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A Decision Tree Approach for the Analysis of Construction Delay Claims

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Abstract

Delays during the executions of construction projects can have far-reaching consequences. It may result in time and cost claims and has the potential to end in costly disputes if the claims are not accurately assessed. The assessment of delay claims as part of a construction project can also influence the financial success of a project. The transparent and accurate analysis of delay claims is an essential component of a successful risk mitigation strategy for construction projects. The paper summarizes a study that was conducted to develop a user-friendly guideline, making use of decision trees, to assist practitioners to navigate this potential minefield of complexities in the process of the assessment of delay claims. A qualitative research methodology was followed, utilizing an action-research approach to develop a decision-support framework for delay claims. The findings of the research were informed by focus groups, consisting of industry practitioners with specialist knowledge in construction contracts and delay analysis. The iterative process followed assisted in producing a tool that can be used in practice as a guideline for the analysis of delay claims.

Table of Contents

Introduction

Delays during the executions of construction projects can have far-reaching consequences. It may result in time and cost claims and has the potential to end in costly disputes if the claims are not accurately assessed. Various analytical methodologies were developed over the years as aids to determine the extent of the delay, but there is limited information on the extent of use of these methodologies, and their effectiveness to produce accurate results (Braimah, 2008). Countless problems are encountered in the process of assessment of delay claims to produce objective results. Perhaps the most significant contributing factor to disputes is the lack of clear guidance on how to assess delay claims. (Danuri, Othman & Lim, 2006).

Limited information is available in terms of an overall framework or procedure to guide practitioners in the assessment of delay claims. Past research studies are fragmentary in nature. Researchers tend to address one of the aspects of delays in isolation of the others. For example, research by Moselhi and El-Rayes (2002) focused only on weather related delays and had the objective to develop software to quantify the impact of weather conditions on project progress. Although this system will be helpful in the assessment of weather-related claims, it cannot be utilized as an overall decision-support system for claim evaluation because of its narrow focus on only one cause of delay.

Bubbers and Christian (1992) made use of a hypertext-information system to assist in the analysis of claims by informing contractors, owners, and their representatives of the contract provisions. The main purpose of the utilization of hypertext in this study was to organize the data; and thereby to enable users to focus quickly on only the relevant material. The hypertext-based system indeed acts as a decision-support system; but it does not provide a framework to guide practitioners through the claim-evaluation process.

A PhD study by Braimah (2008) developed a complex model to assist practitioners to choose the most suitable delay analysis method for construction delays. The aim of the model is to serve as a tool to select and justify the specific delay analysis method utilized in the assessment of delay claims. Although this model is a helpful tool in deciding on which of the common delay analysis methods should be utilized for a specific delay, it does not provide guidance on each step in the claim assessment process.

The Society of Construction Law (SCL) is a United Kingdom based body comprising of built environment professionals and construction attorneys. The SCL has developed a Delay-and-Disruption Protocol with the objective to offer good practice guidance for the management and analysis of construction delays. Section 3 of the protocol offers high level guidelines on various aspects to considering in the analysis of delay claims (SCL, 2002).

The American Association for the Advancement of Cost Engineering (AACE) published a practice guide for forensic analysis: the AACE Forensic Schedule Analysis Practice note No 29R-03. The practice guide is a very comprehensive technical resource for forensic schedule analysis.

The review of the literature showed that that there is a need for a holistic framework or step-by-step guide to simplify the complex process to accurately assess whether an event delayed completion.

The article aims to summarize the findings of PhD research conducted to develop a framework making use of decision trees to assist practitioners with the analysis delay claims.

Delays – The Basics

Before attempting to address the complexities in the process of analysis of delay claims it is necessary to have an understanding of the basic terminology associated with delays.

Types of delay

As a result of the prevalence of delays and their consequences a set of relatively standardized terms developed over the years to describe different types of delay. These terms are commonly utilized in construction contracts and industry literature when delays are addressed. Figure 1 graphically depicts the different types of delays categorized in terms of risk, compensation and impact on project completion.

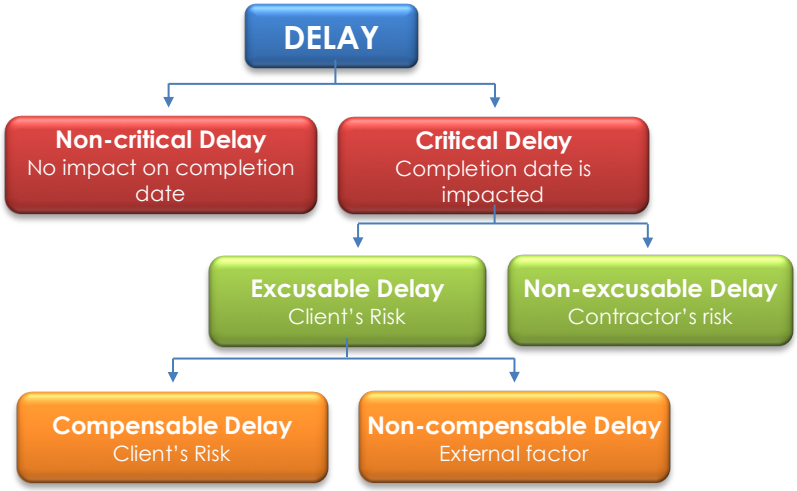

Figure 1 – Types of Delay

The aspects that are integral in categorizing the different types of delay collectively influence the outcome of the analysis delay claims.

Critical delays

To understand the concept of critical delays it is necessary to distinguish between a delay in progress and a delay to project completion. A delay in progress influences the planned commenced and duration of an activity or set of activities. The planned commencement and/or completion of the activity might differ from the original intent, but this deviation does not impact the planned project completion date. However, if this delay is of such significance that it directly

impacts the planned completion of the project it is on the critical path and can be describe as a critical delay.

The critical and non-critical delays can be defined by the impact on completion:

- Critical delay – a delay event that is of such significance that the occurrence of the event directly results in the project completion date being postponed to a later date.
- Non-critical delay – a delay event that does not cause the planned project completion date to be impacted.

Excusable delays

Non-excusable delays are commonly described as those delay events that the contractor is responsible for or which is within the contractor's sphere of control. The contractor takes on the risk of these types of delay events when entering into a construction contract and would therefore not be compensated in any way for the occurrence of a non-excusable delay.

An excusable delay, on the other hand, can be described as a delay caused by either of the following:

- Third parties or incidents beyond the control of the owner and the contractor, and
- The owner or those in the owner's employ. (Alaghbari, Kadir & Salim, 2007).

Compensable delays

Contractors will in most cases only be able to apply for additional compensation when a delay event is excusable. However, not all excusable delays are compensable.

- Non-compensable delay can be defined as an excusable delay that takes place as a result of events beyond the control of the owner and the contractor. It is generally accepted that if the contract allows, the contract period will be extended but compensation is not payable.
- Compensable delay – an excusable delay caused by the owner or those in the employ of the owner. The project completion date will be extended, and the contractor will receive compensation for the delay (Tumi et al., 2009).

Contractual compliance in terms of delay claims

Compliance with the contractual provisions is another important consideration in the process of delay analysis. Delay claim provisions in the majority of standard construction contracts can be classified into the following two main categories:

- Clauses dealing with the notification of a possible delay, and
- Clauses dealing with the claim itself.

Many contracts have a strict time provision or time bar for the contractor to notify the owner when a delay event occurs. A maximum number of days will be stipulated within which the contractor will have to notify the owner. Many modern construction contracts would dictate that non-compliance with the notification time bar would result in the delay claim not being considered. Contracts also typically include requirements for the delay claim itself. The requirements include stipulations on the content of the claim and the time allocated to the contractor to prepare and submit the delay claim documentation. Generally, contracts do not provide for strict enforcement of the claim requirements. It is very seldom that a construction contract would allow the outright rejection of the claim if these requirements were not met.

Methodology

Knowing that the analysis of delay claims is often challenged it was of particular importance that the method utilized to produce the delay analysis decision framework should be robust and without reproach. Several possible approaches to develop the framework were considered. After a critical review of the available research methods, action research, a very specific qualitative research approach, was identified as the most appropriate choice for the research method.

Action research is a knowledge creation approach that is particularly suited for practical application, it requires researchers to work with industry practitioners, (Reason and Bradbury, 2001 and Huang, 2010). The action research process followed to develop the framework for the simplification of the analysis of delay claims is depicted in Figure 2:

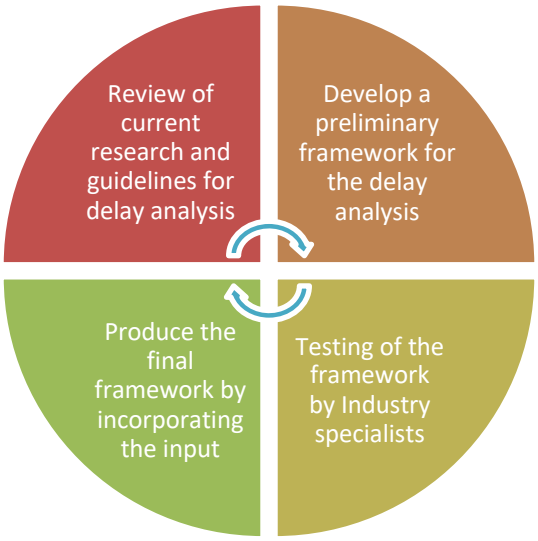

Figure 2 – Action research process to develop a delay analysis framework

The preliminary framework started to take shape after the review of a large number of research studies and industry guidance documents. The next and perhaps the most important step was to

test the validity of the framework through the scrutinization of industry specialists. Focus group meetings were arranged with contractors, architects, engineers, delay claim specialists, construction attorneys and members of form contract review committees. The final decision support framework was then produced after the input from these meetings was incorporated.

Universal Decision Tree Framework

The process of assessing delay claims consists of a series of decisions taken in regard to a number of different matters – ranging from compliance to contractual clauses to risk allocation between contractor and owner. In essence, the evaluation of delay claims is a sequential decision-making process, in which each decision would influence the outcome of the claim. A guidance tool should therefore support this sequential process of decision-making. With this requirement in mind several decision support methods were considered. The one that showed the most promise to be applied in this set of circumstances was decision trees.

A decision tree can be defined as a flowchart-like structure that shows the various outcomes when decisions on a matter need to be made. The most striking advantage of decision trees compared to some of the other decision support methods was that researchers remarked that decision trees are easy to utilize and understand (Murthy, 1998). Decision trees have many uses, such as, predicting a probable outcome, assisting in the analysis of problems, and aiding in making decisions. When formulating and configuring decision trees, the results of real-world factors are analyzed and compiled, so that the specifics of the previous factors and the related results are used to predict the results of future factors (Smith & Tansley, 2003).

To be able to apply decision tree principles to delay analysis it was necessary to identify the decisions taken as part of the analysis process. The literature and focus groups identified the following essential decisions required when a delay claim is to be analyzed:

- Was the delay critical?
- Was the delay excusable?
- Were the contractual provisions complied with?
- Was the delay compensable?

Arguable the most significant decision in the analysis of delay claims is whether the delay is critical or not. Many construction contracts do not specifically mention the term ‘critical delay’, but would rather refer to a delay to the contractual completion date. For a delay to impact the contractual completion date, it would necessarily have to be critical. A decision that is universal in delay claim analysis is whether the delay event ultimately impacted the contractual completion date or if considered from a scheduling perspective, whether the delay is on the critical path.

Another important consideration when analyzing delays is entitlement. Construction contracts often address entitlement by means of the concept of excusable delays. Although, not always expressly mentioned in construction contracts the concept of excusable delays are utilized to determine whether the contractor is entitled to an extension of the contract period when a

specific delay event occurs. During the delay analysis process another consideration is whether the delay event is excusable and will establish entitlement to additional time and compensation.

Entitlement can also be influenced by the compliance with the contractual provisions. Claims for additional time are governed by the provisions within the construction contract. These provisions direct the process to be followed in dealing with delays. Non-compliance with contractual provisions may in certain circumstances carry severe penalties that may result in the entitlement to additional time or compensation being forfeited. One example is the notification provisions of many modern form contracts that would institute a strict time bar if a notification of delay is not submitted timeously. In addition to the other decisions required the analysis process would also have to consider whether the contractor complied with the contractual provisions relating to the notification of delay and the claim.

Claims for the extension of the contract period can also include a request for delay cost. A further decision that will have to be made is whether the circumstances justifies the payment of compensation or in other words whether the delay is compensable.

To incorporate the decision made during the delay analysis process it should be kept in mind that decision trees consider decisions in a sequential manner. The starting point in the development of the universal decision tree framework was to establish the sequence in which the four decisions should be made. Two main considerations formed part of the process to determine the most appropriate sequence. The first was to determine whether any of the decisions are dependent on any of the other decisions to be made. The second was to consider the sequence in terms of the level of effort required to make the decision.

When determining whether a delay is critical (impacting the completion date) one of the common delay analysis methods are typically applied. This can be a very time consuming process and it might be abortive if the delay event is not excusable or if the claim is forfeited due to non-compliance. Therefore, it will make more sense to rather start with one of these two important consideration before criticality is considered.

To determine whether the contract provisions were complied with would normally not be a very involved process. The documentation submitted as part of the claims submission would be evaluated to determine whether the relevant contractual provisions were complied with. The decision on whether the delay is compensable is often influenced by the number of days the delay impacted completion. Therefore, it is sensible to consider the decision relating to compensation last. The following sequence of decision making is therefore proposed:

- Decision 1 – Were the contractual provisions complied with?
- Decision 2 – Was the delay excusable?
- Decision 3 – Was the delay critical?
- Decision 4 – Was the delay compensable?

If the decisions required in the delay claim analysis process are translated into a decision tree, the decision tree can be formulated as follows:

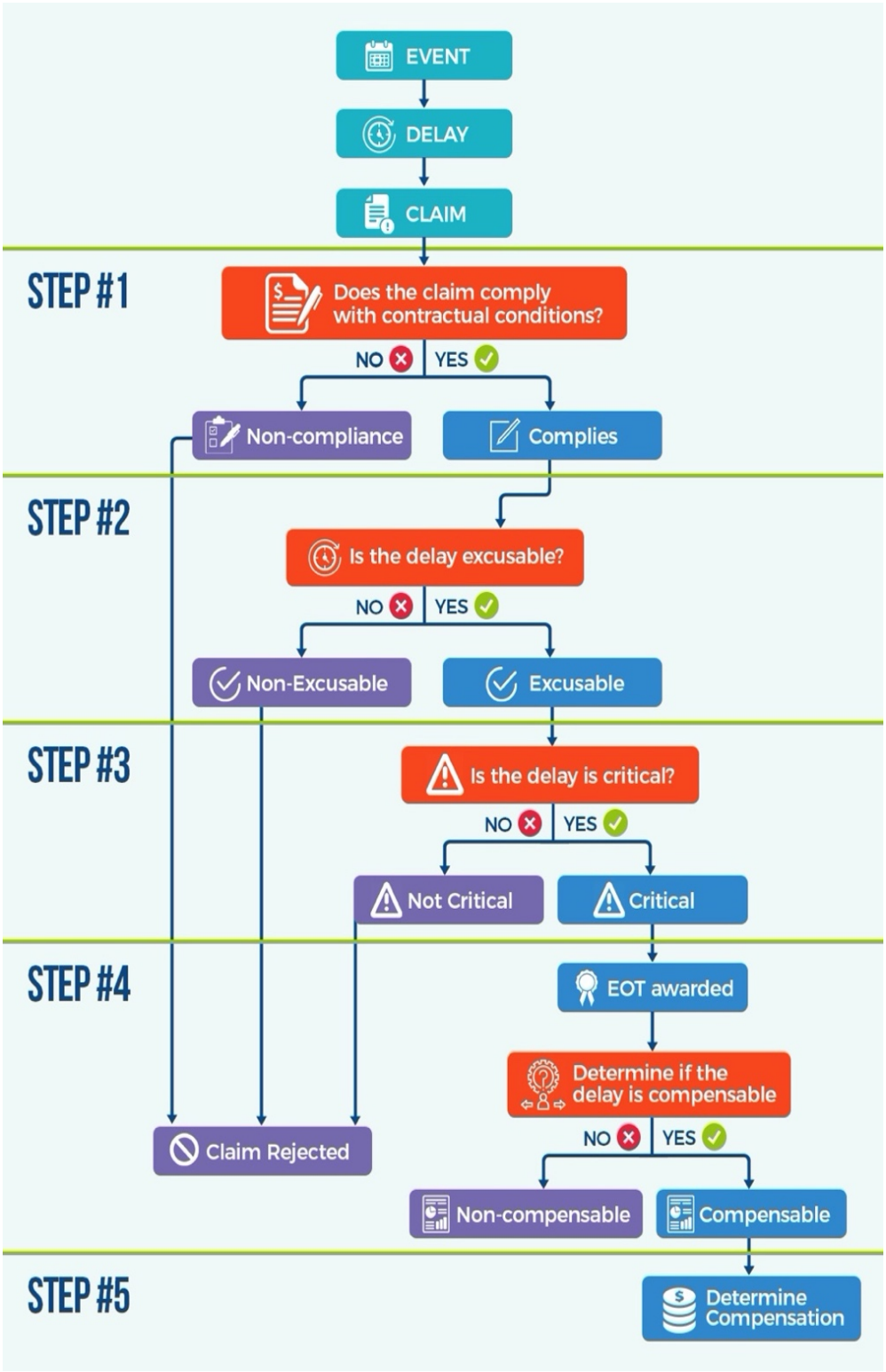

Figure 3 – Universal decision tree framework

Step 1 – Does the claim comply with the contractual provisions?

Compliance with the contractual provisions is often a prerequisite for a delay claim to be considered for approval. Delay claim clauses in most construction contracts can be separated into the following two main categories:

- Clauses dealing with the notification of a possible delay; and
- Clauses dealing with the claim itself.

The first step in the analysis process is to identify the relevant delay-related contract clauses and then to test the contractor's compliance with these clauses. Many contracts have a strict time provision or time bar for the contractor to notify the owner when a delay event occurs. A maximum number of days will be stipulated within which the contractor will have to notify the owner. The calculation of the number of days would typically start from the date when the delay event occurred. To adjudicate a strict time bar the following steps can be followed:

1) Determine the date when the delay event occurred.
2) Determine the date when the contractor submitted the notification of delay.
3) Compare the delay event date with the notification date to establish whether the notification adhered to the time bar.

Normally, the contract would dictate that non-compliance with the notification time bar would result in the delay claim not being considered. The decision tree allows for the claim to be rejected in cases where the notification deadline was missed.

Contracts typically include requirements for the delay claim itself. The requirements include stipulations on the content of the claim and the time allocated to the contractor to prepare and submit the delay claim documentation. Generally, contracts do not provide for strict enforcement of the claim requirements. It is very seldom that a construction contract would allow the outright rejection of the claim if the requirements were not met. For example, if the contractor does not fully comply with the claim content requirements the possibility that the claim for additional time will succeed is slim. Delay claims would typically still be considered even in cases where the claim content requirements or the time allocation for the delay claim submission was not adhered to. The next step will be to consider whether the delay was excusable.

Step 2 – Is the delay excusable (owner's risk)?

Most contracts provide for an extension of the contract period – but only if a delay is deemed to be excusable. When a claim is being evaluated, it is essential to determine whether the delay in question is an excusable delay or a non-excusable delay.

An excusable delay can be described as a delay caused by either of the following two factors:

1) Third parties or incidents beyond the control of the owner and the contractor; and
2) The owner or those in the employ of the owner.

To determine whether a delay is excusable, it is required to assess the root cause of the delay event. Contracts normally provide guidance on what type of delay events can be considered excusable. If the contract stipulates that the cause of the delay event is not excusable, in other words the contractor's risk, the claim can be rejected. When the delay is indeed excusable the decision tree considers the criticality of the delay in step 3.

Step 3 – Is the delay critical?

Most construction contracts only make provision for the extension of the construction period for events causing a delay to the contractual completion date. The completion date will only be impacted when a delay event:

- affects a critical activity (an activity on the critical path); or
- if the effect on a non-critical activity is so severe that the activity becomes critical.

During step 3 the delay event will be assessed to determine whether the occurrence of the event delayed the completion date. Several methods to analyse the impact of a delay event on the completion date were developed over the years. When applying one of the delay analysis methods it will be possible to determine whether the completion date was impacted and the extent of the impact. If the completion date was not delayed the claim can be rejected. For delays that impacted the completion date, the next step in the decision tree will be to determine whether the delay is compensable.

Step 4 – Is the delay compensable?

The payment of compensation for the delay events is influenced by the allocation of risk between the contractor and the owner. It is general practice that an excusable delay caused by the owner is compensable. During step 4 the contract will be consulted to determine whether the delay is compensable. If no guidance is provided in the contract it can be safely assumed that compensation will only be payable to the contractor for delays caused by the owner or for delays which the owner took on the risk. If the claim is compensable the compensation will be calculated as part of step 5 of the decision tree.

Step 5 – Calculate Compensation

The construction contract utilized would normally provide guidance on how compensation should be calculated when a delay event occurs. The compensation calculation provided by the contractor as part of the claim should be analyzed to determine whether it is in line with the provisions of the contract.

Contracts often provides for the payment of delay related compensation on a proven actual cost basis for cost incurred as a direct result of the delay. In such cases, the delay claim should include

information substantiating the cost. The cost information should be reviewed and if it is lacking additional information should be requested.

The principles defined as part of the universal decision tree framework can be applied in the process of assessing delay claims by developing decision trees for each step informed by the provisions of the construction contract utilized.

Conclusion

The delay analysis method described in the paper is unique in that it aims to assist practitioners in a holistic manner by incorporating all considerations in the analysis process in one framework. Other forms of guidance produce to date are mostly focused on the assessment of the criticality of the delay. By following the clear and simple steps to assess delays the decision tree framework would hopefully contribute to eliminating uncertainty in the assessment process of delay claims and provide for more transparency.

Delays will always be part of construction projects and should not be ignored. The risk associated with construction delays can be effectively addressed by increasing our knowledge to find fair and transparent ways to analyze and resolve the consequences of construction delays.

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