessons learned more specifically and easily. During the project stages, problems can be pinpointed and suitable lessons can be checked in the document. Moreover, lessons learned document can be used to see in which stage of project; more attention is needed to be paid. So that recurrence of the positive outcomes is supported while recurrence of negative outcomes is avoided.

5.3. Research Contributions

The objective of this thesis was to develop a lessons learned document to avoid recurrence of negative outcomes and to promote recurrence of positive outcomes for FDOT projects.

This research contributed to the body of knowledge lessons learned document for FDOT projects. The document focused on all project stages, related activities during a project building phase from the pre-construction to the post-construction phase. The content of the document was a compilation of suggestions, recommendations by different DRB board members.

The lessons learned document can be used in several facets. First of all, parties involved in construction project can use the document to identify how to avoid possible future disputes. Secondly, parties that experienced the problems during the project can use the document as a reference guide for resolving dispute.

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