

# Challenges in Construction Project Management: Time Extensions and Claims Implications

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## ABSTRACT

In construction projects, delays are widely recognized as the most prevalent, costly, complex, and risky issue. Diverse project scheduling and planning methodologies may employ disparate approaches for evaluating extensions of time (EoT). Extension of Time (EoT) claims are a critical component of construction project management, providing contractors with the enforceable right to extend project deadlines due to unforeseen delays beyond their control. Notwithstanding their significance, the submission and handling of EoT claims frequently results in disputes, overspending, and delays, all of which can have an adverse consequence on project performance. This study endeavours to thoroughly investigate the delay causes which leads to EoT claims in construction project management, utilising an extensive analysis of extant literature, industry standards, and case studies, as well as evaluates the implications of EoT claims on project time, costs, quality, and stakeholder satisfaction. By investigating the delay causes and its implication which leads to EoT claims in project management, this study seeks to provide comprehensive insights and practical recommendations for improving the EoT assessment process as well as minimizing the delay causes and its implications towards overall project management. The study aims to enhance the efficiency and fairness of EoT assessments, reduce disputes and delays, and improve overall project performance and stakeholder satisfaction.

**Keywords:** Construction Project, Extension of Time, Delay Causes, Implication, Project Management, Time Management, EoT assessment

## INTRODUCTION

An extension of time (EoT) in the context of construction projects denotes a formally approved adjustment to the project's completion date. This adjustment is typically granted in response to delays that are outside the control of the contractor, thereby recognizing that the contractor should not be penalized for delays for which they are not responsible. According to Yusuwan & Adnan (2018), extension of time (EoT) is defined as the additional time granted to the contractor to provide an extended contractual period or date by which work is to be or should be completed and to relieve it from liability for damages for delay, usually liquidated ascertained damages (LAD). Besides, as referred to Braimah, N., (2013), EoT claims are utilized in preparing for unforeseen circumstances that could affect the project timeline, such as adverse weather, changes to the design, or external interruptions. However, despite its critical role in the construction industry, effective management of EoT claims remains a contentious issue, often leading to disputes, project inefficiencies, and cost overruns (Ilyas et al., 2020).

Beyond project timelines, the implications of EoT claims are enormous. The relationships among stakeholders, the financial security of contractors, and the general success of the project management could all be greatly impacted by them (Al-Keim, 2017). Furthermore, Okereke et al., (2021) emphasizes that ineffective EoT claim management can intensify disputes, obstruct stakeholder communication, and create a cascade of delays and inefficiencies which continues throughout the project's lifespan. In addition, according to Ahmed, (2023), the complexity of modern construction projects continues to expand, large-scale and multinational enterprises are

becoming more prevalent. This has made a thorough understanding of EoT claims essential, especially when it comes to risk management, contractual frameworks, and project management strategies.

Besides, as referred to the study by Alnaas et al., (2014), the scope for the assessment of EoT in construction projects is extensive, covering contractual review, identification and analysis of delay events, evaluation of impacts, compliance with notice and documentation requirements, and consideration of communication, coordination, and mitigation efforts. This all-inclusive approach guarantees a comprehensive and equitable evaluation of EoT claims, ensuring efficient project management and dispute resolution (Hansen et al., 2022; Umi Amirah et al., 2024). By granting an EoT can prevent the project from stalling due to disputes over delays. Therefore, construction work can continue without the looming threat of liquidated damage, which might otherwise halt progress and lead to further complications (Ilyas et al., 2020). Without EoT, contractors may face financial penalties for delays not caused by their actions. On that account, it can be emphasized that EoT protects contractors from such financial burdens, ensuring that they remain solvent and capable of completing the project.

Although numerous studies have examined the causes and implications of construction project delays, the focus on EoT claims as a specialized area of delay management remains under-explored (Braumah, 2013). This study seeks to fill that gap by providing a comprehensive analysis of the causes and implications of EoT claims within the construction industry. It will delve into the major causes of delay and categorize them as employer-caused, contractor-caused and external-caused or neutral delays together with their implications on project management. This study also will identify and analyze the assessment of EoT claims as well as providing comprehensive insights and practical recommendations for improving the EoT assessment process.

In the context of construction project management in Malaysia, time extensions and claims for delays are common issues that can arise due to various factors such as unforeseen events, changes in scope, or poor project planning. These delays, if not managed properly, can lead to disputes, cost overruns, and contract violations. Let's break down the key issues related to time extensions and claims implications in Malaysia. In Malaysia, most construction projects are governed by the Standard Form of Contract (such as the PAM 2006 or CIDB Contract) or bespoke contracts. These contracts usually have clauses relating to time extensions, liquidated damages, and claims due to delays. Contractors are typically required to complete the project by a specified date, but under certain circumstances, they can apply for an extension of time (EoT).

### **Causes and Implications for Eot Claims in Construction Management Projects**

According to Yoke et al., (2012), construction delays arise from EoT, either beyond the contractually stipulated completion date or past the date the parties mutually agreed upon for project delivery in project management. It defines the criticality of the delay in the completion of the overall project and its impact thereafter.

Consequently, Hansen et al., (2022) describes that there are several key aspects that can be considered in assessing the EoT which are the identification of delay events and the evaluation of the delay impacts. For identification of delay events, it can be divided into three factors that influence the delays in the completion of the construction project which are delay caused by the employer, delay caused by the contractor, and neutral delay. We will further discuss these factors which lead to the EoT claims and its implication to the project management (Braumah, 2013).

### **Delays Caused by the Employer**

Based on the study by Saifullah et al., (2023), the study defines the employer-caused delays in construction projects management can have significant impacts on the project's timeline and frequently result in requests for an Extension of Time (EoT). The employer or their representatives are accountable for these delays for various reasons of their conduct or failures to act. According to Ahmed (2023), there are common types of employer-caused delays and their implications for EoT claims which can be identified in terms of design changes and variations, late instructions and site conditions, and accessibility.

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## Change of Designs and Variations

According to Agyekum-Mensah & Knight (2017), in terms of design changes and variations, several design changes after the construction have begun often requiring revisions, adjustments, or replacement of the completed structures or final products. Consequently, the project schedule needs to be revised to accommodate the design changes which leads to disruptions and potential resequencing of construction activities (Ilyas et al., 2020). As referred to Albogamy et al., (2014), these changes frequently affect activities on the critical path in construction management which can directly extend the overall project duration. Accordingly, there are additional costs incurred due to rework, material wastage, and labour for implementing the changes which may result in increased overheads, extended site supervision, and potential penalties for delayed completion (Albogamy et al., 2014).

Based on the study by Assaf et al., (2019), contractors frequently need to reallocate labour and equipment in order to fulfil modification of the design as the consequence of variations and changes in the design, which can end up in inefficiencies and idle time of project management. Additional time is anticipated to acquire new components or materials listed in the revised designs. Furthermore, these changes also may affect the quality and performance of the overall project management (Al-Azad et al., 2019). Besides, contractors have to ensure that new design elements integrate seamlessly with the existing work and meet performance specifications in project management (Assaf, S., et al., 2019). Therefore, it can be stated that design changes and variations proposed by the employer can have significant impacts on construction project timelines, often necessitating EoT claims (Ilyas et al., 2020).

## Access and Site Conditions

In construction project management, delays pertaining to site conditions and access are rarely experienced and can have a substantial effect on the project timeline (Al-Azad et al., 2019). He added that these delays, which are frequently the employer's fault, may give rise to requests for an EoT. Based on the study by Amri et al., (2020), it often happens in projects that are related to delays in handing over the site by the employer to contractors where the employer fails to provide timely access to the construction site as per the agreed schedule. Besides, according to Islam & Trigunaryyah (2017), there is also an issue with regard to site access where access is granted only to certain parts of the site, restricting the contractor's ability to mobilize resources effectively. Kikwasi (2023) also emphasized in his finding that in certain cases, unexpected environmental or geological issues that were not appropriately surveyed or disclosed by the employer, including contaminated soil or high groundwater levels, were discovered.

These issues may affect the schedule disruptions, additional costs, quality, and performance of the overall project (Agyekum-Mensah & Knight, 2017). According to Saifullah et al., (2023), delays in site access or unforeseen conditions necessitate rescheduling of project activities, incurring hindrances and potentially revising the construction schedule. Moreover, there will be expenditure arising from delayed equipment rentals, greater labor costs, and revision due to unanticipated site conditions (Ahmed, 2023). Similarly, Ilyas et al., (2020) also emphasizes that delays caused by employer-related site conditions and site access issues can have an enormous impact on the completion date of construction projects and require EOT claims.

## Late Instructions by Employer

Based on the study by Hossain et al., (2022), construction project completion and progress can be severely impacted by delays brought on by employer-issued late instructions. These delays arise when the employer or their representative fails to provide necessary directions, approvals, or decisions in a timely manner. Marzouk & El-Rasas (2014) in their study added that this often happens in approving or providing instructions on construction methods or sequences. Shah (2016) also stated that late instructions for revisions to the scope or design require rework or additional time to complete. Accordingly, the study found that any instructions that lack necessary details, lead to confusion and delays as additional clarification is sought (Hossain et al., 2022).

Consequently, fabrication works may become rushed to meet deadlines once the instructions are received, which can compromise the quality of work (Ahmed, 2023). Islam & Trigunaryyah (2017) in their study also emphasized

that delays in issuing critical instructions can affect the critical path, directly extending the overall project completion date and substantially there are additional costs incurred due to extended project duration.

### **Delays Caused by The Contractor**

According to Remon & Asmaa (2016), construction projects' timelines and performance can be severely impacted by delays caused by contractors, which makes EoT claims necessary in project management. Several factors lead to delays caused by contractors that will be discussed further in terms of poor planning and scheduling, subcontractor performance, and financial issues (Isa 2014). As referred to Isa (2014), these delays can impact on the overall project timeline, lead to cost overruns, and affect the quality and performance of the project management.

### **Poor Planning and Scheduling**

Poor planning and scheduling by contractors are significant contributors to delays in construction projects (Isa, 2014). Marzouk & El-Rasas (2014) in their studies also mentioned that these delays often occur due to failure to establish an extensive project plan by addressing the project's resources, risks, scope, and timeline. Moreover, according to Nguyen (2020), insufficient identification of risks at the planning stage ultimately results in an inadequacy for anticipated issues. Frequently, mismanagement of the critical path prepared by contractors whereby the contractors are unable to recognize and control the critical path, leading to delays in completing the works which have an instantaneous impact on the project's completion timeline (Shah, 2016). Ergo, as referred to Song (2014), poor planning, and scheduling often lead to schedule disruptions whereby the contractors have to reschedule activities as an outcome of unsatisfactory preliminary planning, which could cause delays and the project schedule to be amended. Based on the study by Boon Hui Yap et al., (2021), delays in critical tasks negatively affect the critical path and consequently prolong the project's time frame. Besides, due to improper planning and scheduling, labour and equipment may sit idle, resulting in inefficiencies in project management (Agyekum-Mensah & Knight, 2017).

Ultimately, poor planning and scheduling by contractors can lead to significant delays in construction project management, impacting timelines, costs, quality, and overall project performance (Song, 2014). Ilyas et al., (2020) also reiterated in their studies that effective resource allocation, realistic scheduling, extensive project planning, strong risk management, and continuous enhancement are all vital in managing and averting delays driven by poor planning and scheduling.

### **Sub-contractors Performance**

For construction projects to be completed on schedule, subcontractor performance is essential. The project timeline as a whole may be seriously disrupted by subcontractors' failure to fulfil their contractual obligations (Remon & Asmaa, 2016). As a matter of fact, according to Isa (2014), interruptions to work caused by subcontractors for a variety of reasons, including equipment failures, labour disputes, and financial difficulties contributed to delays in the project's progress. Failure to communicate between subcontractors and the main contractor also results in miscommunication and delays (Marzouk, M. M., & El-Rasas, 2014). Due to this issue, the main contractor needs to reassign resources to other tasks or projects to the subcontractor, potentially causing productivity losses (Hossain et al., 2022).

Besides, based on studies conducted by Kikwasi (2023), the studies have found that labor and equipment may remain idle while waiting for subcontractors to complete their work, leading to inefficiencies. These delays and interruptions may have a detrimental effect on the overall performance of the project (Kikwasi, 2023). Therefore, to effectively manage and prevent delays caused by subcontractor performance, it is imperative to choose subcontractors carefully, establish detailed contractual agreements, communicate regularly, manage resources and finances, and participate in ongoing development (Al-Azad et al., 2019).

### **Financial Issues**

According to Memon et al., (2012), delays in construction projects are largely caused by financial problems.



These issues can stem from various sources, including cash flow problems, budget overruns, and financial mismanagement (Memon et al., 2012). Al-Keim (2017), added that poor cash flow management may result in insufficient funds to cover ongoing project expenses. Occasionally, the contractors often underestimate the overall cost of the project whereby the contractors have quoted initial project cost estimates too low, leading to budget shortfalls as the project progresses (Amri et al., 2020). Consequently, according to Razak et al., (2023), financial constraints can force contractors to reschedule activities, causing disruptions and delays. Marzouk & El-Rasas (2014) also mentioned in their study that construction projects may eventually come to an end in the event of suppliers and subcontractors failing to receive payments on schedule or the inability of the contractor to purchase materials. Moreover, Isa (2014; Michael Alabi et al., 2024) stated in their studies that financial pressure also can induce cost-cutting measures that lower the quality of the work. Thus, by comprehending various forms of financial issues and their implications, effective financial planning and management are essential in managing and preventing delays.

### **Neutral Delays**

As referred to the research conducted by Eboreime et al., (2013), excusable non-compensable delays, commonly referred to as neutral delays, occur due to circumstances that are outside the control of both the employer and the contractor. These delays are typically unforeseen and unavoidable, impacting the construction schedule without attributing fault to any party (Eboreime et al., 2013). According to Al-Azad et al., (2019), several types of neutral delays can be identified which are adverse weather conditions and force majeure events. Amri et al., (2020) mentioned in their study that adverse weather conditions like heavy rain, snow, hurricanes, or extreme temperatures often hinder construction activities. Besides, the study added that anticipated seasonal weather changes, such as monsoon rains, may have an impact on the construction timeline (Yoke-Lian., et al., 2012). Similarly, based on the study by Ahmed (2023), these delays can significantly impact project timelines, costs, and overall performance. Next, according to Hanse, et al., (2022), events classified as force majeure include natural catastrophes, wars, and pandemics, as well as other unexpected and unpredictable occurrences outside the control of the contracting parties. These occurrences have the potential to seriously impede construction works and result in delays (Muhwezi et al., 2014). Previously, Nafe Assafi et al., (2022) mentioned that the widespread outbreaks of infectious diseases such as COVID-19 led to labor shortages, supply chain disruptions, and the implementation of health and safety protocols. Due to this unfortunate event, construction projects suffered severe disruptions because of it. Therefore, contractors as may implement effective strategies for management that may assist them in successfully overcoming these challenges by addressing the many forms of neutral delays and their effects (Nafe Assafi et al., 2022).

### **Studies Related to Causes and Implications of EoT Claims in Construction Project Management**

Based on survey conducted by Assaf et al., (2019) in Saudi large building construction projects, they found that the main causes of delay and EoT claims are from the employer and contractor where the causes are in terms of preparation and approval of shop drawings, delay in contractor's progress, payment by the employers and design changes. They also added that the relationship between subcontractors, the cash problems during construction, slow decision-making process of the employer, design errors, labor shortages and inadequate labor skills were the main causes of the EoT claims.

Another research from Eboreime et al., (2013), a questionnaire survey was carried out with contractors, consultants and client organization in Nigeria whereby the research has identified that the causes of EOT claims and cost overruns in Nigerian construction projects were attributed to delayed caused by the employer and contractor. The causes of delays are finance and payment arrangements, shortages in materials, poor contract management, inaccurate estimation and overall price fluctuations. Similarly, Saifullah et al., (2023) have addressed the cause of delays which require EOT claims on building project in Nigeria. They identified the causes of the delay and EOT claims involved the employer and contractor. The delays caused by the employer included slow decision making, variation in orders and cash flow problems whereas the delays caused by the contractor were financial difficulties, planning and scheduling, material management problems, equipment management problems, inadequate site inspection and shortage of manpower. The survey also found that neutral delays also taken places which were inclement weather, acts of nature, labor disputes and strikes.

Song (2014) conducted a survey regarding the causes of EoT claims in Hong Kong construction projects and identified that there are five major delay causes which were unexpected ground conditions, slow decision-making by the whole project team, inefficient site management and supervision, employer-initiated variations and necessary variations of works.

Different research from Samarah & Bekr (2016) studies the causes of EoT claims on construction of public projects in Jordan whereby the result of his research indicated that three main causes of EoT claims were delays caused by the employer, contractors and neutral delay. The outcomes of his research were related to late deliveries, economic conditions, designers, user changes, weather, site conditions and increase in quantity. Correspondingly, Ahmed (2023) also carried out a survey investigating the most important causes of delay which related to the grounds of EoT claims in construction project management with traditional type of contracts from the viewpoint of construction contractors and consultants. Results of the survey demonstrated that contractors and consultants agreed that interference from the owner or employer, worker productivity, poor contractor experience, finance and payments, poor planning, late decision-making, and subcontractors were among the top ten most important causes of delay which led to the application of EoT claims.

With regards to the implications of EoT claims, Eboreime et al., (2013) studied and analyzed the implications of construction delay which leads to the application of EoT claims on project delivery in Nigerian construction project management. The outcomes of the study were related to time overrun, dispute, arbitration and litigation and total abandonment. Similarly, a survey was conducted by Nafe Assafi et al., (2022) to explore construction delays in public-funded, mixed and private-funded construction projects of Bangladesh. The results identified were delays caused by the contractor mainly construction mistakes and defective work often acted as a contributory cause to cost overruns in construction projects management.

Next, Song (2014) carried out a survey and research findings to investigate strategies of compressing construction durations of various types of building projects based on the lessons learned from Hong Kong. Based on the causes of delays identified as the significant from the research, specific technological and managerial strategies for reducing construction period in particular building sub-sectors were formulated to improve the construction time performance of Hong Kong building projects. Diversely, Wei (2024) explored the standard methods currently available for assessing EOT delays on major projects and issues around such assessment together with the impact of delays on the project.

From the above studies, it can be deduced that some studies have alluded to the probable link between the causes and implications of EoT claims without a systematic analysis. Nafe Assafi et al., (2022) linked the neutral delays to the probable cost overruns in construction projects in Bangladesh whereas in Saudi, Assaf and Al-Hejji (2019) linked the delays caused by the contractor to the probable time overruns in construction projects. Samarah & Bekr (2016) linked the delays caused by the employer to the probable disputes occurring in construction projects in Jordan. Similarly, in Hong Kong, Song (2014) also linked the delays caused by the employer to the probable time overruns in construction projects.

### **The Assessment of Eot Application in Construction Project Management**

According to Yusuwan et al., (2017), assessing Extension of Time (EoT) claims is a crucial procedure that entails determining if a project delay allows an extension beyond the original completion date. Okereke et al., (2021) stated that the assessment needs to be comprehensive, impartial, and compliant with the terms of the contract. Nevertheless, considering the numerous elements that contribute to project delays and the risk of obligation being disputed, this procedure can be challenging (Braithwaite, 2013). Furthermore, there is a discussion on the principles and concepts of EoT claim assessment, common challenges, and best practices for the application of EoT claims in construction project.

### **The Principles and Conceptual of EOT**

EoT provisions are essential in managing delays in construction projects (Braithwaite, 2013). According to Ilyas et al., (2020), EoT clauses provide the parties with a way to change the terms of the contract by extending the 7-project completion date in the event of delays. Tables 1 shows the provision in relation to EoT that has been

stated in standard form of contracts that are frequently used in Malaysia which are PAM Contract 2018 and PWD Standard Form 203A (Rev 10/83).

Table 1 – The EoT provision in Standard Form of Contracts Frequently Used in Malaysia.

Standard form of Contract	Provisions
PAM 2018	<p>Extension of Time (<u>EoT</u>)</p> <p>23. Extension of Time</p> <p>23.1 If the Contractor is of the opinion that the completion of the Works is or will be delayed beyond the Completion Date by any of the Relevant Events stated in Clause 23.8, he may apply for an extension of time provided always that:</p> <p>(a) the Contractor shall give written notice to the Architect his intention to claim for such extension of time together with an initial estimate of the extension of time he may require supported with all particulars of the cause of delay. Such notice must be given within twenty-eight (28) Days from the date of the AI, CAI or the commencement of the Relevant Event, whichever is earlier. The giving of such written notice shall be a condition precedent to an entitlement of extension of time; and</p> <p>(b) within twenty-eight (28) Days of the end of the cause of delay, the Contractor shall send to the Architect his final claim for extension of time duly supported with all particulars to enable the Architect to assess any extension of time to be granted. If the Contractor fails to submit such particulars within the stated time (or within such longer period as may be agreed in writing by the Architect), it shall be deemed that the Contractor has assessed that such Relevant Event will not delay the completion of the Works beyond the Completion Date.</p>
PWD 203A	<p>Extension of Time (<u>EoT</u>)</p> <p>43. Delay and Extension of Time Upon it becoming reasonably apparent that the progress of the Works is delayed, the Contractor shall forthwith give written notice of the causes of delay to the SO and if in the opinion of the SO the completion of the Works is likely to be delayed or has been delayed beyond the Date for Completion stated in the Appendix or beyond any extended Date for Completion previously fixed under this Condition:</p> <p>(a) force majeure as provided under clause 58,</p> <p>(b) exceptionally inclement weather</p> <p>(c) by reason of directions given by the SO, consequential upon dispute with neighbouring owners provided the same is not due to any act, negligence or default of the Contractor or any Subcontractor, nominated or otherwise, or</p> <p>(d) by reason of the Contractor not having received in due time necessary instructions, drawings, levels or instructions in regard to the nomination of sub-contractors and/or supplies provided in this Contract, from the SO due to any negligence or default of the SO and for which he shall have specifically applied in writing on a date which having regard to the Date of Completion stated in the Appendix to this Conditions or to any extension of time then fixed under this Conditions, was neither unreasonably distant</p>

	<p>from nor unreasonable close to the date on which it was necessary for him to receive the same, or</p> <p>(e) by delay on the part of artists, tradesmen or others engaged by the Government in executing work not forming part of his Contract, ...</p>
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(Source: PAM Contract 2018 and PWD Standard Form 203A (Rev 10/83))

From Table 1, it can be highlighted that EoT provisions in these PAM and PWD standard forms of contract are designed to address delays in construction projects in Malaysia. Despite its importance, these provisions often lead to disputes due to mismanagement, misinterpretation, and inadequate documentation. Therefore, a well-drafted contract with clear, unambiguous language on delays and time extensions can mitigate some of these challenges (Ilyas et al., 2020).

### Challenges Related to EOT Claims in Construction Industry

As referred to the study by Yoke-Lian et al., (2012), EoT is a standard contractual instrument used in construction project management to grant contractors additional time to complete their work in the event of delays. Nevertheless, several common challenges frequently arise during the assessment and granting of EoT claims. Delays in construction industries occur frequently resulting from a variety of unanticipated circumstances. According to Yusuwan et al., (2017), one of the primary mechanisms to address these delays is the EoT claim, which allows contractors to request additional time to complete their work without incurring penalties (Okereke et al., 2021). Notwithstanding its significance, there are a few challenges associated with the EoT assessment process that can seriously affect stakeholder relations, project costs, and timelines in construction project management. According to Hansen et al., (2022), ambiguities in contract provisions, inadequate documentation, complex and varied delay analysis methods, and communication breakdowns can all complicate the process. These challenges not only lead to disputes and litigation but also affect project timelines, costs, and stakeholder relationships.

Firstly, in terms of ambiguities in contract provisions, Ilyas, M. et al., (2020) describes that one of the foremost challenges in EoT claims is the lack of clarity in contract terms regarding EoT. EoT provisions are interpreted differently across numerous standard contracts, including IEC, PWD, and PAM, which might cause project parties to misunderstand or misinterpret the terms. These ambiguities can lead to complicated disputes in project management, especially when the contracts are poorly drafted or do not cover situations, including concurrent delays or partial delays brought on by minor changes. Besides, proper record-keeping is essential for substantiating EoT claims. Nevertheless, according to Yusuwan & Adnan (2018), a lot of construction companies frequently lack reliable methods for keeping thorough records of delays, variations, and the underlying causes of them. This results in insufficient documentation, which weakens their position when submitting EoT claims and increases the likelihood of rejection or disputes with employers or contractors (Yusuwan et al., 2017).

Next, Yoke-Lian., et al., (2012) stated that another challenge that accountable is the complexity of delay analysis in construction project management whereby the process of delay analysis, which is necessary to support EoT claims, is frequently difficult and resource intensive. Each of the various approaches (such as Impacted As-Planned and As-Planned vs. As Built) has advantages and disadvantages. Therefore, some project teams may lack the experience necessary to choose the best approach, which could result in inaccuracies that could impact the claim's outcome. The analysis may get more complex and contentious if there are misunderstandings regarding delay culpability, whether it is compensable or excusable (Nguyen, 2020). Apart from that, based on the study by Alnaas et al., (2014), concurrent delays in construction project also affecting the project management. This happens where two or more events cause a delay simultaneously, are particularly challenging to address in EoT claims. Due to a lack of explicit standards in many conventional contracts, it can be challenging to determine responsibility and entitlement in circumstances of concurrent delays. This ambiguity can lead to lengthy disputes as each party may argue against incurring additional costs or penalties and perceive the impact of the delay differently (Alnaas, et al., 2014).



Often, decisions on EoT claims rest with project managers, contract administrators, or arbitrators whose subjective interpretations of the provisions of the contracts and project delays may affect the results of EoT claims (Amri et al., 2020). This subjectivity may introduce bias or inconsistency in decisions, as different decision-makers may evaluate similar delay scenarios in different ways. Moreover, this may result in a feeling of injustice or even prompt parties seeking legal action, which would add further time and cost (Memon et al., 2012). Therefore, addressing these challenges necessitates a strategic approach that includes improved project documentation, more precise delay analysis methods, increased stakeholder communication, and clearer contractual guidelines (Al-Keim, 2017).

### **Delay Analysis Methods**

Delay analysis is essential to substantiate EoT claims, as it provides a structured approach to assess the delay's impact on the project's completion date. According to Yusuwan & Adnan (2018), the delay analysis is carried out to measure the impact of the Employer's events or neutral events on the Contractor's work programme and to identify the extent to which progress will be affected. It is used to quantify the period of delay, demonstrate the impact on the critical path, and establish entitlement to a time extension. The most-cited delay analysis methods in the literature are (1) As-planned vs As-Built, (2) Impacted As-Planned, (3) Collapsed As-Built, (4) Window Analysis and (5) Time Impact Analysis.

#### **As-Planned vs As-Built Analysis**

This method compares the as-planned activity against the original work programme with the as-built duration for the same activity on the as-built programme. The differential time between the duration of the as-built programme and the duration of the as-planned programme is taken as the period of delay to which the contractor is entitled to an EoT as a result of the relevant delay event (Yoke-Lian., et al., 2012).

#### **Impacted As-Planned Analysis**

This method adds the identified relevant delay event either as a separate activity or onto the duration of an existing activity into the as-planned programme. Then, the as-planned programme which incorporates the delay event is re-run to show the resultant revised completion date, this programme is called an impacted as-planned programme. The differential period between the completion date shown on the as-planned programme and that shown on the impacted as-planned programme is the delay period to which the contractor is entitled (Boon Hui Yap et al., 2021).

#### **Collapsed As-Built Analysis**

Under this method, an as-built programme including the delay event will first be created. Then, the delay event is removed from the programme to create a collapsed as-built programme to show what the completion date would have been if the delay event had not (Yusuwan & Adnann, 2018; Boon Hui Yap et al., 2021). The differential period between the completion date on the as-built programme and the completion date on the collapsed as-built programme is the delay period to which the Contractor is entitled to the EoT (Yoke-Lian., et al., 2012).

#### **Window Analysis/ Contemporaneous Period Analysis ("CPA")**

In order to prevent delays and cost overruns, contractors must ensure the following: regardless of the scale of the project, they must not underestimate its complexity; seek alternative methods of raising funds; maintain efficient administration of the site; employ appropriate construction methods to prevent rework; dispatch an adequate number of personnel to the site; and furnish them with the required machinery, equipment, and tools. Furthermore, it is recommended that contractors make every effort to employ proficient and trained personnel who can supervise matters pertaining to estimates, establish efficient and effective financial management on-site, and ensure timely project execution (Umi Amirah et al., 2024). This method divides the project into specific periods or windows. The delay analysis first begins with updating the programme within the first window using as-built information, including all the delays encountered in that period. However, the remaining as-planned

programme beyond this window is maintained. The differential period between the project completion date of this reviewed or revised programme and that before the review process is the number of project delays as a result of the delays within the first window (Yusuwan & Adnan, 2018; Yoke-Lian., et al., 2012). The same step is repeated in analyzing the remaining windows to determine the overall delay period.

### **Time Impact Analysis (“TIA”)**

According to Society of Construction Law, Delay and Disruption Protocol (2002), this method has been recognized as the most reliable. First, it requires a large amount of information in order to perform the analysis and as-planned schedule in CPM format is necessary, and periodically updated schedule is strictly required. Second, as this method offers detailed analysis and involves a periodically updated schedule, time and effort are the key elements in performing the analysis, making it time consuming and costly to operate, particularly in situations where large numbers of delaying events are involved (Yusuwan & Adnan, 2018). Third reason as identified by Boon Hui Yap et al., (2021), the result of the analysis may be influenced by a variety of factors because time impact analysis is intricate as it determines accumulative results from many sources of contemporaneous data.

Each of these methods has advantages and limitations, and selecting the appropriate technique depends on project specifics, contract requirements, and available data. A significant challenges in EOT assessment arises when parties dispute the chosen method of delay analysis, often leading to further contention over the delay's actual impact (Boon Hui Yap et al., 2021).

### **Cost Implication**

In the Malaysian construction industry, disputes over Extensions of Time (EoT) and their associated cost implications frequently lead to legal proceedings. A notable case that addresses these issues is *KL Eco City Sdn Bhd v. Tuck Sin Engineering and Construction Sdn Bhd* [2020] MLJU 2457.

*KL Eco City Sdn Bhd v. Tuck Sin Engineering and Construction Sdn Bhd* [2020] MLJU 2457

In this case, the contractor, Tuck Sin Engineering and Construction Sdn. Bhd., sought an EoT due to delays allegedly caused by the employer, KL Eco City Sdn Bhd. The court examined whether the contractor had complied with the contractual conditions precedent necessary for an EoT claim. The decision emphasized the importance of adhering to contractual procedures when seeking extensions and highlighted the potential cost implications for contractors failing to meet these requirements.

This case underscores the critical importance of understanding and complying with contractual obligations related to EoT and associated costs in the Malaysian construction industry.

## **METHODOLOGY**

The objective of this paper is to examine the causes contributing to delay which leads to EoT claims in construction projects by collecting data from previous articles or journals. The paper gathered and organized studies that examined pertinent issues (i.e., causes of delay/implication of delay/risk management of delay) in construction projects.

The causes contributing to the delays which lead to EoT claims were identified in the chosen studies, categorized, and ranked according to the significance attributed to them. By applying specific keywords in the titles of studies published within the quin-decennial of 2010–2024, we were able to find over a hundred articles that examined the causes and implications of EoT claims in construction project which reflected to the delays. Then, we examined and selected only those that identified and ranked the causes contributing to delays which lead to EoT claims in various cases in different countries, as well as the implications of the EoT claims resulting from the delays. In the end, we selected 30 studies pertinent to the subject matter of this paper, identified and categorized the causes and implications contributing to the delays which lead to EoT claims, and provided a summary of several project management-based recommendations for the best practices of EoT claims. Several countries and

cases comprised the research domain. The top 10 of the most important causes contributing to delays which leads to EoT claims and provided summaries of their assessment and management best practices in applying the EoT claims have been included in this paper from the prior study. Due to variations in project type, location, and the approach employed to identify the factors in the research, the significance of the delay causes differentiation considerably. Thus, the descriptions of some causes were identical or repeated across studies, whereas the descriptions of other causes were completely distinct. In accordance with the characteristics and definitions of each cause, the causes extracted from every reviewed study were categorized according to the group to which they most surely belonged.

Causes of delay which leads to EoT claims will be classified into some groups, including delays caused by the employer, delays caused by the contractor and neutral delays. The data collected from the top 10 delays causes of previous research. Afterward, the data will be processed to generate a rating on the cause of the delay. In addition, the implication and management of delays will be summarized from previous research.

### Data Analysis

Over 50 causes of delay which leads to EoT claims were identified in more than 30 studies. The causes were classified into three major groups based on their respective descriptions and corresponding categories. Furthermore, the analysis revealed that most research consistently grouped two or three characteristics together within the same category. Subsequently, the causes of EoT claims are numbered based on their occurrence based on three categories as mentioned previously are specified in Table 2. Literature yielded a total of the 10 most significant causes for each study. Finally, there were a total of 35 causes in each of the three frequently occurring causes. Consequently, it would become easier to choose the most significant causes of EoT claims out of this list.

Table 2 – Categorization and ranking of delay causes which leads to EoT claims

Category	No.	Delay Causes	No. of occurrence in Literature
Delays caused by the Employer	1.	Financial problems and payment delays from employer	4
	2.	Poor contract management by employer	1
	3.	Slow decision making	2
	4.	Delays in approval	1
	5.	Changes of design	3
	6.	Late site possession from employer	1
	7.	Employer interference	1
	8.	Unrealistic contract duration and requirements imposed by employer	1
	9.	Variation orders and mistakes	2
	10.	Discrepancies in contract documents	1
	11.	Quality assurance or control	1
	12.	Undisclosed site conditions from employer	1

Delays caused by the Contractor	13.	Shortages or inadequacies in materials	1
	14.	Poor quality of materials	1
	15.	Poor cost estimation	1
	16.	Late procurement of material and equipment	1
	17.	Labor shortages	2
	18.	Unskilled or inexperienced staff and labor / labor productivity	1
	19.	Inadequacies or incompetence of contractor	2
	20.	Financial and payment problems by contractor	3
	21.	Subcontractor's delay or performance	1
	22.	Improper construction methods by contractor	1
	23.	Improper planning and scheduling by contractor	3
	24.	Mistakes during construction stage and defective works	1
	25.	Lack of communication between parties	1
	26.	Additional work attributable to mistakes	1
	27.	Poor site management	2
28.	Disputes between parties	1	
Neutral delays	29.	Inclement weather	2
	30.	Acts of nature / Infectious diseases	1
	31.	Labor disputes and strikes	1
	32.	Economic conditions / Inflation / Escalation of material prices	1
	33.	Regulatory changes	1
	34.	Unforeseen site condition	1
	35.	Problems with neighbours	1

Categories of delay causes which lead to EoT claims are divided into three categories, i.e. delays caused by the employer, delays caused by the contractor and neutral delays. Based on the number of occurrences of various delay causes that lead to EoT claims in different study under consideration, following top 10 delay causes have been identified and shown in Table 3. These delay causes which lead to EoT claims can be a major indicator in minimizing the implications of EoT claims in construction projects as well as to reduce any potential risk in project management which consequently play a vital role in the success of construction project.



Table 3 – Categorization and ranking of delay causes which leads to EoT claims

Category	No.	Category and Delay Causes	No. of occurrence in Literature
Delays caused by the Employer	1.	Financial problems and payment delays from employer	4
	2.	Changes of design	3
	3.	Slow decision making	2
	4.	Variation orders and mistakes	2
Delays caused by the Contractor	5.	Financial and payment problems by contractor	3
	6.	Improper planning and scheduling by contractor	3
	7.	Labor shortages	2
	8.	Poor site management	2
	9.	Inadequacies or incompetence of contractor	2
Neutral delays	10.	Inclement weather	2

Based on the literature, the number of occurrences consists of these three categories of delay causes which leads to EoT claims provided in Table 3. It has been identified that (1) financial problems and payment delays from employer, (2) changes of design (3) slow decision making, and (4) variation orders and mistakes were the top delays caused by the employer. Whereas for the top delays caused by the Contractor, it has been reiterated from the data that (1) financial and payment problems by contractor (i.e Main Contractor and Subcontractor), (2) improper planning and scheduling by contractor, (3) labor shortages, (4) poor site management, and (5) inadequacies or incompetence of contractor meanwhile inclement weather was the most occurrence of neutral delays which leads to EoT claims in construction projects. From these top ten delay causes of EOT claims, the dominant causes of delay for EoT claims are financial problems and payment delays from both employer and contractors mainly between Main Contractor to Subcontractor.

From the data reiterated in Table 3, for delays caused by the employer, it has been supported by Memon et al., (2012) and Nafe Assafi et al., (2022) in their studies where financial problems and payment delays from the employer is the most vital issue which obstruct the progress of work on site due to unpaid work done by the contractor and may impact the overall project management. According to Al-Keim (2017), construction works involve huge amounts of money and most of the contractors find it very difficult to bear the heavy daily construction expenses when the payments are delayed. He added that due to the late payments from the clients, work progress can be delayed as there is inadequate cash flow to support construction expenses, especially for those contractors who are not financially sound. Next, as referred to the studies conducted by Agyekum-Mensah & Knight, (2017) and Albogamy et al., (2014), changes of designs or variation orders and mistakes by the employer often lead to the delay of work and subsequently leads to the application of EoT claims. Consequently, as referred to Al-Azad et al., (2019), these changes frequently affect activities on the critical path in construction management which can directly extend the overall project duration. Apart from that, based on the studies carried out by Hossain et al., (2022) and Shah, (2016) found that slow decision making by the employer with regards to the construction matters or issues that often occurred on site leads to delay in progress work and as a result the application or the submission of EoT claims has to be made by the contractors to relieve them from liability for damages for delay.

Next, with regards to the delays caused by the contractor, according to Amri et al., (2020) and Razak et al., (2023), in their study, it has been found that contractors tend to rely on continuous cash flow to cover labor,

supplies, and equipment. Therefore, one of the major delays caused by the contractor which led to the application of EoT claims is financial and payment problems caused by the contractor. As referred to Memon et al., (2012), an imbalance between the project's cash inflows (payments received) and outflows (expenses) may result in financial challenges. Consequently, the contractor may be unable to hire qualified personnel, acquire the required supplies, or finish the planned work as a result of this circumstance (Isa, 2014). Besides, according to Song (2014), improper planning and scheduling by contractors often leads to delay and application of EoT claims. Shah (2016) reiterated in his study that the incompetence of contractors to develop a practical and feasible "work program" during the initial planning phase can occasionally be linked to a lack of systematic site management and inadequate contractor experience with the projects. Other than that, the quality and quantity of labor supply also can have a major implication on the projects (Agyekum-Mensah & Knight, 2017). According to a study conducted by Agyekum-Mensah and Knight (2017), the low quality and productivity of foreign workers, particularly from Indonesia and Vietnam, have been identified as issues in the Malaysian construction industry, often affecting project progress and efficiency. Additionally, illegal workers are frequently apprehended by Malaysian immigration officials and deported, leading to a shortage of labor in the construction industry.

Apart from that, inclement weather which categorized under neutral delays often leads to EoT claims. According to Al-Azad, et al, (2019); Ohueri et al., (2018), the EoT claims frequently hinge on weather-related delays as inclement or unforeseen weather could render challenging to proceed safely or efficiently. As referred to the research conducted by Amri et al., (2020), as mentioned in their study, that inclement or adverse weather conditions like heavy rain, snow, hurricanes, or extreme temperatures often hinder construction activities. These delays can significantly impact project timelines, costs, and overall performance (Ahmed, 2023).

With regards the implications of delay which leads to EoT claims, an analysis of the survey questionnaire responses conducted by Abdul-Rahman, et al., (2015) within Malaysian construction project context, has identified that there were six major implications and it has been ranked accordingly based on the result which are (1) time overrun, (2) cost overrun, (3) dispute, (4) arbitration, (5) litigation and (6) total abandonment provided in Table 4.

Table 4 – Ranking for the implications of delays which leads to EoT claims

Ranking of effects (based on overall)	
Effects of delays	Rank
Time overrun	1
Cost overrun	2
Dispute	3
Arbitration	4
Litigation	5
Total abandonment	6

(Source: Abdul-Rahman, H., et al., 2015)

### The Best Practices of EoT Claims in Construction Project Management

According to Yusuwan & Adnan (2018), the best practices or practical way for the assessment of EoT claims intended to promote a proactive and methodical approach in order to handle the different challenges that were previously highlighted. Olawale & Sun (2010) stated that the implementation of these practices can help construction stakeholders and project managers better handle the intricacies of EoT claims, reduce disputes, and enhance stakeholder relationships and project schedules. Therefore, as referred to the study conducted by Prinsloo (2016) emphasized the best practices which can tackle specific challenges in EoT claim assessment that frequently occurs in construction project management.

Based on the study by Ahmed (2023), the study found that there is a need for clear and comprehensive contract

drafting. According to Hansen et al., (2022), it is crucial to draft contracts with straightforward clauses pertaining to EoT claims. Besides, as referred to the research conducted by Yoke-Lian., et al., (2012) related to EoT claims, the research revealed that contracts should describe appropriate delay analysis techniques, delay categories and scenarios that qualify for EoT. For instance, standard contract forms, such as PAM2006 or PWD203A, provide model clauses for EoT claims. Pertaining to that, Ilyas et al., (2020) mentioned that interpretive challenges and confusion during claim assessments can be prevented when these are customized for the particular project and both parties agree to the conditions. Additionally, recording daily progress, site conditions, and any delays can be rendered practicable by creating thorough documentation procedures at the beginning of a project (Yusuwan et al., 2017). Yusuwan et al., (2017) also highlighted that data collection may be streamlined, and accurate, up-to-date records can be kept with the help of construction management software. It is easier to verify EoT claims when they occur provided the staff are trained on the importance of keeping consistent records for probable claims.

Different studies conducted by Boon Hui Yap et al., (2021), discovered that the utilization of standardized delay analysis methods, particularly Impacted 'As Planned' or Time Impact Analysis ("TIA"), encourages uniformity in assessing the impact of delays which may leads to EoT claims across construction project management. As referred to Yusuwan & Adnan (2018) in their studies identified that the possibility of disputes over the implications of delays is minimized when project managers and contract administrators are trained in these methods. The study also discovered that by engaging an independent third-party delay analyst can improve objectivity significantly with a neutral assessment on the implications of delays, mainly for complex projects (Azhar et al., 2010). Besides, according to Bahadir & Mykhaylova (2014), the studies revealed that it is easier to define who is liable for overlapping delay occurrences when contracts provide clear provisions for handling concurrent delays. Contracts may, for instance, outline the procedure for handling of concurrent delays, giving contractors time entitlement without providing compensation on particular overlapping delays (Bahadir & Mykhaylova, 2014). Similarly, a study carried out by Yusuwan, et al., (2017) disclosed that it is also possible to handle concurrency more clearly by using delay analysis instruments that can examine the implications of each delay event independently.

Apart from that, another studies by Abdul-Aziz (2012) unveiled that the best practice of handling EoT claims is impartially and consistently when a particular claim management team is established, or a claims officer is assigned to the project management team. The studies also identified that to reduce subjective decision-making, this team or person should be well-versed in project management principles, delay analysis methods, and contract law. This perspective lessens the possibility of prejudice or inconsistent EoT claim principles by balancing project interests while upholding contractual terms.

These best practices for EoT claims provide a structured approach to handling time extension requests, minimize misunderstandings, and reduce the likelihood of disputes. AlSehaimi et al., (2013) highlighted in his studies that the effectiveness, impartiality, and transparency of EoT assessments can be improved by construction project managers by implementing a targeted approach to each highlighted issue. In addition to improving project results, integrating these practices into project management procedures encourages a more proactive, cooperative approach to construction project delay management (Sorensen, 2024).

## CONCLUSION

It is common knowledge that, in addition to cost and quality, time is the most significant aspect in the construction process. In any construction project, contractual claims are inevitable. Regardless of whether a construction project is completely executed, only a few are contractually claim-free. Contractual claims will inevitably arise in the construction industry due to its complexity and distinctiveness, encompassing various responsibilities and expertise carried out by different parties. It is the duty of the parties involved to handle these claims. Therefore, a successful claim management procedure is necessary to guarantee that any emergent contractual claims are handled fairly for all parties.

This study has successfully achieved its objective which is to identify the delay causes and its implication which leads to EoT claims in project management, besides providing comprehensive insights and practical recommendations for improving the EoT assessment process as well as minimizing the delay causes and its

implications towards overall project management. Based on the data obtained from previous journals, a list of 35 causes of delay which leads to EoT claims in construction projects was generated based on three major categories which are delay causes by the employer, delay causes by the contractor and neutral delays. Data was collected, organized, and analyzed using mean rankings of delay significance, identifying financial and payment issues, inadequate systematic project planning, and adverse weather conditions as top contributors to delays and as a ground for EoT claims. This analytical approach enabled a systematic identification of delay categories and their occurrence rates, revealing critical insights into EoT claims.

Ergo, the findings from this study emphasized that the financial and payment problems together with improper planning and scheduling in project management which delays caused by the employer and contractor significantly impacted project timelines and necessitated EoT claims. Delays due to employer-caused financial difficulties, slow decision-making, meanwhile delays due to contractor-caused such as poor planning were unexceptional, whereas inclement weather represented a major neutral delay. These delays not only prolonged the timeline of project management but also escalated costs and disputes, affecting overall project success.

Moreover, this study also emphasized that clear communication, thorough documentation, and a structured approach in assessing EoT claims are essential to mitigate the impact of delays. To guarantee efficiency and consistency, this study recommended utilizing standardized delay analysis methods such as Time Impact Analysis (“TIA”) as one of the best practices in project management. Apart from that, the study also suggested that by drafting an effective contract that clearly outlines delay scenarios and establishes guidelines for EoT claims can help reduce disputes. Additionally, it is advisable for the key players in project management to enhance their financial stability to prevent cash flow-related delays. Ultimately, this study has highlighted that minimizing delays and effectively handling EoT claims requires a proactive approach, including selecting qualified contractors, defining contract terms unambiguously, and employing advanced delay analysis methods. By implementing these strategies, it will aid the construction industry by enhancing project schedules, minimizing conflict, and ensuring more seamless project delivery and successful of project management.

Time extension and claims related to delays in construction projects are complex issues in Malaysia. Clear communication, proper documentation, and adherence to contractual obligations are essential in mitigating these challenges. Project managers must be proactive in managing the schedule, monitoring potential delays, and addressing issues quickly to avoid disputes. If disputes do arise, understanding the legal framework and available dispute resolution mechanisms will be key to navigating the issue effectively.

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