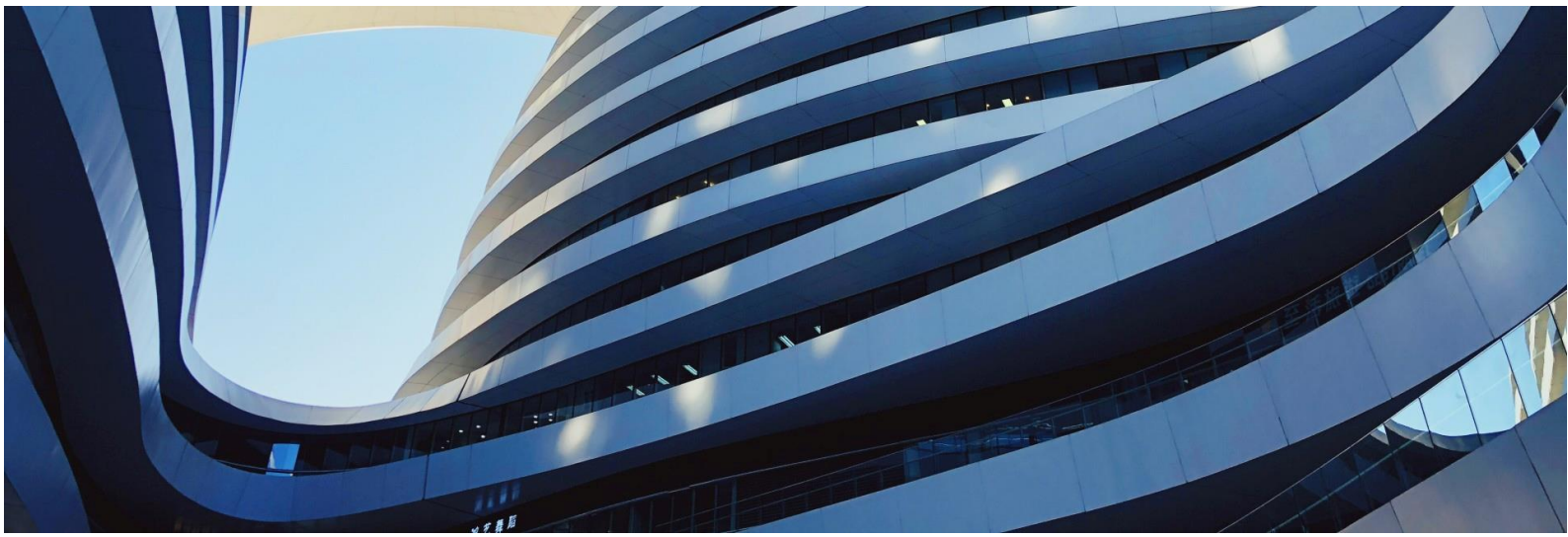

A statistical review of delay analysis techniques used over the last decade

Introduction

Delay analysis can be performed using a variety of methods. The choice of methodology depends on many factors, like the nature of the project, contractual requirements, availability and reliability of information made available, the time allocated to conduct the analysis, as well as others.

To justify the selection of a given method, delay analysts and experts often refer to two guidance documents: the Delay and Disruption Protocol published by the UK Society of Construction Law (SCL Protocol) and Recommended Practice 29R-03 issued by the US-based Association for the Advancement of Cost Engineering International (RP 29R-03).

When a delay analysis is conducted during project execution, immediately or shortly after the occurrence of a delay event, the associated delay impact has yet to materialise. In this situation, delays can only be assessed on a prospective basis – i.e., contemporaneous analysis of delay. The SCL Protocol recommends, in the absence of contradictory contractual or legal requirements, to carry out a time impact analysis.[1] RP 29R-03 does not provide any contemporaneous guidance as the document focuses solely on delay analysis carried out retrospectively.

When delays incurred is analysed at a significant time distant from the delay event and its effect retrospective analysis of delay), the 2nd edition of the SCL Protocol recognises that one size does not fit all, and provides a list of six commonly used delay analysis methodologies:

a) Impacted As-Planned Analysis;

[1] Society of Construction Law – "*Delay & Disruption Protocol*" (2017, 2nd edition), para. 4-2 to 4-12

b) Time Impact Analysis;
c) Time Slice Window Analysis;
d) As-Planned versus As-Built Window Analysis;
e) Retrospective Longest Path Analysis; and
f) Collapsed As-Built Analysis.

Except for the retrospective longest path analysis, the same delay analysis methodologies are also referenced in RP 29R-03.

The strengths and limitations of each of these methodologies have been commented on by judiciary for years and tested to some degree in court. Articles discussing delay analysis methodologies tend to advocate for the adoption of certain methods and the dismissal of others. Ultimately, it is difficult to get a clear picture as to which of the six methods are frequently used in practice to perform delay analysis retrospectively.

This article seeks to provide some answers by conducting a statistical analysis on delay analysis techniques based on a representative sample established using data from major capital projects around the globe on which HKA has provided delay analysis services. The purpose of this analysis is not to rank delay analysis methods based on how frequently they are employed, but rather to identify major trends and discuss why some methods have been rising or declining over the last decade.

“The statistical analysis shows a large disparity between the different delay analysis techniques”

Data Collection

To ensure the analysis produces the most meaningful results, only projects meeting all the following selection criteria were included within the representative sample:

a) The choice of delay methodology was not expressly prescribed in the contract.
b) The delay analysis prepared to determine causes of delay was:
    i. conducted retrospectively;
    ii. diligently prepared and reasonably substantiated; and
    iii. transmitted to the opposing party on or after 1 January 2010.
c) The Responding party reviewed the delay analysis and provided a substantiated reply or an alternative delay analysis.
d) The amount claimed in relation to delay (prolongation) exceeded $5 million.

In addition, because the nature and location of the project may influence the choice of a delay analysis methodology, projects coming from all sectors and regions were considered as part of this analysis. Figure 1 below shows a breakdown by sector and regions of projects included within the representative sample.

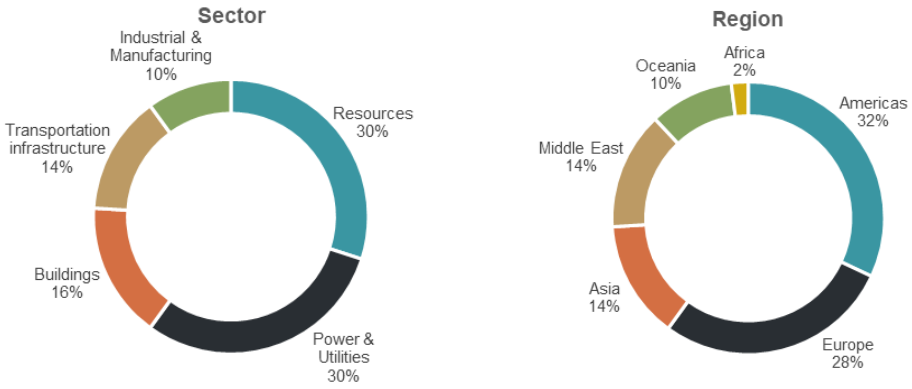

Figure 1 – Sector and Region of projects retained for analysis

To preserve confidentiality, data collection was limited to:

a) the date at which the Claimant served the delay analysis to the Respondent;
b) delay analysis methods used by the Claimant and the Respondent; and
c) the region where the project was located.

Analysis Results

Results from the statistical analysis shows that all six methods listed in the SCL protocol were applied between 2010 and 2021. As illustrated in Figure 2 below, these six delay analysis techniques have been used about 85% of the time to analyse delay retrospectively by either the Claimant, the Respondent, or both. Other methods to analyse delay only amount to 2%, and the remaining 13% represents situations where the Respondent simply issued a criticism of the Claimant's delay analysis.

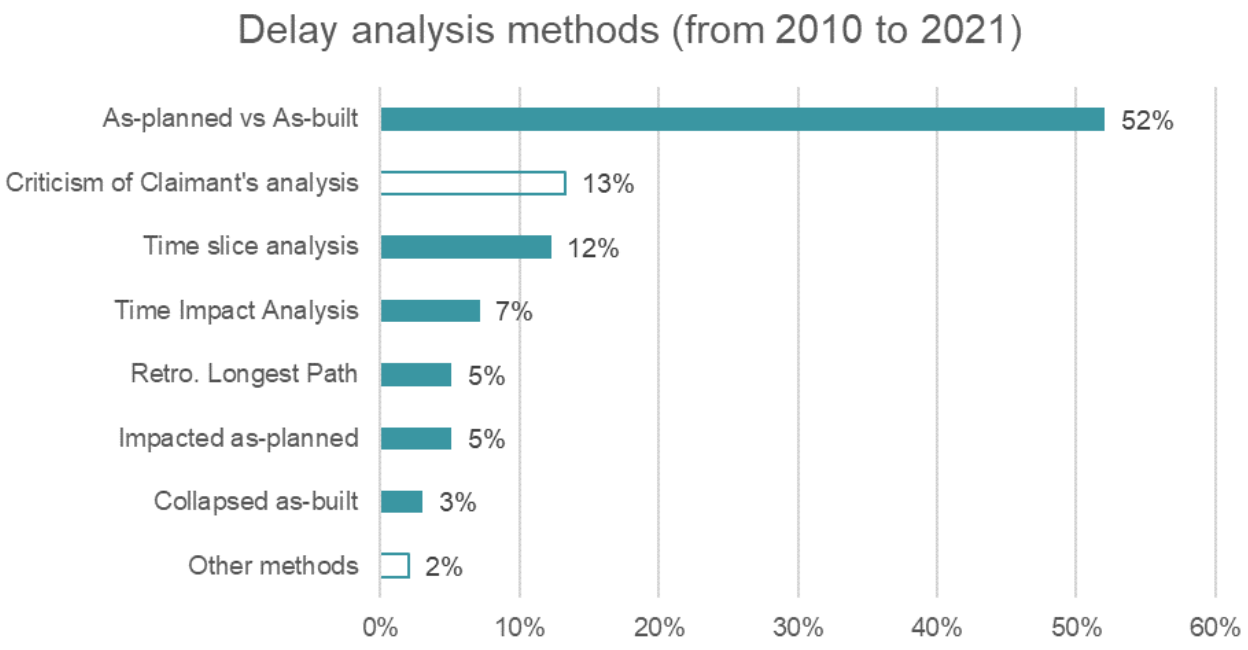

Figure 2 – Distribution of delay analysis methods between 2010 and 2021 in all regions

As shown in the above bar chart, an as-planned vs as-built approach was chosen about half of the time. This method was not always carried out in windows as described in the SCL Protocol, yet the project duration was most of the time sub-divided into smaller time periods for complex and multi-year projects.

The other five methods lag far behind. The second most used technique - time slice window analysis – was chosen only 12% of the time, and the remaining four methods were all below the 10 percent mark.

Yet these methods were not employed in the same proportion by the Claimant and the Respondent. The same method was selected by both parties only 34% of the time. As shown in Figure 3 below, the biggest difference concerns the impacted as-planned method that is four times more relied upon by the Claimant than the Respondent. This delay analysis technique, which consists of modelling delay events in a logically linked baseline schedule to assess the (theoretical) impact on project completion, has the reputation to favour the Claimant as Respondent's risk delay events are more likely to be identified and reflected in the impacted schedule than the ones for which the Claimant is liable. It can be argued the analysis confirms this hypothesis. A closer review of the collected data shows the impacted as-planned method was only employed by both the Claimant and the Respondent on one occasion to determine causes of delay retrospectively. The reason invoked by both parties was a lack of reliable as-built information.

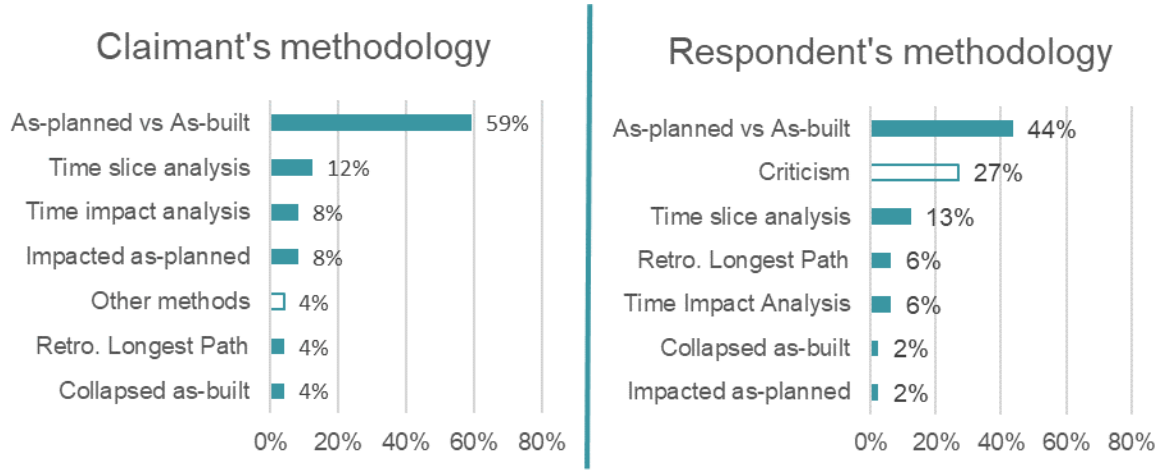

Figure 3 – Distribution of delay analysis methods – Claimant's versus Respondent's methodology

It is also interesting to review the evolution of delay analysis method selection over time. Dividing the timeframe of the analysis into two equal periods, it is observed that the delay analysis methods identifying delay impacts first (i.e., the effect) – namely As-planned vs As-built, Time slice window analysis, and Retrospective longest path – have all been on the rise during the decade. Conversely, methods modelling delay events first (i.e., a cause) to assess the associated impact of delay later – Time Impact Analysis, Impacted As-planned, and Collapsed As-built – have all severely decreased since 2016. This is demonstrated by the time impact analysis which fell from 20 to zero percent, as shown in Figure 4 below.

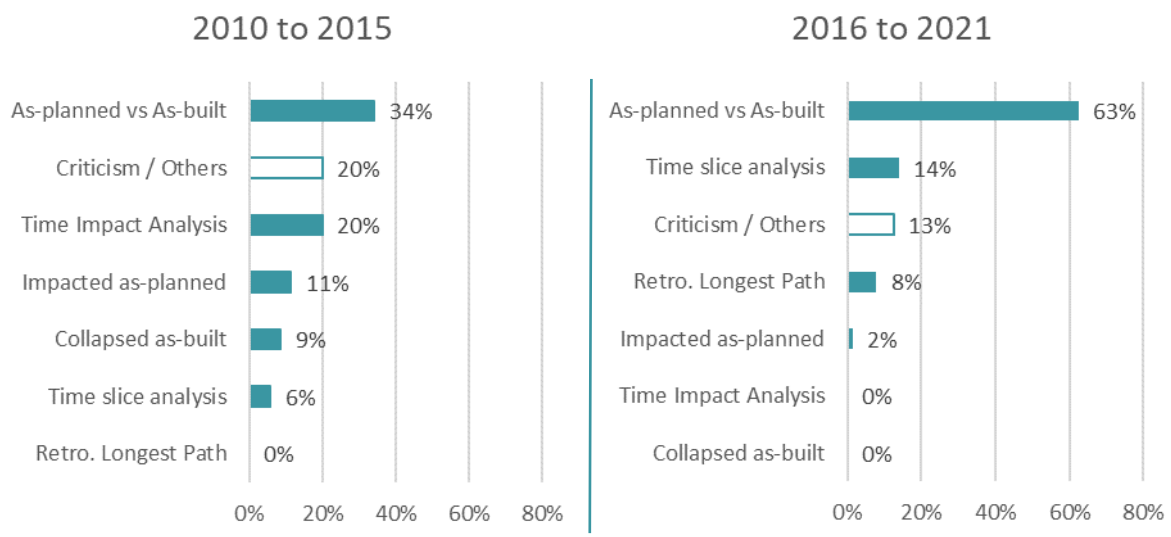

Figure 4 – Evolution of delay analysis methods usage over time in all regions

According to the above bar chart, the choice of the As-planned versus As-Built method nearly doubled over the last decade. This method was also more often formalised as a windows analysis since 2016; a detailed review of the data shows a three-fold increase occurred between the two analysis sub-periods.

Furthermore, looking at the results of the analysis based on geographical region, there is a notable difference between Americas and the rest of the world. As shown in Figure 5 below, the time slice window analysis is preferred 31% of the time on this continent, which is more than twice the global average (12%). All other delay analysis techniques are less often chosen in all regions (except for the collapsed As-built analysis). Despite these differences, the As-Planned versus As-Built approach remains the most commonly used technique and the overall order of preference remains the same.

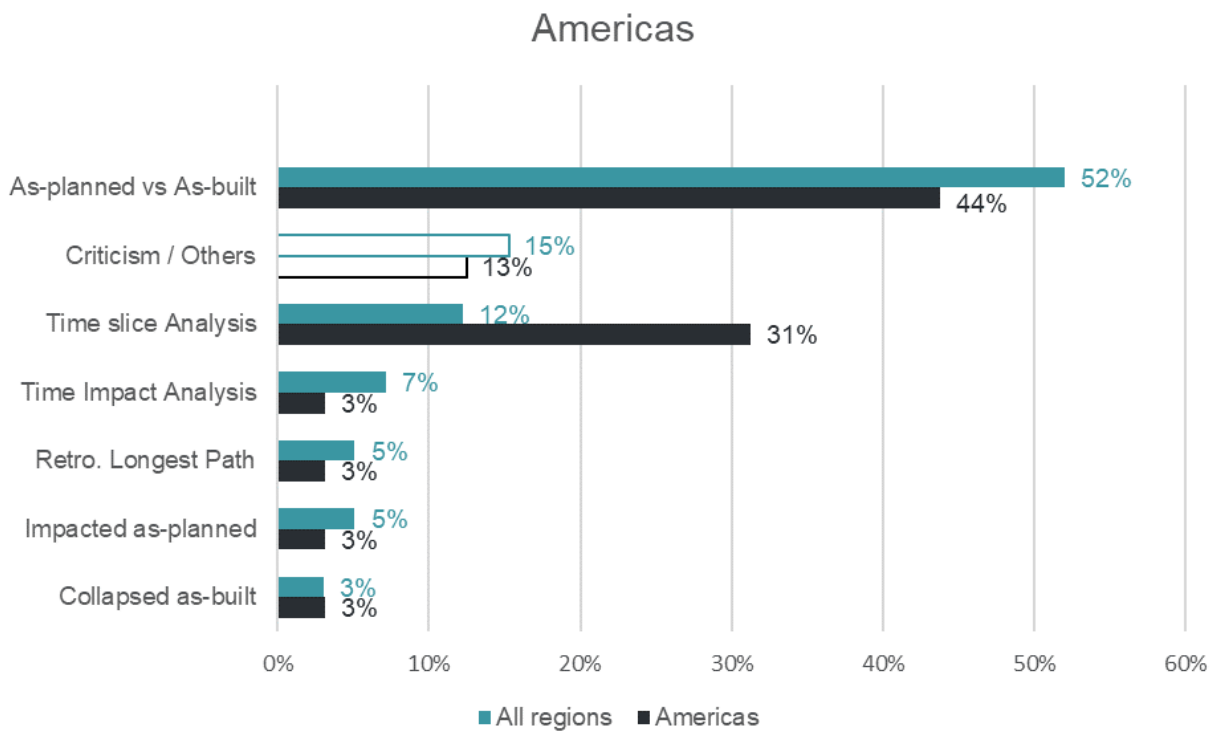

Figure 5 – Comparison of delay analysis methods used in Americas and in all regions of the world

Discussion

The statistical analysis shows a large disparity between the different delay analysis techniques.

The As-Planned versus As-Built methodology is the most frequently used at any point in time, regardless of the region or the nature of the project. It could be argued this technique is the most versatile and preferred by the parties to analyse delay retrospectively whenever the project, contract and legal requirements allow it.

On the contrary, the impacted as-planned and the collapsed as-built methodologies are being used less frequently and used in very specific situations.

The interpretation of results for the remaining three methods is less straight forward.

Time impact analysis

The usage of time impact analysis to conduct delay analysis retrospectively has been debated for a long period. This method is highly praised by some and heavily criticised by others.[2]

The first edition of the SCL Protocol, published in 2002, stated time impact analysis was "*to be used wherever the circumstances permit, both for prospective and (where the necessary information is available)*

[2] E.g., Livengood John - "*Retrospective TIAs: Time to Lay Them to Rest*" (2008, AACE International Annual Meeting); Robert M. D'Onofrio – "*Ranking AACE International's Forensic Schedule Analysis Methodologies*" Cost Engineering Magazine (July/August 2015, AACE International)

retrospective delay analysis".[3] Abandonment of the preference for retrospective time impact analysis was announced by the SCL Protocol review committee in July 2015.[4]

Analysis results show the influence of this change of position, and more generally of the SCL Protocol. Until 2015, the time impact analysis was the second most used technique (20% of the time). Between 2016 and 2021, the time impact analysis method was not used retrospectively on any of the sample projects.[5]

Irrespective of the position set forth in the SCL Protocol, and the amount of discussion regarding the reasonableness of this method to conduct retrospective delay analysis, the present analysis shows that time impact analysis has never been on the verge of replacing the As-planned versus As-built analysis as the most commonly used method. The time and effort required to perform a time impact analysis was probably a limiting factor for its widespread adoption.

Time slice window analysis

The analysis shows that time slice window analysis is the second most commonly used method for analysing delay retrospectively. Analysis results tends to confirm this method is on the rise, albeit mainly in the Americas.

Multiple reasons could explain the preference for the time slice window analysis over the other methods:

a) commonly accepted as a robust method when reliable programmes are available;
b) ability to determine the as-built critical path based on CPM contemporaneous programme;
c) less time consuming and easier to explain than a time impact analysis;
d) more robust than an impacted as-planned or a retrospective as-built; or
e) A combination of the above.

Yet none of the above reasons are readily apparent from the results of the statistical analysis.

It could also be argued that the revision of the SCL Protocol rescinding the recommendation for the retrospective time impact analysis may have benefited the time slice window analysis. It should be underlined that the influence of the SCL Protocol is more limited in the United States as RP 29R-03 predominates[6], and no similar increase was witnessed on other continents. A possible influence of the SCL Protocol therefore remains to be established.

Retrospective longest path analysis

The influence of the SCL Protocol is more apparent for the retrospective longest path. This method was not used at all between 2010 and 2016 on any of the projects within the sample. Then, this technique was

[3] Society of Construction Law – "*Delay & Disruption Protocol*" (2002, 1st edition), para 3.2.11
[4] Society of Construction Law – "*Delay & Disruption Protocol*" (2015, RIDER 1), para 14-15
[5] Figure 4, supra.

applied 8% of the time in the subsequent period. The inclusion of this delay analysis technique in the 2nd edition of the SCL Protocol is most certainly not foreign to its recent adoption rate increase.

Conclusion

The statistical analysis presented in this article provides some trends on delay analysis methods used between 2010 and 2021.

The As-planned versus as-built is the most commonly used technique for Claimant and Respondent. The preference for this method has increased in the recent years and remains prevalent in all sectors and regions.

More generally, methods assessing effects of delay first have progressively gained preference over those starting with causes of delay. The prevalence of the time impact analysis to conduct retrospective delay analysis has declined in popularity in recent years. The impacted as-planned and collapsed as-built analysis techniques have also been less employed in recent years.

The revision of the SCL protocol has most certainly played an important role in this transition, but its reach and influence are less noticeable in the Americas.

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François Michaud has over 10 years of experience in the construction and engineering industry. He specializes in CPM scheduling and delay analysis, disruption analysis, and claim management. Additionally, François has a thorough experience in eDiscovery and document management systems. François advises clients on issues revolving around prolongation, loss of productivity, acceleration, and others time and cost-related matters. His experience includes the preparation, negotiation, and settlement of claims in nuclear, oil and gas, infrastructure, and technologies sectors.