Factual Disagreements in Construction Delay Disputes: Identification, Evaluation and Testing of the Justifications for Difference in Opinion

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Abstract. Construction delay claims are a leading cause for disputes in the sector. There are two primary aspects to such disagreements: legal and factual. The focus of this paper is the latter. It identifies, evaluates and ranks the factors that impact the analysis of evidence concerning construction delays. The research method is two-fold, involving content analysis of twenty case studies, that identifies the reasons for difference in expert opinion (or factors), and testing of these findings in a survey questionnaire designed to examine the impact and comprehensiveness of those factors. This method provides a more rigorous assessment than previous studies and therefore a more precise list of variables. It is concluded that the factors can be grouped into two categories: (i) materials and documents and (ii) matters of interpretation. Although both categories are important, the deficiencies in the former are often exploited by the parties and/or legal professionals to generate conflicting results in terms of extension of time entitlements. Incorrect, incomplete, undisclosed and/or unagreed records and procedures are used to generate ambiguity and create opportunities to perpetuate claims and disagreements. The work presented here provides additional support to the proposition that opportunistic behaviour is at the core of factual delay disputes and further evidence that tailored contractual delay protocols such as delay analysis clauses can be an effective aspect of a broader solution.

1. Introduction

The literature is generally highly critical of the cost and frequency of construction delay disputes, specifically noting that such disagreements are one of the leading causes for disputes not only in the UK [1] but also globally [2]. They are expensive, time consuming, widespread, persistent [3] and can add to considerable transaction costs in construction projects [7]. Whilst previous studies address the evaluation of the issues that lead to time-related disputes, specifically the primary reasons for the

divergence in delay expert opinion during dispute resolution proceedings, this study focuses on improving the comprehensiveness of the list of factors and the identification of their impact. The empirical analysis reported here is based on twenty case studies and fifty survey questionnaires that address these objectives by (i) organisation and categorisation of the arguments currently relied upon by delay experts, (ii) measurement of the importance of those factors, (iii) provision of additional evidence to support the feasibility of suggested solutions (or mitigation measures) and (iv) recommendation of additional solutions to address issues that emerge from this study. The structure of this paper is as follows: after a presentation of the background, and a summary of relevant literature, the research methodology is presented and the findings are described. This is followed by a discussion where the key issues are evaluated and the potential solutions analysed. These form the basis of recommendations for the more effective management of factual disagreements in construction delay disputes during the contract administration phase of projects to enable more efficient resolution (or even avoidance) of factual disputes by preventing the escalation of claims into disputes.

2. Literature Review

Currently, most construction contracts require the contractor to complete the works by the completion date (or the section completion dates). Any delays to the completion dates have adverse effect and can lead to significant financial loss and expense to the parties involved in such disagreements [7]. However, contractual provisions and procedures are presently ineffective in preventing time-related disagreements where the causes can vary from different interpretations of terms like the word 'delay' [9] to arguments relating to the most suitable delay analysis method in the context [10]. The result is often high value, highly problematic extension of time (EOT) disputes where EOT means an extended contractual period that provides a later date by which the works should be completed by the contractor and to relieve it from liability for delay damages [11].

Such context generates opportunities for claims management and dispute resolution consultants like commercial professionals who specialise in 'Forensic Delay Analysis' [12]. Forensic Delay (FD) experts form their opinions on records (such as contemporaneous programmes and progress reports) that are processed with the assistance of delay quantification techniques (e.g. the Critical Path Method, or CPM) and delay analysis methods [13]. It is the interaction between the materials and documents (or records) and the matters of interpretation (or analysis) that is the focus of this paper. Specifically, identification, evaluation, ranking and categorisation of the factors (or justifications for the difference in expert opinion) that lead to disagreements on EOT entitlements. Along with the subjective interpretation of facts involving the absence of necessary materials, documents, contractual procedures and the flawed use of delay analysis approaches.

Although an evaluation of delay analysis methods is outside the scope of this paper, it is important to state that the there are two organisations that can influence the selection of the delay analysis approach, the Society of Construction Law (SCL) and the American Association of Cost Engineering (AACE). Basically, these organisations provide protocols (or practice directions) that recognise several delay analysis methods that can be divided into two categories, prospective and retrospective [11] [14]. However, it is important to note that the 2017 SCL Delay and Disruption Protocol (i) has not been explicitly adopted by any specific standard form contract, (ii) is not put forward as the benchmark of good practice throughout the construction industry (iii) does not purport to be consistent with best practice, (iv) recommends that the parties try to agree an appropriate method of delay analysis before each embarks upon significant work on an after the event delay analysis and (v) warns that failure to consult the other party on delay analysis methodology may be taken into account by the decision maker [11]. Earlier work by authors (see Kraiem and Diekmann [15]; Braimah [16]; Society of Construction Law [11]; Scott *et al*. [17] and American Association of Cost Engineering [14]) discuss the advantages, disadvantages and suitability of a range of delay analysis methods. For example, the relevance of a particular delay analysis method is context specific, depending on criteria like availability and quality of programmes and records [18]. Recent studies indicate that the accuracy of delay analysis methods depends on, among others, the availability of adequate materials and documents including baseline

programme, regular programme updates and accurate as-built records [10]. However, currently there is little to prevent players from selecting one delay analysis method over another to prioritise their clients' interests. Additionally, the parties are rarely compelled to share such information, or indeed bound to agree on the technique that should be used for its analysis. Consequently, there is a strong argument that without good quality of materials and records the analysis of delays is unlikely to be sufficiently accurate to avoid fact-related delay disputes. In other words, insufficient and/or poor-quality information can increase the uncertainty of outcome. Furthermore, subjective selection rationale, modification of recognised delay analysis methods and/or the use of unrecognised delay assessment techniques are at the core of factual construction delay disputes.

The authors undertook a systematic literature review of all academic articles and doctoral dissertations from four data bases; namely, (i) the Association of Researchers in Construction Management ('ARCOM') research database, (ii) the 'ICONDA' library that is the online repository containing publications relating to the Council for Research and Innovation in Building and Construction ('CIB'), (iii) Google Scholar and (iv) the British Library 'Ethos'. From this literature it is clear that the identified published work (excepting those of the author) is predominantly focused on the factors that *cause delay*, and not on explaining *how or why* disagreements occur over what should be *matters of fact* in delay claims and disputes. This is driven by an entirely different set of factors.

This study offers (i) a comprehensive list of those factors and (ii) research methods that rely upon access or recourse to documents submitted as evidence in dispute resolution forums; specifically, the justifications for differences in expert opinion on extension of time entitlements stated by delay analysts in evidential material. Without this understanding efficient and effective solution to this problem cannot be offered. This study is grounded upon a large sample of real case material and the availability of such information to the authors was critical to the identification of a comprehensive list of factors and root causes and underpins the development and ultimate contribution of this research. The study also provides evidence that the sector concurs with the proposition that identifying and implementing the most suitable delay analysis method at the inception stage of a project (or before the contract is signed – also known as *ex ante* agreements) can be a part of the solution.

3. Research Methodology

The aim of this study is to identify, evaluate, categorise and rank the factors (or justifications for the difference in expert opinion) that lead to disagreements on EOT entitlements. The research methods are archival research (involving the content analysis of twenty case studies) and a survey questionnaire that tested those results, by asking participants to (i) rank the thirty-three factors and (ii) add to the list of reasons for disagreements over matters of fact in construction delay claims and disputes.

Construction delay disputes require substantiation. This usually involves the production of multiple delay (expert and/or non-expert) reports, including responses and replies to such testimonials that indicate each party's case and the claimed EOT entitlement. The disputes terminate with a decision unless non-binding forms of dispute resolution like negotiation or mediation are used successfully. Each case study represents a dispute that took place between January 2015 and November 2021. Therefore, one of the criterions for selecting the case study sample was recency. The other was response. For example, where only one delay report was available the case was excluded. In other words, at least two delay reports must be available, one representing each party's case. Based on these selection criterions, twenty case studies were selected from an initial sample of forty-three. Content analysis was conducted to identify, categorise and evaluate the factors. The sample includes projects based in Africa, Asia, EU and the UK that were managed by various organisations. The project archives were provided by one private entity. Under the normal principles governing arbitrations and other 'alternative' dispute resolution forums, these records are available to the organisations involved in the disputes but are not publicly available. For ethical reasons the cases have been anonymised and described by their function (e.g. 'Packaging Plant'; 'Teaching Facility'; 'Infrastructure') and approximate location. The table below provides a brief description of the case studies including project type, service, type of contract, location, client, and dispute resolution forum.

Table 1. Case studies (CS).

CS	Project Type	Service	Location	Client	Contract	Forum[1]
1	Mixed use development	Independent delay report	UK	Contr.	JCT	Adj.
2	Building	Independent delay report	UK	Eng.	Bespoke	Adj.
3	Building	Independent delay report	UK	Eng.	Bespoke	Adj.
4	Infrastructure	Independent delay report	UK	Eng.	NEC	Adj.
5	Infrastructure	Independent delay report	UK	Design.	NEC	Adj.
6	Infrastructure	Independent delay report	EU	Contr.	Bespoke	Arb.
7	Power Station	Independent delay report	EU	Contr.	Bespoke	Arb.
8	Shopping centre	Independent delay report	Asia	Subcon.	FIDIC	DAB
9	Infrastructure	Independent delay report	UK	Contr.	NEC	Adj.
10	Infrastructure	Independent delay report	UK	Contr.	NEC	Adj.
11	Bridge construction	Independent delay report	Africa	Contr.	FIDIC	DAB
12	Building	Independent delay report	UK	Client	Bespoke	Adj.
13	Shopping centre	Independent delay report	Asia	Subcon.	FIDIC	DAB
14	Mixed use development	Delay analysis report	UK	Eng.	JCT	Neg.
15	Mixed use development	Delay analysis report	UK	Eng.	JCT	Neg.
16	Residential development	Delay analysis report	UK	Client	JCT	Neg.
17	Infrastructure	Independent delay report	UK	Contr.	NEC	Adj.
18	Building	Independent delay report	UK	Client	JCT	Adj.
19	Railway services	Delay analysis report	UK	Eng.	NEC	CAP
20	Data centre	Independent delay report	UK	Contr.	JCT	Adj.

From the above cases, thirty-three factors were identified and included in a survey questionnaire. This questionnaire was distributed via LinkedIn to all English-speaking professionals that currently identify their occupation as delay analyst, or scheduling/programming expert, or forensic planning specialist, or construction claims professional. This criterion was based on a pilot study and the archives that suggest (i) FD analysts have the necessary expertise to rank the factors and (ii) FD analysts can operate across multiple legal systems including Australia, England and Wales, India, Finland, Peru, Slovenia, Scotland, Spain, the UAE and several states in the USA. Some four hundred participants were identified and invited to complete the questionnaire, specifically to rank the factors on a Ten-point Linkert Scale where 1 is the least important and 10 is the most important. Fifty responses were received between June 2021 and November 2021. This is a sample of 15%. It is argued that this sample is meaningful as this is a niche profession that consists of many small firms and few larger organisations, and the small players require advertisement of their services via the world's largest professional networking website LinkedIn. Furthermore, senior and junior personnel from all large firms also use this social media platform.

4. Findings and Discussion

The discussion centres around the findings from the two data collection methods, but also thematically; specifically, around the factors emerging from (i) the archives and (ii) the survey questionnaire.

4.1. Factors - Archival Research

The analysis of the archives supports earlier work by Atanasov *et al*. in that the primary types of disagreements can be divided into two categories: records and analysis. Alternatively, the factors can be

[1] Adjudication (Adj.); Arbitration (Arb.); Negotiation (Neg.); Claims Avoidance Procedure (CAP); Dispute Adjudication Board (DAB).

categorised into four groups: baseline programme, as-built programmes and records, delay analysis and others. However, further analysis of the archives concluded that (i) there are at least thirty-three factors (or justifications for differences in expert opinion on EOT entitlements) and (ii) the thirty-three factors can also be divided into three categories: materials and documents, matters of interpretation and others. As indicated in the figure below, the materials and documents category includes factors mainly relating to the quality of the baseline programme (BP), programme updates (PU) and as-built (AB) records.

Category			Factors	Impact
Archival Research	Materials and Documents	Baseline Programme	BP high level and/or incomplete	7.1
			BP lacks/erroneous logic (e.g. assumption/modification of logic/critical path)	6.9
			Disputed duration of BP activities (e.g. overestimated planned durations)	5.4
			Disputed BP status (e.g. lack of acceptance)	5.7
			BP unavailable to one party	5.5
			BP unavailable electronically to one party	5.0
			BP does not exist (e.g. not required by the contract)	6.0
			BP contradicts another contract document/term	5.9
		AB Programmes and Records	PU lack detail (e.g. high level or missing activities/areas/buildings)	6.5
			PU lack/erroneous logic (e.g. assumption/modification of logic)	6.7
			PU are inaccurate representation of the progress of the works	7.1
			Disputed status of the PU (e.g. lack of acceptance)	6.3
			PU are irregular (e.g. not required by the contract)	6.4
			PU exist but are unavailable to one party	4.9
			PU exist but are unavailable electronically to one party	4.9
			PU do not exist (e.g. not required by the contract)	8.3
			AB records exist but are unavailable to one party	6.3
			AB records exist but are incomplete, inaccurate, or contradictory (e.g. multiple records)	7.3
			AB records contradict the programme(s) (e.g. logic, float, activity durations)	7.0
			Interpretation of progress records to match the BP/PU activities (e.g. lack of coding)	5.7
	Matters of Interpretation	Analysis	Reliance upon a modified/unrecognised delay analysis method (DAM)	6.2
			Reliance upon a modified/incomplete Critical Path Analysis	6.4
			Alternative to longest path arguments (e.g. magnitude of delay)	6.8
			Use of effective/substantial completion dates	5.0
			Weak selection rational for DAM (e.g. each party used a different recognised DAM)	6.6
			High level analysis (e.g. global delay claims)	6.7
			Partial/incomplete cause and effect analysis (e.g. analysis of delays caused by one party only)	6.8
			Resource/mitigation/acceleration arguments	6.2
			Other programme-based arguments (e.g. complexity, common sense)	5.9
			Exclusion of a specific item (e.g. area/building from the analysis of a section/milestone)	5.2
	Other		Snagging and time of completion	5.0
			Concurrency arguments	7.5
			Other legal arguments (not subjects of this study)	5.8

Figure 1. Survey questionnaire results: ranking of the factors by their importance.

4.2. Impact Analysis - Survey Questionnaire

The overall survey questionnaire results indicate that each one of those thirty-three factors was considered important by the FD analysts. Furthermore, the overall results were divided by the five groups of participants based on the number of construction delay disputes each professional was involved in (i.e. (i) less than five disputes, (ii) five to twenty-five, (iii) twenty-five to fifty, (iv) fifty to one hundred and (v) over one hundred disputes). These results were compared to establish if significant deviations (i.e. more than two points on the Linkert scale) exist between those groups. The findings indicate that the rankings are generally consistent between the experience groups. This provides further

strength to the overall results. Consequently, the proposed solution should aim to address all factors as the impact score variance is not significant enough to ignore some factors, though prioritisation is feasible. The average overall rankings vary from 4.9 to 8.3 points where 'materials and documents' scored high, specifically the absence of records ranked the highest, followed by incomplete, inaccurate, or contradictory records and programme updates and high level and/or incomplete baseline programme. The 'matters of interpretation' category also ranked high where incomplete analysis, weak selection rational for delay analysis methods and high-level analysis were considered most important. From the 'others' category the concurrency arguments were the highest ranked factor.

4.3. Additional Factors - Survey Questionnaire

Besides ranking the identified thirty-three factors, the participants were invited to add to the list. Fifteen additional factors were provided and categorised. The findings are illustrated in the figure below. The aim of the categorisation was to identify the main issues. The grouping is based on root cause analysis seeking to identify the underlying drivers that should inform the development of effective solutions. However, it is difficult to accurately categorise these factors because a degree of interpretation is required to ascertain the root causes. For example, submitting unconsolidated claims may be due to lack of knowledge (or understanding), or motivated by bias to exaggerate the impact of a specific event. Nevertheless, it can be said that bias, lack of knowledge and contractual arguments were the main themes (or reasons for disagreements) emerging from the root cause analysis. These reasons along with the above findings in terms of materials and documents and matters of interpretation are discussed further below.

Category			Factors
Survey Questionnaire	Behaviour	Bias	Human involvement
			Emotion
			Misaligned expectations
			Partiality of the contract administrator
			Unexplained modification of records
			Reliance on document not included in the contract
			Hypothetical claims i.e. no actual impact on the project
		Knowledge	Inadvertent modification of records
			Lack of understanding of the adopted DAM
			Lack of understanding of the conditions of contract
			Submitting unconsolidated claims
			Failure to submit EOT claims in a sequential order
	Other	Contract	Contractual arguments about culpable and non-culpable delays
			Time barring notice and claim particulars
			Float ownership arguments

Figure 2. Factors identified from the survey questionnaire.

5. Conclusions

The conclusions are organised according to the emerging themes, namely materials and documents, matters of interpretation, lack of knowledge, concurrent delays and strategic behaviour.

5.1. Materials and Documents

The findings indicate that the integrity of baseline programmes is pivotal to the analysis of delay disputes. Specifically, the BP should be detailed (as opposed to high level) to enable the FD analysts to conduct accurate EOT assessments, and to reduce the opportunities to speculate with the agreed plan including making assumptions as to, among others, the intended activity logic, sequence and durations. Such speculations can create uncertainty and encourage opportunistic behaviour. Similarly, the absence of accurate as-built records and programmes is likely to perpetuate disputes and ultimately lead to

uncertainty because it can be very difficult to accurately determine EOT entitlements. The absence of such data is likely to constrain the rationality of the parties and their advisors. Consequently, this study supports earlier work by Atanasov *et al*., upholding the assertion of Gibbs *et al*. that uncertainty of outcome can be driven by the insufficiency and/or poor quality of data [18] [19]. Contract procedures that require the production and acceptance of regular programme updates and the use of technology to record and share data appear to offer effective solutions to such problems. Sensors [21], 3D scanners [22], blockchain technology [23], and drones [24] are among the existing technology that can generate and share accurate records (or even capable of automating aspects of the process e.g. contemporaneous validation of as built programmes) or, at least, to produce high quality validated as built programmes and records. Therefore, procedural and technological solutions are available that can reduce factual disagreements in construction delay disputes, specifically those concerning materials and documents.

5.2. Matters of Interpretation

The findings indicate that (i) ten factors relate to the analysis of delays and (ii) delay analysis usually involves interpretation of relevant facts. Consequently, those factors can be described collectively as 'matters of interpretation'. Generally, the degree of interpretation required to form an expert opinion is dependent on the available facts. In other words, if data (or evidence) are unavailable to substantiate the facts, the FD analysts are required to make assumptions including planned and actual programme logic, sequence and activity durations. Alternatively, a 'high-level analysis' can be completed. However, this approach lacks accuracy. This factor, along with 'weak selection rational' of delay analysis methods and 'partial analysis' were among the highest ranked. Although the literature suggests that FD analysts accept that the use of different delay analysis methods should not lead to differences in the EOT entitlement, the evidence (from both the archival study and the survey) suggests that this is often the case. This study supports earlier empirical work by the authors in that these were among the most frequent reasons for disagreements. The survey findings also indicate that (i) high-level analysis, weak selection rational and partial analysis are among the most important reasons for disagreements and (ii) EOT assessments often involve bias. Consequently, interpretation can be influenced by bias. It must be noted that the sample involves delay disputes that were settled in alternative dispute resolution forums where the privacy of the parties and delay experts is guaranteed. It is argued that this is an important factor which can act as a catalyst of bias and perpetuate disagreements by encouraging (or, at least, not preventing) subjective assumptions. Specifically, the archives indicate that in all case studies at least one of the FD analysts relied upon either a different delay technique or a 'modified' delay analysis method. Often these two factors were stated as the primary reasons for disagreements on EOT entitlements. Conducting incomplete analyses can also generate and prolong EOT entitlement-related disagreements. For example, critical path arguments, including (i) the analysis does not discuss adequately the near-critical paths; (ii) the identified critical path lacks substantiation; and (iii) the analysis is inadequate because it only includes select aspects of the project.

In summary, the analysis above indicates that opportunistic behaviour and bias are at the core of the issue. However, such opportunities can be significantly restricted by improving the acceptability of delay analysis methods through implementation of *ex ante* contract-specific delay analysis protocols. Such agreements should stipulate the accepted method and provide a detailed description of it (see subsection 5.3 below), including a statement of the parties' responsibilities to record and share relevant materials and documents. Additionally, radical changes to the ownership of data by implementation of trusted and transparent technology at project level is recommended. The analysis of the archives supports earlier work by Atanasov *et al.* in that the primary types of disagreements can be divided into two categories: records and analysis [19].

5.3. Lack of Knowledge, Training and Delay Analysis Clauses

The survey questionnaire results indicate that some of the issues discussed above can be caused by lack of knowledge. In other words, ignorance can contribute to disagreements as factors, including lack of understanding of delay analysis methods have been ranked very important by some participants. It is

argued here that this factor can be addressed by education in the form of a professional training and/or the use of contractual delay analysis clauses like the following:

> *In order for the Contractor to determine the amount of such extension, the Subcontractor shall prepare a "Time Impact Analysis" for adjustment of the required Date for Completion. The "Time Impact Analysis" shall define the extent of adjustment and the basis therefore in a form acceptable to the Contractor and shall include but not be limited to:*

The archives indicate that such clauses can be used successfully in identifying and implementing the most suitable delay analysis method at the inception stage of construction projects, or before the contract and subcontracts are signed. As indicated by the quotation above such clauses can be very prescriptive in terms of the steps that must be undertaken to complete the analysis of delays. A recent DAB decision also indicates that the parties are free to implement such clauses in the contracts and that terms like this one are upheld by decision makers in the UAE. Consequently, the sector appears to be endorsing ideas like the use of contractual delay protocols to reduce uncertainty in the context of factual delay disputes by improving the acceptability of delay analysis methods. As indicated in the literature review, this recommendation appears to be co-ordinated with current guidance, including the most recent SCL protocol and AACE practice direction.

5.4. Concurrent delays

Besides matters of interpretation, the survey questionnaire results indicate that 'concurrency' arguments and other contractual arguments like 'float ownership' can perpetuate disagreements. The term 'concurrent delay' concerns circumstances where two or more delay events arise at different times, but the effects of those events are felt at the same time. However, for the purpose of this paper, concurrency does not become an issue unless both an employer risk event and a contractor risk event lead to delay to the completion date [11]. Although this category is not the focus of this study it can be said that some legal systems, including England and Wales, have recently indicated that the parties to a contract are free to allocate the risk of concurrent delay by incorporation of concurrent delay clauses that use clear wording to allocate such risk to contractors [26]. Otherwise, the risk will be allocated in a fashion established by the courts. For example, in England and Wales contractors are usually entitled to extensions of time but not payments for loss and expense [27]. In Scotland, the delay will be apportioned [28]. Consequently, the potential solution to this issue appears to be in the making, at least in the UK.

5.5. Strategic behaviour

As indicated above, the participants used words like 'human involvement', 'emotion' and 'partiality' to describe factors that indicate bias. These findings support a hypothesis that strategic behaviour is at the core of factual delay disputes. On the other hand, all factors have been ranked important. Consequently, it is argued that an effective solution must address the problem holistically but nevertheless acknowledge that strategic behaviour aimed at creating opportunities is at the core of the issue. The evidence presented here indicates that the absence (or withholding) of materials, records and documents can be exploited by the parties and their advisors (or consultants) by making assumptions that are beneficial to their case. The evaluation of the issues and potential solutions presented here indicate that certainty of outcome in delay disputes can be improved by the provision of adequate training, exploitation of technology, contractual delay protocols and/or radical changes to the ownership of relevant data at construction project level.

6. Limitations and Further Research

There are certain limitations to drawing conclusions from these findings. Although the sample is relatively small, it was tested with fifty relevant professionals of whom sixteen have been involved in more than twenty-five delay disputes. The ranking of the factors by highly experienced professionals (or those involved in more than twenty-five delay disputes) and relatively less experienced professionals

(five to twenty-five delay disputes) was generally consistent. This provides further strength to the findings. Consequently, the creation and testing of an effective solution, namely a requirements model is recommended. This research is currently underway and the results will be presented in future published work. Exploration of the previously noted issue of using forms of alternative dispute resolution where the privacy of the parties and their experts is guaranteed, specifically if this creates uncertainty and opportunities for disagreements, and investigation of effective solutions to mitigate this problem would also be a valuable line of enquiry.

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