

AMERICAN UNIVERSITY OF BEIRUT

TIME-AT-LARGE CALLINGS: COMPUTATION OF
REASONABLE TIME AND ADMINISTRATION OF RELEVANT
CONTRACTUAL OBLIGATIONS

by
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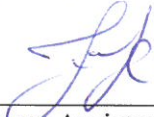
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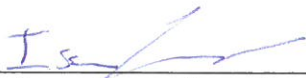
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AN ABSTRACT OF THE THESIS OF

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Delays have been found to be the most cited source of disputes and the costliest cause of problems on construction projects in many contractual regimes. Delays can be caused by either Contractors or Employers or both. Delays can sometimes be controlled or remedied through the extension of time mechanisms stipulated for in contracts. However not every delaying event is covered in contracts, which makes delays in such cases hard to limit and prone to escalate the disagreements on hand to the level of complicated disputes.

Disputes may reach the point where the Contractor declares time to have become at large, a case that existed a long time ago in many construction cases documented in literature, but still has uncertain and unanswered ends. It is safe to say that there is a consensus in the literature about the fact that in such cases, the Contractor is not bound anymore to finish by a fixed Time for Completion. Instead, he is supposed to finish all the works within “such a time that is reasonable under all circumstances” (McNair, 2011). The computation of this reasonable time remains quite vague, and only few papers tackle the topic.

A diligent reading of the literature shed the light on a noticeable repetitive pattern, that is the attempt of the courts involved in time-at-large disputes to try and define the circumstances that shape the environment surrounding the Contractor as he moves on with the remaining works after he declares time to be at large and therefore dictating his progress on Site. In addition to this, several judges address the question of what remains enforceable from the contractual time risk structure in time-at-large situations.

This research aims to find a common definition for the circumstances which govern the time taken by the Contractor to finish the Works. And since this process requires time impact analyses, whether presented by the Contractor or the Employer or both, the research also addresses the question of schedule administration in time-at-large cases. This was possible through filtering the standard conditions of contract and the principles AACE protocol which provide clear guidelines concerning the contractual obligation of the Contractor of regularly updating his schedules. These two pillars of the research then help draw theoretical framework on the computation of what would be considered as “a reasonable time”. Finally, two real-life and recent case studies are illustrated to validate the proposed theoretical framework.

It was evident at the end of this research that computing a reasonable time depends on the circumstances which exist at the time of executing contractual obligations, which can only be truly reflected through contemporaneously updated schedules. Such approach should be normally valid but could be rendered impracticable in some severe cases.

As for the outcomes of this study, they definitely contribute to the existing discoveries concerning the computation of reasonable time and administration of relevant contractual obligations. It offers a set of clear guidelines which both Employers and Contractors could benefit from when dealing with complicated time-at-large callings.

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CHAPTER 1

INTRODUCTION

1.1 Background

It is evident that many construction projects are destined to face claims. Whether they consist of monetary compensation or extra time for the completion of the project, these claims are indeed inevitable. The two types of claims are interrelated, since a request for an extension of time includes covering the prolongation costs that are requested additionally to the initial contract price. Time extensions claims, which are definitely on the rise, happen to be extremely problematic especially to the owner, who is usually consumed with the time management aspect of his project. The time pillar is considered quite crucial, and its management contributes to the success of the construction project (El Adaway et al., 2016). Time is of extreme importance in this industry as Employers demand a completion of the works without delays in order to profit from the project as soon as possible (Fawzy and El-Adaway, 2014).

In fact, the Contractor's actual completion date often overrides the original Time for Completion already agreed upon when signing the contract with the Employer. Subsequently, the Employer is entitled to recover from the Contractor liquidated damages at a rate predetermined in the contract, when the delay is under the responsibility of the latter (Brawn, 2012). Therefore, the purpose of the extension of time (EoT) clauses, when present in the contract, is to provide the Contractor with an additional time without having to pay any damages to the Employer (El Adaway et al., 2016).

In the light of such delaying events, the parties adopt confrontational approaches, which leave the EoT claims frequently hard to be amicably solved (Shabbar, 2017). In reality, the application of both EoT and delay damages clauses may be stalled by complicated events that can surface throughout the execution of the works. For instance, some cases end up with the Contractor declaring time to have become at large. This type of scenario is considered to be against both parties' interests and causes "more costly disputes than any other grounds" (Linares, 2013). In this case, the Contractor is not bound anymore to finish by a fixed Time for Completion. Instead, he is supposed to finish all the works within "such a time that is reasonable under all circumstances" (McNair, 2011). One may think that this situation is rare to happen. The truth is that not only is this concept being frequently encountered in the past few years, but it also dates back to the oldest case studies (Holme v. Guppy, 3 M&W 387, (1838)).

There can be several conditions justifying for calling time to be at large by the Contractor. On the one hand, the contract might not specify a Time for Completion in the first place (Abdul-Malak and Jaber, 2017). On the other hand, this date can be specified in the construction contract, but the extension of time mechanism could fail. This can result either from the absence of the provisional clause in the contract, or when "such a provision had not operated in the circumstances so as to expunge the delay effect of the prevention" (Tweeddale, 2006). That is, time can be set at large in case of an act of prevention by the Employer. In other words, the Employer himself is responsible for impeding the Contractor from meeting the time for completion. However, the clause allowing for time extensions can be both present in the contract and covering the type of delaying event on hand, but with the engineer not making a

decision concerning the request. This is equivalent to a waiver by the Employer to have the project delivered within a specific fixed date (Abdul-Malak and Jaber, 2017).

When time is called to be at large, the Contractor denounces the previously agreed upon completion date, whether it is the originally specified time or the certified extended one (Gibson, 2008). Also, a direct consequence of time being at large is the nullification of the recovery of any liquidated damages stipulated for in the contract, since there is no completion date acting as a baseline from which the damages can be computed (Jaber, 2013). Since the completion date from which such damages are calculated is dismissed, the Contractor can claim additional time to finish the works without having to pay any delay damages to the owner. This period of time is supposed to be reasonable and determined based on events that, under the regular operation of the EoT clause, would grant the Contractor a “virtual” extension of time. As such, all excusable delays that surface after time has been set at large should be included in calculating the overall reasonable time.

According to Gibson (2008), determining what a reasonable time to complete the works is depends on the existing circumstances that led to time becoming at large. Its computation relies on the information available upon the date when time was declared to be at large. To be noted is that these circumstances are not caused by the Contractor or attributed to him, or even falling under his control. This computation is viewed as a delicate procedure, which “considers what in ordinary circumstances a reasonable time was, and then considers to what extent the time for performance of the Contractor was extended by extraordinary circumstances and events out of his control” (Ying, 2007).

Despite the fact that the Employer is not entitled to recover liquidated delay damages when time is called at large, there is still a viable remedy in case the Contractor completes the works within such time that is deemed unreasonable. To this end, the Employer can claim general damages, but, unlike in the liquidated damages case, these need to be proven by the Employer. However, the limit of these general damages cannot exceed that of the liquidated damages, had this mechanism been operable and valid (Kheng, 2003).

1.2 Problem Statement

A matter like time at large typically escalates to a complicated dispute that may lead to costly resolution means, including arbitration. The Employer and the Contractor will most probably be in disagreement as to the amount of reasonable time needed to finish the project. The literature addresses this topic superficially, giving vague or ambiguous guidelines to start from. It has not yet addressed how to precisely quantify what may be deemed as reasonable time, leaving the parties to a project with uncertainty about the appropriate approaches and strategies that they may use to make their case.

Moreover, another critical problem that surfaces when time is called to have become at large, which has not been answered yet, is related to the divergent opinions of the parties when it comes to relinquishing or maintaining the Contractor's contractual obligations pertaining to the administration of the construction time schedule. Among these responsibilities is the duty of the Contractor to submit updated and/or revised schedules when carrying on with the works. This is viewed as a necessity in order to allow the Engineer to base his staffing strategies on the planned work activities. In this

regard, the question as to what the Contractor should present in his updated schedules when a time extension has been denied and time has subsequently been set at large, has not been answered yet, thereby adding more complexity to the situations likely to emanate from such time-at-large callings.

1.3 Research Objective

On the one hand, the purpose behind this research is to make use of any available information concerning methodologies that can help deduce a framework, which aims at explaining how to determine the deserved reasonable time. On the other hand, it is important to also address the schedule administration aspect once the Contractor calls time to be at large. This entails understanding what the literature offers as guidelines and defining how to expand and develop any such possible existing framework. Furthermore, analyzing several real-life cases will be useful in deducing the factors forming part of the Contractor's rationale, used for validating the reasonableness of the time taken to complete the works. To this end, scrutinizing specific standard conditions of contract related to subjects including extensions of time, liquidated damages, schedule administration, and rate of progress may prove to be instrumental in shaping the prospective findings of this intended research.

1.4 Methodology

The methodology to be followed in this research includes the following steps:

1. Conduct a review of the literature concerned with both objectives of this intended research;

2. Examine the circumstances prevailing in time at large situations as deduced from time at large case studies.

3. Examine standard conditions of contract as well as protocols covering forensic delay analysis to deduce the scheduling related obligations that survive calling time to have become at large;

4. Draw a theoretical framework on how to compute the reasonable time by relying on steps 2 and 3.

5. Scrutinize two recent time-at-large case studies validating the findings of the research.

6. Offer a summary of the work, conclusions and recommendations, limitations of the proposed solutions, and future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Schedule and Cost Overruns

According to Iyer and Jha, in any construction project, the success is measured in terms of its performance on schedule, cost, quality and “no-dispute” (K. C. Iyer and K. N. Jha, 2006). Delays and cost overruns, which are evidently interrelated, are the most common problems that occur in construction projects (Matin, 2016). Controlling schedule slippages would definitely help in constraining a major part of the cost overruns, especially those due to general escalation and interest (K. C. Iyer and K. N. Jha, 2006). Matin continues to define success as a goal that can be attained by achieving “successful technical performance”. In fact, finishing a project on time without delays and additional incurred costs depends on factors such as “personal performance, owner, Contractor, consultant, design team, labors, availability of materials and other sources, contractual relations etc. He emphasizes on the importance of the role of the project management aspect in controlling the factors listed above in order to accomplish a successful construction project.

2.1.1 Root Causes Behind Schedule and Cost Overruns

Currently, the problem of delays and cost overruns is analyzed by identifying the different causes behind these failures (Adam et al., 2016). They are aggregated according to their nature into the following classification:

- Communication: lack of communication between Contractors and clients, inefficient communication;
- Financial: delayed payment to Contractors/consultants, poor financial planning, price increases;
- Management: poor site management, inadequate managerial skills, poor monitoring and control, slow decision making, client-initiated change orders, inadequate design specs, rework, poor labor planning;
- Material Planning: shortage of equipment, poor material planning;
- Organizational: unsuitable management structure, poor organization structure, poor process procedures;
- Project: project complexity, project duration;
- Psychological: optimism bias, deception; and
- Weather: harsh weather conditions, unforeseen ground conditions.

2.1.2 Mitigation measures

Asiedu, Adaku and Owusu-Manu (2017) complete in their paper the process of investigating the causes to cost overruns and delays by proposing to these issues a set of mitigation measures that could be predictive, preventive or corrective, while specifying the contractual party responsible to each of the actions. Their research is based on factors recognized to have led to schedule and cost overruns in the Ghanaian construction industry.

For instance, poor project planning and supervision could be mitigated by ensuring that project funds are insured before projects awarded, agreeing on cash-flow forecasting plans between the parties to the contract before starting the project and

establishing payment delay management procedure before contract commencement. The problem of change orders for example can be mitigated by ensuring that project designs and estimates are completed and agreed upon before contracts are awarded and ensuring that these designs are peer reviewed by “independent colleague professionals” to prevent having any design discrepancies and errors.

The list of mitigation measures goes on for other serious problems affecting schedule performance such as poor contract administration, competence of project team, lack of effective coordination between contractual parties, cultural and political risk etc. The mitigation methods listed in this section are examples of preventive measures one could take. However, it is crucial to have basic remedies for the parties of a project to resort to by stipulating for them in the contract agreement, such as the extension of time mechanism.

2.2 Extension of Time Mechanism

Kazaz et al. (2011) state that almost every construction investment, whether in industrialized or developing countries, suffers from a deviation from its originally planned schedule. In fact, numerous factors surface during the execution of construction projects, which hinders a systematic and smooth flow of work, thus “resulting in time-based anomalies”. Soren and Soren (2014) describe construction sites as being dominated by chaos and complexities, which renders the commitment to a robust schedule till the end of the project a considerable challenge. In conclusion, delay in the completion of projects has become a common and serious issue in the industry of construction (Bramah, 2014).

Usually, any construction contract stipulates for a specific Time for Completion to which the Contractor commits to when signing the agreement. However, delays are inevitable, and the Contractor will often find himself in the rough position to ask the Employer for an extension of the Time for Completion. The Society of Construction Law (SCL) as contained in the Delay and Disruption Protocol (SCL 2002) defines an extension of time (EoT) as “the additional time granted to the Contractor to provide an extended contractual time 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 damages)”.

As for the delays that are bound to happen in any construction project, they are classified into four categories: critical versus non-critical delays, excusable versus non-excusable delays, compensable versus non-compensable delays and finally concurrent delays (Shabbar et al., 2017). Critical delays are the ones that push the completion date of the project further, while non-critical delays do not (Trauner, 2009). Knowles (2005) indicates that excusable delays are the ones caused by the Employer, his personnel or a neutral agent. Vasilyeva-Lyulina (2015) adds that an excusable delay is both unforeseeable and falls beyond the control of the Contractor, and according to Mubarak (2015), an excusable delay can be compensable or non-compensable. On one hand, the compensable delays are the ones caused by the Employer or his personnel, such as differing site conditions, the access to the site and the variations in work. As a result of such delay, the Contractor has the right to request for an extension of time and the resulting additional costs. Non-compensable delays on the other hand are the types of delays that deprive the Contractor from having any monetary compensation. In-excusable delays do not entitle the Contractor to any additional time or costs to finish

the works (Manzur et al., 2016). Mubarak (2015) similarly adds that non-excusable delays as non-compensable events that could have been foreseen by the Contractor, or the ones that directly fall under his responsibility. Finally, Arif and Murad (2013) define concurrent delays as a situation where “more than one delay occurs simultaneously, either of which would alone delay the overall project”. Subsequent to such delays, the Contractor may get an extension of time but no additional compensation.

Almost all of the standard forms of contract stipulate for Extension of Time (EoT) clauses that cover excusable delays which may happen in construction projects. In the case of occurrence of construction delays, the Contractor must submit an EoT application claim to the Employer. Norazian and Hamimah (2013) state that this claim should be thorough and complete, “based on all relevant facts and the documents related to the delays, including a thorough analysis to the delayed events”. The claimant however, before putting forward any request for an EoT, should identify the contract provision which entitles him to make the claim in the first place. An EoT can only be granted if the claimant follows the procedure specified in the contract.

If the Contractor fails to meet the date for completion agreed upon, and if the delays are decided to be of his own responsibility or falling under his control, then the Employer will have the right to recover liquidated damages from the Contractor. However, if the delays are considered to be beyond the Contractor’s control, then the latter has the right to file for a request to an extension to the agreed Time for Completion. That is, EoT clauses when present in contracts typically serve to reimburse the Contractor for any time lost and thus giving him an extension of time without having to pay liquidated damages to the Employer and compensating him with the incurred prolongation costs during the awarded period. Nevertheless, the Employer

would still be able to recover damages from the Contractor in case he does not meet the new date for completion (El-Adaway et al., 2016).

The EoT clause should specify all the events causing critical delays for which the Contractor is entitled to an additional period of time to complete the works. The events stipulated for in this clause are considered to be at the Employer's risk and not the Contractor's. They normally include "acts of default" by the Employer, such as the failure to grant a timely possession of the site on the designated start date and the lateness in providing information to the Contractor. Jaeger and Hök (2009) specify in their book that in the case of such acts of unlawful prevention, "the Employer becomes the arbiter of, and gains the advantage from, his own- wrong." The events listed under the EoT clause also cover "perfectly valid actions" such as the instruction of variations or additional work. In addition to this, the clause covers "neutral events" such as differing site conditions and exceptionally adverse weather (Brawn, 2012).

2.2.1 EoT Under FIDIC 4th

The delays in 1987 FIDIC are listed under Sub-Clause 44.1 such as:

- The amount or nature of extra or additional work;
- Any cause of delay referred to in these conditions;
- Exceptionally adverse climatic conditions;
- Any delay, impediment, or prevention by the Employer; or
- Other special circumstances which may occur, other than through

default of or breach of contract by the Contractor or for which he is responsible.

Bunni (2005) further added the following list of Sub-Clauses that may entitle the Contractor to an extension of Time: 6.3 and 6.4 (delay in supply of documents),

12.2 (adverse physical obstructions or physical conditions), 27.1(fossils and articles of value and antiquity), 36.5 (tests required but not provided for), 40.2 (suspension of the progress of the works), 42.2 (failure to give possession of site), 41.1(commencement of works), and 69.4 (Contractor's entitlement to suspend work or reduce rate of work).

He then explains that the last condition listed in 44.1 giving the Contractor the right to demand an additional period of time in the case of "other special circumstances" is quite vague and ambiguous, therefore leading to clashing interpretations. This ambiguity is replaced with a more precise statement under the EoT clause in the 1999 FIDIC.

2.2.2 EoT Under 1999 FIDIC

As for the 1999 FIDIC, Bunni (2005) makes it clear that apart from Sub-Clause 8.4 (Extension of Time for Completion), there are other numerous Sub-Clauses which entitle the Contractor to an extension of time. A diligent Contractor would be able to identify the events granting him deserved additional time to complete the works pursuant to the following clauses: Sub-Clause 1.9 (Delayed drawings), Sub-Clause 2.1 (Lack of access to and possession of the Site), Sub-Clause 4.12 (Adverse physical conditions), Sub-Clause 4.24 (Fossils), Sub-Clause 4.7 (Error in specified reference points), Sub-Clause 7.4 (Delayed tests), Sub-Clause 8.5 (Delays caused by authorities), Sub-Clause 8.9 (Suspension initiated by the Employer), Sub-Clause 10.3 (Interference by the Employer in Tests on Completion), Sub-Clause 13 (Variations), Sub-Clause 13.7 (Changes in legislation), Sub-Clause 16.1 (Contractor's entitlement to suspend work), Sub-Clause 17.4 (Employer's risk) and finally Sub-Clause 19.4 (Force Majeure).

The EoT clause in the FIDIC requires the Engineer to employ his expert judgment to determine the extent to which completion has been delayed. To be specific, Sub-Clause 3.5 in the FIDIC requires the Engineer to make a fair determination concerning the EoT request by “having regard to all the relevant circumstances” (Jaeger and Hök, 2009).

As for Sub-Clause 8.4, it states that the Engineer should exercise his judgment to determine the extent to which completion has been delayed by the relevant events in accordance with Sub-Clause 3.5, which says that he must make a fair determination with regard to all relevant circumstances. The Engineer can only make such determination after the Contractor puts forward a notice to claim not later than 28 days after he became aware of the event or circumstance causing him delay. As a prerequisite to bringing a claim, the Contractor is supposed to provide full supporting details of his application within 42 days of the occurrence of the delaying event.

In an ideal situation, the Contractor puts forward a request for an EoT and the Employer extends the duration of the project. However, the reality of construction projects shows that such demands rarely go smoothly. In fact, it is more likely that the Contractor and the Employer enter into disagreements that could probably escalate to disputes.

2.3 Disputes in Construction

Tazelaar and Snijders (2010) describe the construction industry as being a tough and competitive business, involving short-term and opportunistic type of relations, rather than long-term and solid partnerships between the contractual parties. Thus, it is the adequate environment for the proliferation of problems and claims which

could rise to the level of disputes. In fact, some claim that the construction industry is considered to be a “dominant blame-culture” where the parties to a contract have a strong tendency towards the use of litigation in order to resolve their disputes (Khalfan et al., 2007).

Following years of investigations, researches have come to the conclusion that predicting and planning for every single event that could happen in construction projects is almost impossible, and the occurrence of problems throughout the execution of works is inevitable, especially in long-duration high-value projects. Problems that Engineers and managers are expected to be able to mitigate, when blended with conflict, rise to the level of disputes (On Cheung and Wing Yiu, 2006).

Aibinu (2009) specifies that delay and disruption claims are the ones to often generate disputes between contract parties and therefore greatly impacting the financing process of a construction project. That is, disputes arise when a Contractor receives an unfair decision from the contract administrator concerning the assessment of the delay claim put forward by the former (Spittler and Jentzen, 1992). In general, it is not uncommon for Employers to refuse to give to their Contractors fair compensations even when there are legitimate reasons behind their claims and demands. Such behavior will naturally lead to conflicts and disputes (On Cheung & Yan Pang, 2013).

In his paper, Aibinu explores the effect of pre-contract negotiation as a means of avoiding or mitigating delay and disruption claims conflict. The results indicate that when the Contractors received an unfavorable outcome from the contract administrator’s decision on their delay claims, the intensity of conflict was lower when there was pre-contract negotiation and pre-contract agreement regarding the rules for quantifying and assessing the impact of anticipated delays than when there was none.

The study also concluded that the intensity of the conflict decreased as the Contractor's perception of the quality of the decision-making process for delay claims increased, the lower the intensity of conflict. Therefore, owners and their project management team should pay more attention to pre-contract negotiation and agreement with the chosen Contractor at the time of entering into contracts. The purpose behind such measure is to agree from the beginning on the rules that will be adapted by both parties for quantifying and assessing the impact of any potential delay and disruption. The clarity of pre-contract negotiations is crucial in constraining the intensity of the potential conflicts which could happen during the execution of the works by facilitating the resolution process of delay claims.

On Cheung and Yan Pang (2013) affirm that contract incompleteness is the root cause behind construction disputes. The agreement between parties on such negotiations is not usually covered by standard forms of contracts. Instead, the Employer and the Contractor can decide to have a separate partnering agreement or to sign an appendix to the original contract. The topics tackled in this supplement to the contract would include: "the rules of evidence for claims, the record requirements for claims and the procedure for keeping the records, form of construction program including the software for the preparation of the program and the procedure updating the program, the methodology for analyzing delay claims, formula for quantifying unabsorbed head office overhead component of prolongation cost, the method for quantifying disruption cost, the handling of concurrent delays, profit—whether claimable and the rate of profit to be paid, acceleration—circumstances under which it will be compensated and basis of compensation, and the question of who owns the float".

Nevertheless, even when contractual parties make sure to take such preventive measures, conflicts are still bound to happen. When disputes surface during the construction works, the opposing parties usually resort to formal resolution mechanisms such as litigation and arbitration, which are regulated by courts or the institutions providing the service, respectively. Alternative Dispute Resolution methods (ADR) have been introduced to the industry in order to provide a more flexible, economic and less confrontational or hostile platform that is based on solid communication for the opponents to solve their conflicts. ADR methods include negotiation, mediation, conciliation, dispute review board (DRB), adjudication, expert determination (On Cheung, 2014). The dispute resolution methods could be quite lengthy due to the complexity of the situation on hand, especially in the case where the Contractor declares time to have become be large as a result of an act of prevention made by the Employer.

2.4 Prevention Principle and Time-at-large Callings

The concept of time being called at large from the actions of the owner is an application of the “prevention principle” in contract law. “The person to whom an obligation is owed cannot insist upon the performance of that obligation if he or she has prevented the other party from performing it” (Multiplex Constructions (UK) Ltd. v. Honeywell Control Systems Ltd., 2007). That is, no person can take advantage of the nonfulfillment of a condition, the performance of which has been hindered by himself, according to Vaughan Williams, L.J., in *Barque Quilpe Ltd. v. Brown*, 1904.

The prevention principle was defined years ago by Bull J.A. from the English case *Dodd v. Churton* (1897): “Where a party to a contract agrees to do a thing within a certain time, the other party must not prevent him from doing it. This is a general

principle, and is not confined to building contracts. [For example] the building owner is not allowed to insist upon the penalty for delay if, by ordering extra, he has prevented the builder from completing the work by a specified time.”

Acts of prevention could be a breach to the construction contract or a wrongful act by the Employer. They could be permitted by the contract but at the same time hinder a timely completion of the works. According to Fawzy and El-Adaway and (2014), an act of prevention could be “a perfectly legitimate action which causes a delay beyond the time for completion, e.g., instructed additional work or other variations” (based on *Dodd v. Churton*, *Multiplex Constructions (UK) Ltd. v. Honeywell Control Systems Ltd. (No 2)*, *Shawton Engineering Ltd. v. DGP International Ltd.*). In this case, the Employer is not committing a breach to the contract. Nonetheless, he is still required to grant the Contractor additional time to complete after instructing extra work in order to absorb his act of prevention. Such acts of prevention also include the failure to provide timely access to the site, failure to provide a complete and proper design, significant design changes, or late provision of materials (O’Connor et al., 2011).

The English Court of Appeal in *Peak Construction (Liverpool) Ltd v. McKinney Foundations Ltd* (1970) applied the prevention principle to the construction contract. It was held that a delay caused by an owner could render time at large if either there was no provision within the contract to award the Contractor an extension of time, or such a provision had not operated in the circumstances so as to expunge the delay effect of the prevention (Tweeddale 2006).

2.4.1 Consequence of prevention acts

O'Connor et al. (2011), state the decision following *Holme v. Guppy* (1838): "Where an owner impedes a Contractor from meeting the completion date, the completion date is suspended, time becomes at large and is replaced with an obligation to complete within a reasonable time". They clarify that the concept of time being put at large as a consequence of actions by the owner is a mere application of the prevention principle in contract law.

From a common law perspective, no person can take advantage of the nonfulfillment of a condition, the performance of which has been hindered by him. Consequently, the original Time for Completion no longer persists in case the Employer impedes the Contractor from meeting the agreed completion date. According to Abdul-Malak and Jaber (2017), in the cases of *Peak*, *Gaymark* and *Honeywell* (previously mentioned), the prevention principle was upheld by the claimants due to the extension of time clause having allegedly failed to account for the respective cause of delay. Thus it can be concluded that when the EoT clause does not cover a certain delay event, and if the Employer insists that the Contractor meets the un-adjusted completion date, then he would be hindering the Contractor from fulfilling his responsibilities. The exclusion of the EoT mechanism stipulated for in the contract of the excusable delay event on hand will have "the direct implication of time being rendered at large in order to protect the Contractor from unjustly paying delay damages".

Therefore, when the prevention principle is upheld, not only time will be called at large, but the Employer will not be able to levy any liquidated damages from the Contractor. Instead, he can only claim for general damages if the Contractor finished the works during a time that is deemed to be unreasonable. These damages shall be proved

by the Employer, and the limit of liability is the one already identified in the construction contract for the liquidated damages provisions (Salwa et al., 2013).

2.5 Liquidated Damages

In any construction project, both the Employer and the Contractor aim for a timely completion of the works. On one hand, the late completion of a project can have profound effect on the return on the investments of the Employers, i.e. the owner of a shopping center, the owner of a hotel, hospital, powerplant operator... In general, the delayed delivery of a project will cause the loss of business opportunities and potential profits, and create social/public problems for public projects (Shen et al., 1999).

Some of the losses incurred as a result of a delay in completion can be tangible; the owner can lose revenues, may have to pay additional interest costs on the construction loan, or even suffer from penalties imposed by regulatory agencies, more operating costs for maintenance, utility, additional rental charges for temporary buildings, costs for additional personnel, extended supervision, inspection and design costs, wage and material cost increases. Other losses can be intangible like the ones resulting from a delay in completing a public project. These are often characterized by inconvenience to the public and are hard to quantify. Not to forget that the relationship between an Employer and a financier may be strained due to late completion (Caplicki and Guidry, 2006). At the same time, Contractors aim to complete projects without delay in order to avoid being liable for liquidated damages. In addition to this, the longer the Contractor stays on site, the more costs he may incur (Fawzy and El-Adaway, 2014).

2.5.1 Definition of Liquidated Damages

Liquidated damages are “specific charges, usually on a daily rate, that are spelled out in the construction contract for each day a Contractor fails to meet the completion date”. Such charges are typically requested by the Employer, in order to secure a timely completion for the project. Therefore, the Employer would be shifting a part of the risk of delayed completion to the Contractor by stipulating for a liquidated damages figure in a provision in the contract (Dobbin, 2007). Liquidated damages are meant to recover for the standard consequential damages, suffered by the Employer, resulting from losses incurred as a consequence of a late completion by the Contractor.

2.5.2 Liquidated Damages as Genuine Pre-estimate or Lesser Sum

According to Lord Dunedin in *Dunlop Pneumatic Tyre Company Ltd v. New Garage* (1915), “the essence of liquidated damages is a genuine covenanted pre-estimate of loss”. In his book, Eggleston (2009) mentions that it follows from the *Widnes Foundry* case that sums stipulated as liquidated damages may be either a genuine pre-estimate of loss or such smaller sums, as the parties may agree. In addition to this, it was stated in *Multiplex Construction Pty Ltd v. Abgarus Pty Ltd* (1992): “It is clear as a matter of principle, and established by authority, that if parties agreed upon a quantum of damage as liquidated damages which is less than the damage which would be suffered from such breach, no attack can be made upon such a liquidated damages provision upon the basis that it is extravagant or unconscionable.”

In general, liquidated damages could be calculated using different methods:

- A percentage of the total contract amount;
- A percentage of contract amount applied for each day of non-excusable

delay;

- Lump sum amount.

According to Assaad (2017), most liquidated damages clauses in the construction industry include a daily or weekly assessment for every delayed day or week for which the Contractor is responsible. That is, liquidated damages are calculated using the “*per diem*” method where a stipulated amount is assessed for each day of delay.

2.5.3 Commonly Used Periods of Assessment

The assessment of liquidated damages either spans from the substantial or final completion date stated in the contract to the actual substantial or actual final Completion date, or are assessed according to completing project milestones (this is beneficial in the case where the final completion is delayed) (Thomas *et al.*, 1995). If the contract does not specify the period of assessment of liquidated damages, then they usually run until substantial completion (Caplicki and Guidry, 2006).

2.5.4 Difference Between Liquidated Damages and a Penalty

Oon (2003) considers the term liquidated damages in commercial contracts a misnomer. In England, there is a clear legal distinction between liquidated damages and a penalty. On one hand, a liquidated damages figure represents a genuine pre-estimate of the loss likely to be suffered by the Employer as a result of the Contractor’s breach. On the other hand, a “penalty” designates a sum that is extravagant in relation to such loss.

A penalty clause is “a compensation for the damages which the creditor suffers from the non-performance of the principal obligation. The penalty clauses with purely

punitive aims are usual on the continent, but are prohibited under Common Law and as a result are not enforceable by the courts. The difference between the penalty clause and the liquidated damages clause is that the sum to be paid when breaking a promise under Common Law has to be reasonably estimated at the time of contracting, taking into account the actual damage that will probably ensue from breach.” (FIDIC guide)

Courts will decide whether the liquidated damages clause are valid and enforceable based on several factors by first examining the reasonableness of the rate specified, which should be rational to the probable loss that would be suffered by the Employer in the case of late completion. In many construction contracts, liquidated damages are not a genuine pre-estimate of these damages, but are often related to amounts included in previous contracts of a similar nature (Seeley, 1997). According to Thomas et al. (1995), typical liquidated damages amounts include factors like:

- Loss of revenue or rental value;
- User costs, engineering and administrative costs;
- Additional wages;
- Moving costs; and
- Interest and extended management and overhead fees.

In addition to this, courts will examine the reasonableness of this provision at time of contracting. Depending on the size and scope of a project, a dispute can take months and years to make it to court. During this time in which the disputes stalls or escalates, the actual damages incurred can be quantified and compared to the fixed amount of liquidated damages stipulated for in the contract before the occurrence of any dispute. Furthermore, they will study how the amount of liquidated damages was settled in order to judge its reasonableness. In most jurisdictions, courts will consider the

liquidated damages to be a penalty if they come to prove that their amount is not a legitimate pre-estimate of the losses. In this case, they will annul the applicability of this provision in the contract and require both parties to quantify and demonstrate the actual losses at law and as otherwise stipulated for in the contract (Caplicki and Guidry, 2006 and Dobbin, 2007). In other words, the Employer can be asked to justify the figure of the liquidated damages by explaining how both parties agreed to it.

The validity of the liquidated damages clauses is a question of law, and thus this matter is entertained by the court. “Whether an amount to be paid upon breach is to be treated as liquidated damages or as an unenforceable penalty is a question of law”. As for the amount of the liquidated damages, it is a question of fact to the jury (Caplicki and Guidry, 2006). Finally, the burden of proof rests on the party that wants to challenge the validity of the liquidated damages provision. Therefore, the Employer does not have to prove loss before he can deduct liquidated damages. Nevertheless, there still are pre-requisite steps that need to be satisfied in order to allow such deduction.

For instance, very often what is called a certificate of non-completion would need to be issued by the Engineer/Architect/S.O. It should be clear though that “a delay to the contractual completion date and the issuance of a certificate of non-completion per se only entitle (subject to the proof for loss suffered) the Employer to deduct sum due, or claim from the Contractor, liquidated damages.” The Employer can choose not to levy liquidated damages. It is therefore not the responsibility or the role of the Engineer/Architect to indicate and to deduct an amount allegedly payable as liquidated damages in any interim certificate. Their only duty is to certify if completion was not

achieved on the date previously agreed upon, and to issue the certificate of non-completion.

Tuuli, Baiden and Badu (2007) explain the three-pronged test that the US courts apply in order to determine whether a liquidated damages clause is legally enforceable:

- The intent test, which essentially assesses whether the parties intended to liquidate damages in advance of the parties' acts and words (Farnsworth, 1990, Bethlehem Steel Corporation v. City of Chicago, 1965).

- The difficulty test, which places great weight on the ascertainment of the contractual damages regarding the degree of uncertainty involved in the estimate (Corbin, 1964). The greater the degree of difficulty in calculating the likely future damages accurately, the more valid the liquidated damages clause becomes in the eyes of the court and vice versa (see Osceola County, Fl v. Bumble Bee Construction, 1985).

- The reasonable test, which assesses delay damages amount in view of the actual damages suffered due to the breach. If the court interprets the proposed damages as significantly greater than actual damages, then the provision is determined to be a penalty and ruled invalid (Corbin, 1964, Wise v. United States, 1919). Moreover, in the case where liquidated damages were wrongfully deducted, the Contractor would be entitled to the repayment of these damages with interests (Oon, 2003).

2.5.7 Annulment of Liquidated Damages in Case of Prevention by the Employer

Under the common law, and as previously mentioned according to Chappell (2007), if the works are delayed by a reason for which the Employer is responsible, then the

Contractor is no longer bound to complete the works within the original time for completion. As a result of a prevention act, time is said to be at large.

In this case, the Contractor is not obliged to complete the works within the original time for completion or the contractually extended one and there is no date from which the liquidated damages can be calculated (Fawzy and El-Adaway, 2014). This implies that the liquidated damages clause in the contract becomes inoperable and therefore the Employer will not be able in this case to levy liquidated damages from the Contractor. Thus, the Contractor's remaining obligation would be to complete the works within such time that is deemed reasonable. In this case, the Employer can still sue for general or unliquidated damages if the completion is delayed by an act of prevention. However, the Employer will have to prove the damages first (Chappell 2012).

Eggleston (2009) mentions that there is some confusion between general damages and liquidated damages because both types flow from a breach of contract. The difference between them is that liquidated damages are stipulated for in the contract and do not need to be proved, while general damages are not contemplated for in the contract and do need to be evidenced. The actual (general) damages collected by the Employer cannot exceed the amount of liquidated damages stipulated for in the contract, but this decision is still not binding (Brawn, 2012).

2.7 Condition Precedents and Notices

The dispute resolution provisions in construction contracts usually lay out specific procedures with condition precedents that can affect both the entitlement and the eligibility of the parties in their demands. According to Black (2004), a condition

precedent is an act or event that must occur before a duty to perform something arises; if the condition is not satisfied then the performance of the duty is not necessary. For instance, serving a notice in order to demand for an extension of time or requesting an instruction from the Engineer concerning a variation order are condition precedents required by the Contractor. Conditions precedents play a crucial role in ensuring a better management and more efficient construction contract administration. Totterdill (2006) states that such conditions have been viewed as a means for instituting efficient project management procedures and a fair distribution of project risks for a less adversarial approach between the parties to the construction contract. In a time-at-large context, Abdul-Malak and Jaber (2018) prove that even when the Contractor fails to comply with notice requirement that are condition precedents for time extension requests, he would still have the right to declare time to be at large when the Employer commits acts of prevention and is aware of the delay that he has caused.

Al-Quady et al. (2013) propose a set of problematic questions that arise out of the compliance or the failure to comply with condition precedents stipulated for in construction contracts:

- How do conditions precedent affect final dispute resolution procedures?
- Are conditions precedent strictly upheld, or are can they be waived by the courts?
- What are the consequences of failing to comply with condition precedent requirements or time limits?
- Must conditions precedent be expressly stated in the contract conditions, or can they be implied?

The authors then discuss few case studies to address the questions above.

2.7.1 Notification of Claims

The conditions of contract usually require a party to give notifications of claims in order to allow the receiving party the opportunity to investigate the cause of the claim and take any possible mitigation actions. In the case of *SNC-Lavalin v. Alliant Techsystems*, the design builder sued for damages for delays resulting from several factors including changes to the work. The owner stated that the required contractual notification was not respected, which bars the design-builder from claiming for additional cost or time. The court reviewed the plaintiff's argument which was based on the fact that the owner had actual notice because the change was an owner-directed change, and thus compliance with contractual notification was not required. However, the court disagreed, and considered that the contract stated that a written notification was a condition precedent to seeking for additional time and cost even in the case of owner-directed changes. That being said, the court ruled in favor of the defendant regarding this claim.

2.7.2 Timeliness of Submission

The different conditions precedents are typically linked to time limits. In *Platt Pacific v. Andelson* (1993), the arbitration agreement stipulated for a specific date after which a party cannot file a demand for arbitration in the event that an already scheduled settlement conference fails. In this case, the plaintiff filed the demand for arbitration after the deadline passed. The court held that "an agreement on a time period to file for arbitration is a condition precedent to arbitration and that the failure of a party to fulfill

the condition precedent is considered a waiver of its right to submit a dispute to arbitration”.

2.7.3 Language Establishing Conditions Precedent

The courts recognize that the parties of a contract can previously agree to make the resolution of any future dispute conditional on a specific act. In order to do so, the contract must make such act or event “expressly or by clear implication” a condition precedent to litigation. If it does, then the failure to comply with the condition precedent prevents the “failing” party from presenting its lawsuit in court. In the case of *Mayfair v. Waveland* (1993), even though the contract did not explicitly state that an architect’s decision is a condition precedent to litigation, the court reached this conclusion through “interpreting the contract as a whole by trying to give meaning and effect to all contract provisions and avoiding any interpretation that would cause any provision to become meaningless”.

2.7.4 Waiver of Conditions Precedent

In *Mike M. Johnson v. Spokane County* (2003), the Contractor argued that the behavior of the Employer implies a waiver of the requirement for compliance with the formal claim procedures to be followed. The court disagreed, stating that negotiations between the Employer and the Contractor do not create an intention to waive such requirements, especially when the facts of the case clearly indicate that the Employer repeated its position in many correspondences that it has no intention of waiving any rights under the contract.

2.7.5 Importance of Notice Provisions

Aibinu (2009) stresses on the importance of the mechanism of notices, and claims that these provisions constitute an integral part of the contractual requirements and improve the communication about events that may lead to delays in project completion or affect its cost. Mewing (2014) also describes notices as a type of “gateway” which allows a proper contract administration to take place after the occurrence of the event giving rise to the claim that would be put forward.

These notices are usually found to be time barred, requiring the parties to act upon them within a stipulated period within the corresponding contract provision. In fact, notice provisions which are not time-barred, especially in the case of claims, can easily lead to conflicting interpretations concerning the adequate time during which a party should comply, thus leading to disagreements (Harris 2015). When a clause in the construction contract imposes a time limit for a certain act to be performed prior to establishing a further act, it is said to be a condition precedent (Lim 2012). Under most forms of contracts, the notice of a claim is considered as a prerequisite for initiating claim determination procedures (Jaeger and Hök 2009).

This is usually the case of the notice put forward by the Contractor in order to claim his right to compensation and/or an extension of time. The entitlement and eligibility of this claim are, in some forms of contracts, conditional to the full compliance with required notice provisions; otherwise, the right is jeopardized, according to many jurisdictions.

Abdul-Malak and Khalife (2017) conducted a close examination of the 20 clauses constituting the 1999 FIDIC general conditions for the construction contract, resulting in 93 encountered notice requirements. The statistics showed that 55 of the 93

notices can be considered to have explicit time-bar stipulations. The breakdown for this specific category of notices can be summarized as follows: 22 notices with qualitative time bars, 17 notices with numerical time bars, and 16 notices with numerical time bars and an inherent urgency (i.e., a qualitative description accompanying the numerical stipulation).

The qualitative class consists of nine notices which are required to be issued “promptly” following the occurrence of the relevant event, and thirteen notices which are required to be issued as soon as practicable following the occurring event. On one hand, the notices which are required to be issued “promptly” are mainly associated with quality-related work matters, with cost-related (or financial/insurance) and progress-related matters also being evident but to a lesser extent. In other words, the work situations involving errors, defects, damages, and alterations are the ones which require an immediate action from the concerned participant and warrant the prompt issuance of the called-for notice. On the other hand, the notices whose qualitative time bars are stipulated to be “as soon as practicable” are found to be mainly related to matters allowing the Employer to file a claim, subject to Sub-Clause 2.5, such as rejection (7.5), remedial work (7.6), rate of progress (8.6) etc. However, the two exceptions in this category are notices pertaining to the encountering of unforeseeable physical conditions, under Sub-Clause 4.12, and the objection to a Sub-Contractor nomination, under Sub-Clause 5.2.

The notices that are numerically barred are the ones stipulated for in Sub-Clauses such as Engineer’s replacement notice (3.4), determination notice (3.5), Sub-Contractors’ subcontract work (4.4 (1) and (2)), repetition of tests after remedying defects (11.6), issuance of the interim payment certificate (14.6) etc. This list also

includes the notice of claim issued under Sub-Clause 20.1 entitling the Contractor to claim for incurred delay and/or cost, because it has a regulated maximum period of 28 days despite “the urgency imparted by the accompanying “as soon as practicable” qualitative stipulation”.

As previously discussed, notice provisions are intended to enhance the communication between the parties to a project. It is important that this communication is established in writing. According to Miller and Smith (2012), this is important for two reasons, the first being that writing demonstrates authenticity, and the second is that it provides evidence that communication has been made. They also add that the required or preferred method of communication should be specified in the general conditions. In addition to this, the conditions of the contract should specify who should receive the notice, while stating the names of each party with emails or addresses, and whether other parties should be copied in notices or other communication forms.

Tweeddale (2006) explains that judicial systems and courts react differently to the failure to comply with notice provisions. In fact, some courts enforce a strict compliance with notice provisions and thus do not accept informal notices to be considered compliant with the provisions listed under the contract (Abdul-Malak and Khalife, 2017).

2.7.6 Notice Provisions as Condition Precedent

Abdul-Malak and Jaber (2018) explain that a notice provision is to qualify as a condition precedent when the following conditions are satisfied:

- State the precise time within which the notice is to be served (Lal 2002);
- Make plain by express language that, unless the notice is served within that

time, the party required to give notice will lose its right to an extension of time and/or money under the contract (Lal 2002); and

- Not place excessive burdens and tight time windows (Gould 2008).

2.7.7 Notice Provisions and the EoT Sub-Clause in the 1999 FIDIC

The notice provision provided by the EoT clause in the 1999 FIDIC (Sub-Clause 8.4) satisfies the three conditions indicated above and thus qualify as a condition precedent. Discussing notice provisions is of great importance because the compliance or non-compliance with them when they are categorized as condition precedents can have a great impact on time-at-large situations.

As previously mentioned, Abdul-Malak and Jaber (2018) explain that the non-compliance of the Contractor with notice provisions does not necessarily make him lose his right to declare time to be at large. Although the Employer has the right of having to be notified of any delays that the Contractor wishes to claim an extension of time for, this right may be abused in a way that will make the Contractor suffer liquidated damages for delays that he should otherwise be excused of, especially in the case of an act of prevention by the Employer leading to calling time at large. If the Employer has contributed to a delay and plans to levy liquidated damages after denying the Contractor an extension of time for simply serving the notice later than it is supposed to be served according to the notice provisions in the contract, the Employer risks being in contradiction with the known principle “a party cannot benefit from its wrong”. The next section elaborates on the different scenarios which justify calling time to be at large, other than the prevention principle already discussed.

2.8 What Leads to Time-at-Large Callings?

There are several conditions and circumstances that can aggravate potential disputes between the Employer and the Contractor and which can lead to time being declared to be at large by the Contractor. The conditions justifying calling the time for completion on a construction project to have become at large under common law can be described through the following:

- Non-specification of a Time for Completion by the terms of the contract (Pickavance 2006)

- Prevention by the Employer: As explained before, this is the situation in which the Employer hinders the Contractor from meeting the original (or amended) completion date. Consequently, the completion date becomes suspended; and time is called at large by the Contractor (O'Connor and Laudan 2011).

- Failure of the time extension mechanism: If the contract does not contain a provision to grant an EoT to the Contractor in the case of a certain act of breach by the Employer causing delay, then the Contractor may call time to be at large. In addition, if the contract does hold the adequate provision to the event of breach but “it had not operated in the circumstances so as to expunge the delay effect of the prevention”, then time could also be rendered at large (Tweeddale 2006).

- Waiver by the Employer of the Contractor's obligation to complete by a definite completion date: If the Contractor claims for an EoT pursuant to a provision covering the excusable delay that happened and the Employer fails to set a new completion date for the project before the agreed completion date passes, then he is deemed to have waived his right to have his project delivered by a specific date. In the

absence of such definite completion date, time of the project is considered to be at large (Astea Ltd. Vs Timegroup Ltd., 2003).

Despite the facts and the circumstances which justify calling time to be at large, the destiny of each case is a matter of law. It will highly depend on the understanding of the time-at-large situation on hand under the corresponding law or jurisdiction.

2.9 Time-at-large Under Common Law and Civil Law

Common law shows very clearly that the principles of time at large are based on the prevention principle, which is also a well-known principle under Civil law. Nevertheless, the concept of time at large under civil law is not as contextually clear as that under common law where it initially originated from. On one hand, common law has relied on commercial fairness and previous cases to properly define time at large. On the other hand, civil law does not explicitly state a remedy for this notion.

The differences between the common law and the civil law when it comes to the concept of time-at-large prevail in the following factors:

- It is necessary in civil law jurisdictions to determine whether there are any relevant *legal principles* on which the time-at-large argument can be based and by which similar legal conclusions can be reached, while common law jurisdictions may be receptive to the argument being pursued in the usual way. Such legal principles will obviously differ between various civil codes around the world. However, their essence often exists in all civil codes though it may be under different names (Bellhouse and Cowan 2007). The following three legal principles are reported to potentially prove useful in sustaining a time-at-large argument under civil law jurisdictions (MacLean

1982):

- *The doctrine of abuse of right*: This doctrine is of long-standing in many civil law countries and condemns not only the exercise of a right but the abusive use of it in such a way as to damage another person;

- *The principle of unjust enrichment*: This is based upon the rule that no one ought to enrich himself at the expense of another; and

- *The principle of equity*: This is based on natural law, on reason, and on the idea that one should not do unto others that which he would not wish others to do unto him.

- A critical issue with civil law jurisdictions, in connection with the changing social, economic, political, and cultural circumstances, place the contemporary judge in situations where there is no express disposition to guide in the law. That being said, the acceptance – in principle – of the necessity of exercising or benefiting from discretion is an important step towards establishing a viable argument for the declaration of time to be at large under civil law systems (MacLean 1982).

- Under civil law, if the Employer prevents the Contractor from completing the contract by the agreed date, then he will not be entitled to recover liquidated damages. Thus, it could be argued that both concepts of time being of the essence and time at large are pure common law concepts which do not blend with civil law jurisdictions, where time extension mechanism is usually not claim based and not put under claim management rules (FIDIC guide).

Another important factor that will feed into the analysis of the time-at-large situation on hand and the time taken to finish the Works is the financial status of the Contractor, to be introduced in the following section.

2.10 Construction Financing Problems

Pilateris and McCabe (2003) open their study by stating that the economics of a Contractor's projects and the Contractor's financial positions in fact decide if the project is going to be completed and if the construction company is going to survive in the first place. To be precise, external factors like the weather, inflation and other economic and market conditions combined with the internal management system of the resources in a construction company determine the fate of the firm.

Davidson and Maguire (2003) list and explain in their paper the various causes of construction Contractor failures:

- Growing too fast: if the construction company does not have the adequate "infrastructure" to support the desired rapid growth of the client or owner company, then it will most likely suffer significant losses.

- Bidding for work in a different geographic region: Logistically speaking, managing a contract that is thousands of miles away instead of a local one is a challenge by itself. The Contractor should account for various factors such as Sub-Contractor quality, suppliers, labor supply, labor rates and laws, codes, permits and tax rates etc.

- Dramatic increase in single job size: The Contractor should draw a clear strategy and think of a way to distribute the risks of taking a bigger-scale project and maybe try to slowly work up its way to a higher level of contracts.

- Obtaining new types of work: For instance, it will definitely not be trivial for a Contractor to switch from the profession of building roads to suspending bridges, just like it will not be simple for it to suddenly start building commercial buildings after being specialized in heavy highway works.

- High employee turnover: The authors state that a sky-high turnover in positions at the construction company such as estimators, project managers, and superintendents will result in “a lower job profitability and potential bidding errors”. In simple plain terms, the higher the turnover rate, the higher the risk that things can go wrong (Natarelli & Mercado, 2007).

- Poor estimation and job costing: A good management team at the construction company that controls and carefully reviews the bids and work on obtaining several quotes from reputable suppliers and Sub-Contractors is vital in order to costing problems in the first place. Natarelli and Mercado add that construction companies should have job costing systems that capture all the direct and indirect costs as well as the Contractor’s risks for individual contracts and not in contracts as a whole.

- Poor accounting systems and poor cash-flows: The accounting system of the company must keep track of the monthly financial statements on the percentage of completion method with detailed contract schedule and also provide for phase coding, identification, allocation for indirect costs, and produce variance reports. This is a critical step in order to ensure a healthy and actively managed cash-flow for the survival of the company.

Kenly (2005) proposes cash-flow forecast methods for the Contractor. The cash-flow forecast and its indicated rate of expenditure may be used as a cost management tool by both the Employer and the Contractor. The latter can monitor

progress against the cash flow and use this as an early indication of problems, instead of having to solve them when they occur. The Contractor will be aware of the possibility of having future problems if progress on the project is to schedule, but costs are higher than planned. That being said, an early identification of the cost over-runs is an essential strategy that may assist in solving the problem before the damage is done. This section is significant because, as explained later in this research, the disturbance of the Contractor's financial resources plays a vital role in defining the circumstances which govern the Contractor's work and thus dictate the process of computing the overall time to complete after declaring time to have become at large.

2.11 Obligation to Compute a Reasonable Time

2.11.1 Time Risk Structure and Circumstances

Pickavence (2006) started his proposed framework on how to compute a reasonable time in time at large callings by first stating what the judge said in the case of *Astea v. Time Group* (2003). He affirmed that such task "...is likely to include taking into account any estimate given by the performing party of how long it would take him to perform ...". In other words, the identified Time for Completion agreed upon serves as a baseline to compute the reasonable time to complete the works. Ying (2007) then adds that experts in several case studies had agreed that what was an appropriate extension of time together with the originally agreed period was a fair indication of what should be regarded as a reasonable time for completion of the works.

According to Pickavence, there are two positions to consider when it comes to the obligation of the computation of a reasonable time in time-at-large callings. The first

one is when the time risk structure of the contract remains enforceable, while the second one is when this structure fails as elaborated below.

2.11.1.1 An Enforceable Risk Structure

In this case, the overall reasonable time to complete the works would be the Time for Completion in addition to extra time caused by Employer's risk events covered by the contract. These risk events are the ones usually stipulated for under the Extension of Time clause. The overall reasonable time also includes the extra period caused by events beyond the control of the Contractor. Such events can be adverse weather conditions, strikes, lock-outs, civil commotion, any event considered to be a "force majeure" etc... They are typically considered to be events that are beyond the Contractor's control and "not ipso facto Employer's breaches". Nevertheless, the delays caused by the Contractor's Sub-Contractors and suppliers for instance may be judged to be beyond or within the Contractor's control. The classification of such events depends on the existing "factual circumstances". In addition to this, factors such as the economic climate, general availability of plant, labor and materials could be discussed at the time of the contract. In such case, they are expected to have a "bearing upon the time actually taken". Ying (2007) supports this approach by agreeing in his research that the effects of acts of prevention by Employer can be considered in calculating a reasonable time for completion.

In the case of *SMK cabinets v. Hili* (1984), the Employer's instruction of a variation after the completion date has passed without a remedy for it in the contract was considered to be an act of prevention which led to time being called at large by the Contractor. Brooking J concluded that the Employer's act of prevention only served to

prevent him from taking liquidated damages that accrued after his breach. Following the reasoning above, the computation of a reasonable time to complete the rest of the works would be the same as the one adapted when normally extending the Time for Completion. Thus, the burden of proving the reasonableness of the time taken to finish the works falls on the Contractor. The proper way to approach this is by demonstrating how the claimed reasonable time covers the delaying effect flowing from the Employer's breach and the risk events stipulated for in the contract. Now that in such conditions the Employer is not entitled to recover liquidated damages, he can only claim for actual losses or general damages after proving how they emanate from the Contractor's culpable delays.

Chow (2004) explains that sometimes the test of "reasonableness" is construed as being synonymous with the convenience and economic interest of the Contractor. In *Neodox Ltd v Swinton and Pendlebury Borough Council* (1985), the Contractor asserted that there was an implied obligation on the part of the Employer to provide all necessary instructions "in sufficient time to enable the Contractor to execute and complete the works in an expeditious and economic manner and/or in sufficient time to prevent the Contractor being delayed in such execution and completion". Diplock J ruled that the consideration of what would be a reasonable time to complete the works does not depend *solely* on the convenience and financial interests of the Contractor. He observed that while it may appear to the Contractor that it is in his interest "to have every detail cut and dried on the day the contract is signed", the considered event could not have been anticipated for at the time of the contract agreement. He then made it clear that the obligation to compute a reasonable time was a question of fact to be

determined with reference to all the relevant circumstances of the observed case, such as:

- Considerations of the Employer's Engineer and his staff;
- The order by which the works were to be carried out and approved by the

Engineer;

- The Contractor's requests for particular details;
- Whether the details requested relate to variations and;
- The length of the contract period.

2.11.1.2 A Lapsing Risk Structure

Pickavance explains that the argument here is that the Employer's breach which led to time being called at large, makes him lose his right under the contract for the Contractor to prove his entitlement to the additional time needed to complete the works. In other words, the burden of proof here shifts from the Contractor to the Employer, who would prove that the time taken to complete is unreasonable in all the circumstances that then exist.

An "overall reasonable" time in this school of thought would be the total time taken to complete the works minus the time consumed by events and matters that fall under the Contractor's control, or in other words are considered to be acts of breach by the Contractor. Amongst other things, such considerations might reasonably encompass, for example, whether or not the Contractor had in all the circumstances:

- Carried out the work with adequate materials goods and workmanship which did not prove defective;

- Arranged deliveries so that materials, goods, plant and other resources were available when needed;

- Expressly or impliedly warranted its ability to maintain progress in a particular situation or at a particular speed;

- Had adequate site organization, labor force, plant and materials; and

- Remained responsible for acts or omissions within the control of the Contractor's Sub-Contractors and suppliers, notwithstanding that they may not have been within the direct control of the Contractor.

For instance, in the shipping case of *Pantland Hick v Raymond & Reid* (1893), the consignee of a cargo was in breach of a contractual obligation to discharge the relevant vessel within a reasonable time. The only event behind the delay that happened was a strike of dockworkers, over which the consignee had no control. The effect of this strike was preventing the performance of the Contractor. On one hand, the appellant considered that an appropriate reasonable time was the extra period that would have been required as a result of the strike, in addition to the original contract period. On the other hand, the respondents (the consignee of the cargo) argued that the question was not what period of time would have been reasonable under ordinary circumstances; instead, it would actually be what time was reasonable under the circumstances as they then were, knowing that these were free from any breaches on their part. Lord Herschell decided that “the only sound principle is that the ‘reasonable time’ should depend on the circumstances which actually exist. If the cargo has been taken with all reasonable dispatch under those circumstances, I think the obligation of the consignee has been fulfilled. When I say the circumstances which actually exist, I, of course, imply that

those circumstances, in so far as they involve delay, have not been caused or contributed to by the consignee.”

Pickavance concludes that a reasonable time to complete “should not so much be based upon ‘circumstances beyond the Contractor’s control’ but along the line taken by Lord Herschell in *Pantland Hick*. That is, by subtracting from the time actually taken to execute, circumstances expressly or impliedly within the Contractor’s control that have caused or contributed to the delay to completion. Accordingly, if the risk structure falls, then it would appear to be appropriate that the onus of proving a reasonable period to complete should lie with the Employer.”

Likewise, Oon (2003) argues that defining what is a reasonable time to finish the works is a question of fact, not law. It should take into consideration all the relevant factors and circumstances, “objectively assessed”. He believes that what constitutes a reasonable time has to be contemplated in relation to the circumstances which existed at the time when the contract obligations are performed while omitting the circumstances which are under the control of the party performing those obligations, normally the Contractor.

Eggleston (2009) considers that the question of what a reasonable time in time-at-large situations is depends on the circumstances of each case. In general, his guidance relies on the House of Lords’ ruling in the case of *Pantland Hick v. Raymond and Reid* where it was “invariably been held that the party upon whom it is incumbent duly fulfills his obligations, notwithstanding protracted delay, so long as such delay is attributable to causes beyond his control and he has neither acted negligently nor unreasonably.” Similarly, in the case of *British Steel Corporation v. Cleveland Bridge and Engineering Co. Ltd* (1984), the judge decided that a reasonable time to complete

the works should depend on the actual circumstances which existed at the time when the contractual services were performed, but excluding circumstances which were under the Contractor's control.

However, Eggleston affirms that an uncertainty remains as to whether the correct approach to assess a reasonable time puts the time actually taken under examination or whether the mission is to draw a theoretical time allowance while considering all the circumstances. Therefore, the burden of proof rests on the asserting party. In other words, the Contractor would have to prove that the time he took to finish the works was reasonable, whereas the Employer would have to show that the time taken was unreasonable.

He then lists few factors that are relevant to the process of computing a reasonable time such as the conditions that would be covered in an EoT provision of formal contracts, like extra works, exceptional weather, strikes etc. He also specifies that even with the absence of a formal contract, it might be appropriate to look at several factors such as the production capability of the Contractor, his management and financial resources, and his other contractual commitments.

For instance, Eggleston discusses the factor of urgency and expedition demonstrated by the Employer in the case of *Astea v. Time Group* (2003). The case considers whether Astea, a supplier of computer software failed to complete within a reasonable time in a contract with Time Group in which there was no completion date specified. Astea argued that its obligation was to finish within a time that is reasonable considering the relevant circumstances at the time, whereas Time adopted the view that a reasonable time should have been assessed by reference to what could have been achieved with due expedition and not by reference to the time actually taken.

The judge explained: “The distinction between these two approaches seemed to be that Mr Hossain (for Time) in effect was contending that Astea was bound to complete the Services as fast as humanly or technically possible, subject only to being excused in respect of delays over which it had no control, while Mr. Kinsky (for Astea) sought to persuade me that the question was not so much how fast the Services could have been performed by Astea had it chosen to allocate to doing so the greatest possible resources and to maintain them for as long as necessary, but rather, considering all of the circumstances, how long, as things turned out, it was reasonable for Astea to take.”

Eggleston further scrutinized this case by analogy to *Pantland Hick v. Raymond & Reid* (1893) previously discussed with Pickavance. He reported the judge’s statements where he explained that the opposing parties Astea and Time Group based their beliefs on the well-known decision of the House of lords in the shipping case. That is, the appellant’s contention is that the process of the cargo discharge and providing the required labor falls under the respondent’s (the consignee’s) responsibilities. In addition to this, the question would be what time would have been required for the discharge of the vessel under ordinary circumstances.

The respondents, on the contrary, considered that the existing circumstances were characterized as extraordinary. Consequently, they believed that the question was whether the time taken to complete the works was reasonable given the existing, and not the typical ordinary, circumstances. As for the judge, it then appeared to him that the only sound principle to adopt in *Astea v. Time Group* is that a “reasonable time” should depend on the circumstances that actually exist. As already mentioned in the case of *Pantland Hick V. Raymond and Reid*, if the consignee discharged the cargo while taking into account the relevant circumstances which in so far as they involve

delay, have not been caused or contributed by them, they would be satisfying their obligation. Thus, by analogy, it was ruled that no breach was committed by Astea since they have not caused any delay in fulfilling their duties.

2.11.2 Overall Reasonable Time Timeline

Jaber (2013) explains according to the timeline below that the overall reasonable time typically consists of the following consecutive periods:

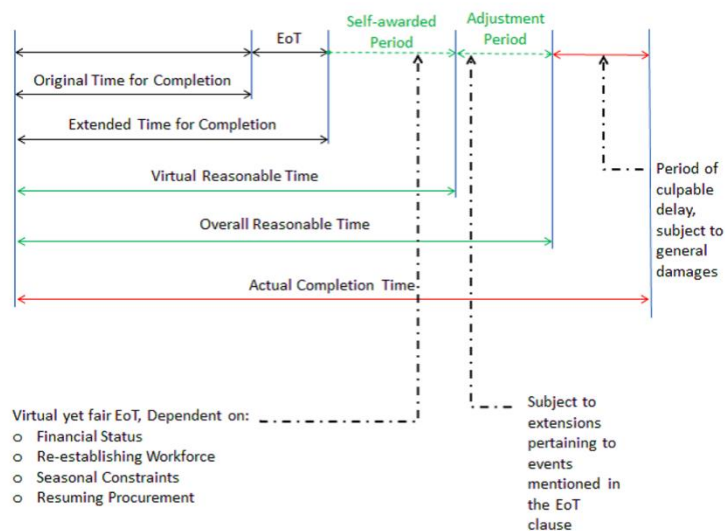


Figure 1 Overall Reasonable Time

1. The original Time for Completion;
2. Any awarded extension of time as requested by the Contractor under the EoT provision;
3. A self-awarded period that is computed based on factors such as
 - Financial status of the Contractor;
 - Re-establishing the Workforce;
 - Seasonal constraints;

- Resuming procurement

4. Adjustment period.

2.11.2.1 Self-Awarded Period

This period takes into consideration the current status of the Contractor, who may be experiencing the consequences of the preventive acts committed by the Employer. Such consequences can be manifested in a progress rate that is slower than the average expected one. The estimation of this period may include the extension of time that the Contractor originally needed (and requested) to recover from the initial breach of the Employer; or it could be a delay analysis that shows the amount of delay suffered from neutral events. This period depends on factors such as:

- Financial status:

The Contractor's credit facilities may have been distressed after the Employer's breach. Thus, his progress would be limited by the money available to him. The Contractor's financing capabilities may reach a point of exhaustion depending on the severity of the Employer's acts of prevention on hand, such as in the case of delayed payment(s).

- Seasonal constraints:

The delaying event that has caused declaring time to be at large may shift the expected completion date in a way that imposes on the Contractor the obligation to work in seasons that require special accommodations. On one hand, some seasonal weather conditions may reduce the Contractor's productivity and therefore extend the time to complete the Works. As the authors describe, "the Contractor's crew may have to work in extreme temperature –either high or low, or they may face high humidity or even limited daylight hours. These circumstances affect the Contractor's productivity rate

and hence the period required to finish the remaining works in reasonable time.” On the other hand, some other conditions, such as storms, can cause excusable delay and suspend the work altogether.

- Re-establishing workforce:

The events and their resulting circumstances which led to time being called at large may lead to the Contractor having to decrease the rate of the Works, or even being obligated to release Sub-Contractors. After declaring time to be at large, and subsequent to the progress rate slowing down or completely stopping on Site, the Contractor will have to remobilize his crew to the Site and re-engage Sub-Contractors. This process may be time consuming, and hence it must be accounted for in the time analysis when judging if the period taken by the Contractor to finish the works was reasonable or not.

- Resuming Procurement Plans:

Similar to remobilizing the workforce, the Contractor may face delays caused by the procedure of resuming procurement plans and thus naturally pushing further the new Time for Completion. As the authors explain, such process can be troublesome for the Contractor, “who may need to reopen letters of credit, or renegotiate with suppliers for new prices, and subsequently may fall back in the queue for fabrication, shipment and delivery plans.”

2.11.2.2 Adjustment Period

This period consists of the time extensions pertaining to the Employer’s risk events covered by the EoT provision and which normally grant the Contractor extensions of time. The delay analysis should demonstrate how the event on hand, that is out of the control of the Contractor, increases the reasonable time to complete the Works.

2.12 Schedule Administration

2.12.1 Programme as a Managing Tool

As already discussed, changes can be the seed to project delays and disputes. One of the underlying principles of all FIDIC forms of contract is the avoidance and reduction of the amount of change that occurs on construction projects. However, FIDIC recognizes that change is inevitable, even though many changes can generally be avoided through good planning. Once having accepted this fact, a management tool for time survey and time management is necessary, which is why the standard conditions of contract require the Contractor to provide a Programme.

Most construction contracts contain provisions for the Contractor to submit to the Employer a programme that shows the manner in which the Contractor plans to carry out and complete the works. In whatever form it is submitted, the programme is a crucial document for the effective management of most construction projects as it provides a tool by which actual job progress against a plan is monitored, thus, enabling an early alert of actual and potential delays which could adversely affect the project completion date. In fact, the courts are increasingly demanding clearer explanations of cause and effect and detailed time impact analysis in complex construction projects.

2.12.2 Contractor Under Continuous Obligation to Update Programme

According to Jaeger and Hök (2009), the Contractor is under the continuous obligation to proceed in accordance with the programme and to update it. In the case where he fails to do so, the Employer has the right to terminate the contract (see Sub-Clause 15.2, 1999 FIDIC) or to issue a request to expedite progress subject to Sub-Clause 8.6. If

actual progress is too slow to complete with Time for Completion and it has fallen behind the current programme, the Engineer may instruct the Contractor to submit a revised programme along with the required revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the agreed Time for Completion (Sub-Clause 8.6). Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may increase the working hours and/or the Contractor's Personnel and/or materials, at the risk and cost of the Contractor. In the case where these revised methods cause the Employer to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 pay these costs to the Employer, in addition to delay damages (if any) under Sub-Clause 8.7.

The conclusion behind this discussion is the following: "If the Contractor decides himself to submit a revised programme in order to comply with its primary obligation to complete the Works within Time for Completion, he does nothing else than to comply with its obligation under Sub-Clause 8.3 and he is not in breach of contract. The Employer will then not be entitled to claims for compensation under 8.6. On the contrary, a Contractor who ignores that actual progress is too slow until the Employer instructs him to submit a revised programme in accordance with Sub-Clause 8.6 must bear additional cost incurred by the Employer."

2.12.3 Programme in Time-at-Large Situations

Jaber (2013) concluded his research by raising the question of whether the Contractor is obligated to provide the Employer with an estimate of the period of time needed to finish the works or not, and if such estimation is binding or not. What seems rational is that "the Contractor shall provide the Employer with a preliminary schedule showing

how he plans to finish the remainder of the works. Such schedule reflects the existing position of the project and the current level of productivity that he can deliver.”

At the same time, this estimation may be dependent on some events or expectations to be fulfilled by the Employer. For instance, the Contractor’s progress when he declares time to be at large depends on the Employer meeting his financial demands. When the latter commits delayed payments, he hinders the progress of the Works on Site. Also, if there were an intervention by the Employer or disturbance by other Contractors in a way which obstructs access to certain parts of the Site, then the Contractor may submit his schedule based on him regaining access to such areas.

Finally, the author specified that this schedule is rather directional than mandatory or binding. In fact, he concluded that updated programmes are advantageous to both parties of the project by stating that “it can be of benefit if the Employer by basing his claim for general damages on it, provided that he met the conditions stated by the Contractor which were attached to the proposed schedule.”

CHAPTER 3

RAMIFICATIONS OF TIME-AT-LARGE CALLINGS

3.1 Preamble

This Chapter presents a critical reading of the guidelines offered by the literature on how to compute a reasonable time to complete the Works in time-at-large situations. It is evident that different references in the literature attempt to define the “circumstances” which govern the Works of the Contractor in time-at-large cases. In addition to the events listed under the standard conditions of contract (1999 FIDIC) which feed into this computation, this Chapter targets to aggregate and scrutinize the multiple definitions of circumstances which rule the computation of a reasonable time after the Contractor declares time to have become at large. In fact, the careful reading of several judges’ rulings revealed that there is a practically unanimous decision about these circumstances. The last section of this Chapter dwells on the origin or the source of such circumstances or realizations.

3.2 Significant Literature Synthesis

The section below elaborates on two important resources from the literature which help create a departing line for the goal of this research. On one hand, the model provided by Jaber (2013) sketches on a simple timeline all the important factors to be accounted for when computing a reasonable time to complete the Works in time-at-large situations. On the other hand, the paper written by Pickavence (2006) focuses on the duty or role of each party when it comes to such process.

3.2.1 Recap on the Overall Reasonable Time – Timeline

Jaber concluded that the overall reasonable time typically consists of the following consecutive periods:

- The original Time for Completion;
- Any awarded extension of time as requested by the Contractor under the extension of time (EoT) provision. This figure represents a clear benchmark to start from;

- A self-awarded period that is computed based on factors such as
 - Financial status of the Contractor;
 - Re-establishing the Workforce;
 - Seasonal constraints;
 - Resuming procurement

The self-awarded period is the time that the Contractor entitles himself to after suffering from certain repercussions due to the denial of the EoT request he put forward. Normally, such repercussions lead to the focal problem that is the disturbance, or in more severe cases, the exhaustion of the Contractor's financing capabilities, which will result in new effects pending to be resolved.

- An adjustment period based on extensions pertaining to events mentioned in the EoT clause (variation orders, differing site conditions, etc.).

Any additional period will be considered to be culpable delay under which the Employer can claim for general damages.

3.2.2 Computation of a Reasonable Time Based on the Status of the Risk Structure

The literature presents two schools of thought which affect the process of computing a reasonable time to complete the works in time-at-large callings. As identified by Pickavance (2006), he differentiates between the two positions below:

- When the risk structure remains enforceable after time being called at large;
- When the risk structure lapses.

3.2.2.1 Risk Structure Remaining Enforceable

Pickavance explains that when the risk structure remains enforceable, the computation of a reasonable time is the one adapted when normally extending the Time for Completion. That is, the burden of proof falls on the Contractor, by showing that the needed “overall reasonable time” covers the Employer’s risk events and any force majeure incidents. One may imply that there are two ways in which the Contractor can fulfill this duty:

1. By conducting a prospective analysis: The Contractor is proactive and produces updated schedules progressively as the project continues. In the case where the Contractor prospectively updates the schedule, he will be presenting with each update a new completion target date. That is, the final completion date and therefore the overall reasonable time will only be revealed when creating the last update. Producing a schedule in one attempt that illustrates the flow of the Works from the moment of declaring time to have become at large till the end of the project is impossible. This is due to the fact that new surfacing events, and the interrelationship between them and the repercussions of the initial (breaching) event subsequent to which the Contractor put forward an EoT request, cannot be predicted by the Contractor from the start.

2. By conducting a retrospective analysis when the Works are done. When adapting this route, the Contractor may resort to the AACE (the Association for the Advancement of Cost Engineering) protocol forensic delay analysis methods. However, the type of available information will greatly affect the results of such analyses; the presence of contemporaneous schedule updates will certainly enhance the accuracy of the method used, whereas the absence of such and the recreation of schedules based on collected records and data will definitely impose limitations on the correctness of the study.

3.2.2.2 Risk Structure Lapsing

Pickavance then continues to explain that when the risk structure fails, the Employer loses his right under the contract for the Contractor to prove his entitlement to additional time to complete the Works. The burden of proof shifts from the Contractor to the Employer, who will need to prove that the time taken by the Contractor to finish is unreasonable. That being said, the overall reasonable time would be the actual time taken to complete minus the time caused by events that fall under the control of the Contractor. The Employer will have to conduct a retrospective exercise (probably an As-Built But-For Analysis) either by directly using the schedule updates produced by the Contractor, or by recreating them in case they were not available. Such exercise consists of collapsing as-built schedules by removing the delaying events which are considered to be under the control of the Contractor.

3.2.3 Responsibility for Proving the Reasonableness of Time

On one hand, Jaber's model focuses on the nomenclature of the different components constituting the overall reasonable time, by attributing to the repercussions of the initial event the title of "virtual reasonable time" and then adding the events normally covered by the EoT clause to form the "overall reasonable time". This model, preliminary but fruitful, does not focus on the means allowing to compute the actual time for completion or suggest whose responsibility it is to prove the reasonableness or unreasonableness of the time taken to finish the Works in time-at-large callings.

Pickavence's research on the other hand, rather emphasizes on the roles of each party and whose duty will it be to show the reasonableness or unreasonableness of the time taken to finish the Works. He uses one term that is overall reasonable time including all of the events (Employer's risk events and force majeure) and excluding all delays that fall within the control of the Contractor. He does not elaborate on the repercussions of the circumstances that led to time being called at large, which by contrast are introduced by Jaber and fall under what he described as a "virtual reasonable time". Instead, he stresses throughout the several case studies he presented, on the importance of defining what kind of circumstances will be surrounding the Contractor while he continues to perform his obligations to deliver the works. Thus, these two theoretical models offered by two different papers are considered to be complementary to one another. Nevertheless, a question arises from Pickavence's suggested framework, and that is, what makes a time risk structure enforceable or lapsing through a dispute?

3.3 Is the Contractual Structure Going to Remain in Place?

Technically, the Employer and the Contractor will never be on the same page when it comes to declaring time to have become at large in the first place. The Contractor could be in a position where he strongly believes that time is truly at large and that the time risk structure is not enforceable anymore, therefore annulling the right of the Employer to levy liquidated damages after the Time for Completion became non-binding (as previously mentioned in the literature by Fawzy and El-Adaway (2014), Chappell (2012), and Brawn (2012)). The Employer however can adopt his own stance that the risk structure is still enforceable, and that the Contractor is indeed culpable of delay for which he can recover liquidated damages.

Depending on the severity of the situation, the Contractor, after declaring time to have become at large, may decide whether to take the matter on hand to a third party and resort to resolution methods such as adjudication. The dispute can further escalate to a point where it can only be solved through arbitration. In other words, at the end of the road, it could be that the adjudicator or the arbitrator decides whether the time risk structure remains enforceable or lapses. Nonetheless, the question is whether the lapsing of the time risk structure leads to invalidating the whole contract, or its failure is restricted to the inoperability of selected Sub-Clauses, such as the provisions pertaining to the rate of progress (Sub-Clause 8.6, which may be rendered inoperable in time-at-large situations according to the 1999 FIDIC guide), and liquidated damages (as explained in the literature).

In his book about global claims in construction, Haidar (2011) explains the various reasons which could lead to vitiating a construction contract. Such causes include:

- **Misrepresentation:** Where a party to contract commits a fraudulent misrepresentation to another party, such misrepresentation can rescind the contract. Rescinding a contract means to reset the positions of the parties back into what they were before the contract was made.

- **Mistake:** A mistake in law must be of fact in order to be operative. The occurrence of a mistake also allows the parties to rescind a contract.

- **Frustration:** According to Haidar, “frustration of a contract occurs only where after the conclusion of the contract a fundamentally different situation has unexpectedly emerged.” The rise of a new set of circumstances may render the performance of the contract more difficult or costly than what was agreed upon when the parties signed the contract. The author then gives the example of an “abnormal” and “sudden” rise or fall in material prices or the failure of a particular source of supply that was arranged before, requiring the Contractor to obtain his materials from another more expensive source. But then Haidar specifies that these events do not normally lead to the frustration of a contract unless they are of a proportion to make the performance of the Contractor impossible. He concluded that the frustrating event “brings the contract to an end forthwith, without more and automatically.”

- **Duress:** Haidar defines Duress as “a means by which a person may be released from the obligations under a contract where unlawful threats have been made”.

In a commercial context, duress is considered to be a vitiating factor to the contract, precisely “where illegitimate pressure has been made that would affect a person’s

economic interests”. In construction, when the Employer withholds payments from the Contractor, the latter suffers from such duress, and therefore has the right to vitiate the contract.

3.3.2 Comparison with Time-at-Large Situations

Above are the multiple reasons that could lead to vitiate a contract between the Employer and the Contractor. Nevertheless, in a time-at-large situation, the circumstances are not harsh enough like the ones stated above to rescind the construction contract and thus for the risk structure to lapse. The properties or characteristics of time-at-large situations do not seem to match the conditions listed above.

When the Contractor declares time to have become at large, he may suffer from slower progress and several complications leading to disrupted work. However, typically, he does not encounter these obstacles as a result of any of the acts presented by Haidar. One can argue that the Contractor may experience extremely severe circumstances imposing some sort of frustration that is hindering him from performing his contractual obligations, and that such reason can give him the right to vitiate the contract. This is a debatable matter, since the Contractor may endure financial difficulties to different extents. He may be struggling with the project, but he may also be merely handling financial troubles which could be remedied. It is not necessary that such complications classify his experience as a true frustration, entitling him to rescind the contract with the Employer.

3.3.3 Clarifying Case Study 1

In *Rapid Building Group v. Ealing Family Housing* (1984), LLOYD LJ stated that: “Like Phillimore LJ in *Peak v. McKinney*, I was somewhat startled to be told in the course of the argument that if any part of the delay was caused by the Employer, no matter how slight, then the liquidated damages clause in the contract ... becomes inoperative. I can well understand how that must necessarily be so in a case in which the delay is indivisible and there is a dispute as to the extent of the Employer’s responsibility for that delay. But where there are, as it were, two separate and distinct periods of delay with two separate causes, and where the dispute relates only to one of those two causes, then it would seem to me just and convenient that the Employer should be able to claim liquidated damages in relation to the other period.”

The ruling of the judge on this case introduces the idea that the duration of the construction project should not be treated as one whole period while managing to solve the dispute on hand. Instead, it should be truncated according to the different causes of delay which may not be necessarily solely induced by one party to the contract.

3.3.4 Clarifying Case Study 2

The following case study *SMK Cabinets v Hili* (1984) presented by Pickavance, coupled with the previous one in this section, paves the way to the conclusion concerning the status of the risk structure in time-at-large situations. According to the author, “In *SMK Cabinets v. Hili*, whilst acknowledging that the prevention principle was grounded upon considerations of fairness and reasonableness, Brooking J concluded that the Employer’s act of prevention only served to prevent the Employer from taking liquidated damages that accrued after the Employer’s breach. The absence

of a power to extend time for a variation given after the completion date had passed (being the act of prevention in this case) did not then upset the parties' contractual rights and obligations accruing prior to the date upon which the instruction was given."

Pickavance specifies that according to the facts of this case, the calculation of a reasonable time to complete the Works is the same as if the contract period had been properly extended through the EoT mechanism stipulated for in the contract. In other words, is it the duty of the Contractor to prove and show what time (additional to that which it initially contracted for) "it reasonably needs to cover the delaying effect of both the Employer's breach and those Employer's risks under the contract. In these circumstances, the only difference between a properly extended time for completion under the contract and a reasonable time to complete outside the contract, is that after the former the Employer is entitled to liquidated damages for delay. After the latter, on the other hand, it is no longer entitled to liquidated damages but must prove its actual losses and, in the *SMK Cabinets v. Hili* case, only the actual losses flowing from the breach."

Recalling the statement "The absence of a power to extend time for a variation given after the completion date had passed did not then upset the parties' contractual rights and obligations accruing prior to the date upon which the instruction was given.", it is becoming clearer to deduce the following: The absence of a contractual remedy that extends time for the Contractor in case of a directed change or variation is considered to be an act of prevention by the Employer. The message behind Pickavance's discussion is that even such breach does not annul the contractual rights of the parties accruing prior to the date upon which the instruction was given.

That being said, it seems that the duration of the project is split into two different periods:

1. The period before the variation was issued; the risk structure is still enforceable during this time; and
2. The period after the variation was instructed (after the preventive act of the Employer); the risk structure lapses for this period of time.

Pickavance further elaborates through the following example: “Say the Contractor is in culpable delay as a result of not being able to obtain sufficient labor, there are no other events and the only breach is a variation (instructed by the Employer). The Contractor would then only be entitled to the putative effect of the variation on the programme it was then following in addition to the contract period and no more, regardless of how long the works actually took to complete. In this case, the burden of proof as to entitlement rests with the Contractor.

However, it is thought that where the Employer has either not stipulated a date for completion, or by its own acts prevented the due date from being achieved, it should not be for the Contractor to prove what period of time to which it is entitled: it should be for the Employer to demonstrate that the time actually taken by the Contractor is excessive in all the circumstances.”

3.3.5 Conclusion

Based on the examples above, I can conclude that the time risk structure remains enforceable for the delay period that the Contractor is culpable of. In other words, the Employer would have the right to levy liquidated damages for this period, and the

Contractor would be responsible to show his new target date to complete the Works either by presenting a prospective or a retrospective time analysis.

Nevertheless, when the Employer is the one culpable of delay because of a preventive act he committed, then the risk structure would lapse. He cannot levy liquidated damages, and the burden of proof shifts to him; he is the one responsible to prove through a retrospective time analysis for this period, that the time taken by the Contractor to finish the Works is unreasonable.

It is important to note that the risk structure lapsing does not rise to the level of vitiating the contract. Instead, it means that some contractual provisions would no longer be applicable after the Employer prevented the Contractor from meeting the Time for Completion agreed upon.

3.4 Standard Conditions of Contract – Contractual Risk Structure Related to Time and Delays

When the time risk structure is still enforceable, the Contractor would need to account in his computation of a reasonable time to finish the Works, for the impacts of risk events that are treated by the contract. The relevant events or causes that constitute the basis of his time analysis, as well as the conditions that he could normally face and which would still could occur in time-at-large callings (such as delays from authorities, suspensions...) along with the obligations that arise from the Contractor's part in order to deal with them are filtered and summarized in the table below.

Table 1 1999 FIDIC Standard Conditions of Contract Relevant to the Computation of Reasonable Time

1999 FIDIC Sub-Clause	Important statements in the FIDIC Sub-Clause and FIDIC guide	Relevance to the computation of a reasonable time in time-at-large situations
8.1	<ul style="list-style-type: none"> • The Contractor has to proceed expeditiously. • The circumstances may give rise to practical difficulties in defining what constitutes “due expedition”, particularly if the Employer considers himself entitled to termination under Sub-Clause 15.2 (c). 	<ul style="list-style-type: none"> • The Contractor must progress with the Works expeditiously even when he declares time to be at large. • The Contractor and Employer might still disagree about the circumstances ruling the progress of the Contractor in this time-at-large setting.
8.3	<ul style="list-style-type: none"> • An experienced Contractor will always prepare an up-to-date programme. • The Employer’s personnel are stated to be entitled to rely upon the programme. • They may, for example, need to arrange for certain people to be available when particular parts of the Works are being executed, or when particular Contractor’s Documents are to be submitted for review. • More of them may need to be on Site during periods when the rate of progress is at its peak, especially if the Contractor’s personnel will be working multiple shifts, including night-work. 	<ul style="list-style-type: none"> • The Employer’s personnel will be able to arrange the necessary teams or crews for the Works by relying on the programme prepared by the Contractor. • The number and specialty of the staff depends on the progress rate of the Contractor, which should be continuously updated and documented in time-at-large situations.
	<ul style="list-style-type: none"> • The third paragraph requires the Contractor to give notice of probable future events which may adversely affect the Works, and particularly those which may increase the actual time required for completion. • Note that it is the actual time for completion which is referred to as being affected, not the Time for Completion to which the Contractor is entitled, so the obligation to notify includes events other than those listed in Sub-Clause 8.4. • Anticipation of future problems is an important part of project management. • Under the second and the last sentences of Sub-Clause 8.3, the Contractor should revise the 	<ul style="list-style-type: none"> • The Contractor still needs to notify the Employer of any future event that affects the Works. • Such events are ones that typically affect the actual time for completion, or in this case, affect the moving targeted date updated by the Contractor.

	<p>programme whenever the previous programme is inconsistent with:</p> <ul style="list-style-type: none"> - Actual progress (which may be either behind or ahead of the current version of the programme), - The Contractor’s obligations (accelerated completion would be consistent with such obligations), or - His stated intentions (for example, “the arrangements and methods... for the execution of the Works” mentioned in Sub-Clause 4.1) 	
<p>8.4</p>	<p>The Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor’s Claims] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause 10.1 [Taking Over of the Works and Sections] is or will be delayed by any of the following causes:</p> <ul style="list-style-type: none"> (a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [Variation Procedure] or other substantial change in the quantity of an item of work included in the Contract, (b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions, (c) exceptionally adverse climatic conditions, (d) unforeseeable shortages in the availability of personnel or Goods caused by epidemic or governmental actions, or (e) any delay 	<ul style="list-style-type: none"> • Sub-Clause 8.4 indicates the events which typically grant the Contractor an extension of time. In time-at-large situations, the Contractor is still entitled to stretch the Time for Completion in the case of occurrence of any of the events listed in this provision.
	<p>Guide:</p> <ul style="list-style-type: none"> • Under CONS or P&DB, Sub-Clause 8.4 (c) entitles the Contractor to an extension of time for climatic conditions which are “exceptionally adverse”. In order to establish whether such climatic conditions occurred, it may be appropriate to compare the adverse climatic conditions with the frequency with which events of similar adversity have previously occurred at or near the Site. An exceptional degree of adversity might, for example, be regarded as one which has a probability of occurrence of four or five times the Time for Completion of the Works (for example, once every eight to ten years for a two-year contract). 	<ul style="list-style-type: none"> • The conditions which make a climatic condition “adverse” also apply in time-at-large situations.

	<ul style="list-style-type: none"> • If the Engineer (under CONS or P&DB) or Employer (EPCT) fails to determine extensions of time in accordance with Sub-Clause 8.4 and 20.1: <ul style="list-style-type: none"> - there would thereafter be no “Time for Completion” (Time is said to be at large), - the Contract would be construed accordingly (Sub-Clause 8.6 may be inapplicable, for example), and - the Contractor’s obligation would be to complete within a time which was reasonable in all the circumstances. 	<ul style="list-style-type: none"> • This part briefly states that when time is declared to be at large as result of the non-action of the Employer or the Engineer in accordance with Sub-Clause 8.4 and 20.1, the Contractor is supposed to complete the Works within a time that is reasonable in all the circumstances.
8.5	<p>If the following conditions apply, namely:</p> <ul style="list-style-type: none"> • The Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country, • These authorities delay or disrupt the Contractor’s work, and • The delay or disruption was Unforeseeable then this delay or disruption will be considered as a cause of delay under sub-paragraph (b) of Sub-Clause 8.4 [Extension of Time for Completion]. <p>FIDIC Guide:</p> <ul style="list-style-type: none"> • This Sub-Clause, like Sub-Clause 8.4, makes no mention of the financial consequences, because they would depend upon the particular circumstances. 	<ul style="list-style-type: none"> • Any delay caused by authorities entitle the Contractor to additional time to complete the Works. • The financial status of the Contractor affecting his progress on Site depends on the particular circumstances prevailing in the time-at-large situation.
8.9	<p>If the Contractor suffers delay and/or incurs Cost from complying with the Engineer’s instructions under Sub-Clause 8.8 [Suspension of Work] and/or from resuming the work, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor’s Claims] to:</p> <ul style="list-style-type: none"> • An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and • Payment of any such Cost, which shall be included in the Contract Price. <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>	<ul style="list-style-type: none"> • The Contractor has the right to show how the effect of any instructed suspension which causes him delay pushes the targeted completion date. • He would still need to follow the procedure and the notice requirements described in the Sub-Clause.

	<p>FIDIC Guide:</p> <ul style="list-style-type: none"> • This Sub-Clause sets out the procedure to deal with a suspension which is not due to the Contractor’s shortcomings. Firstly, he gives notice to the Engineer or the Employer. • He should do so as soon as possible after receipt of the instruction to suspend, making reference to Sub-Clauses 8.9 and 20.1. • The Contractor is not entitled to an extension of time for a delay, and/or to payment of a Cost: <ul style="list-style-type: none"> - if the suspension is due to a cause which was attributable to or the responsibility of the Contractor, and of which the Contractor was so notified under Sub-Clause 8.8, - in respect of the making good of any deterioration, defect or loss caused by the Contractor’s faulty design, workmanship or materials, or - which was due to the Contractor’s failure to protect, store or secure in accordance with Sub-Clause 8.8. 	
<p>8.11</p>	<p>If the suspension under Sub-Clause 8.8 [Suspension of Work] has continued for more than 84 days, the Contractor may request the Engineer’s permission to proceed. If the Engineer does not give permission within 28 days after being requested to do so, the Contractor may, by giving notice to the Engineer, treat the suspension as an omission under Clause 13 [Variations and Adjustments] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [Termination by Contractor].</p> <p>FIDIC Guide:</p> <ul style="list-style-type: none"> • If a twelve week suspension is not due to the Contractor’s shortcomings, he may request permission to proceed. • If no permission is given, he may give notice as described, for which no time limit is specified. • Under the applicable Laws, delay in giving notice may be construed as waiving entitlements under this Sub-Clause. 	<ul style="list-style-type: none"> • In a time-at-large situation, the Contractor may still opt to terminate when the suspension instructed by the Employer affecting his progress lasts for more than 84 days without getting a permission to proceed with the works. Such action requires the Contractor’s compliance with notice requirements.

3.5 Circumstances Underlying Time Reasonableness

The events and conditions previously listed in the table will be dealt with under a certain setting of circumstances, which are likely to stem from the breaching event that led to time being called at large. The occurrence of any of the Employer's risk events may aggravate the existing circumstances and may even create a new set of conditions governing the progress of the Contractor.

3.5.1 Definitions Offered for Circumstances

In order to attribute a precise definition to these "circumstances" shaping the work of the Contractor, the table below presents the judges' statements for four case studies which were earlier elaborated in the literature. In addition to this, the table documents the description of such circumstances as portrayed in a paper by Oon (2003) and the FIDIC standard conditions of contract as well. The purpose behind such exercise is to attempt to reach some directions on what kind of circumstances dictate the computation of a reasonable time.

Table 2 Defining Circumstances According to Different Sources

Source	Description	Definition of Circumstances
Pantland Hick v. Raymond & Reid (shipping case, 1893)	The appellant considered that an appropriate reasonable time was the extra period that would have been required as a result of the strike, in addition to the original contract period. The respondents (consignee of cargo) argued that a reasonable time would actually be what time was reasonable under the circumstances as they then were. Lord Herschell decided that “the only sound principle is that the ‘reasonable time’ should depend on the circumstances which actually exist.”	“the only sound principle is that the ‘reasonable time’ should depend on the circumstances which actually exist”.
British Steel Corporation v. Cleveland Bridge and Engineering Co. Ltd (1984)	The judge decided that a reasonable time to complete the works should depend on “the actual circumstances which existed at the time when the contractual services were performed, but excluding circumstances which were under the Contractor’s control.”	“the actual circumstances which existed at the time when the contractual services were performed but excluding circumstances which were under the Contractor’s control.”
Neodox Ltd v. Swinton and Pendlebury Borough Council (1985)	The obligation to compute a reasonable time “was a question of fact to be determined with reference to all the relevant circumstances of the observed case.”	“all the relevant circumstances of the observed case”
Astea v. Time Group (2009)	The appellant, Time Group, considered that the question would be what time would have been required for the discharge of the vessel under ordinary circumstances. The respondents, Astea, considered that the existing circumstances were characterized as extraordinary. It appeared to the judge to that the only sound principle to adopt in Astea v. Time Group is that a “reasonable time” should depend on the circumstances that actually exist.	“a reasonable time should depend on the circumstances that actually exist.”
Oon (2003)	The question of what is a reasonable time should take into consideration all the relevant factors and circumstances. He believes that what constitutes a reasonable time has to be contemplated in relation to “the	“the circumstances which existed at the time when the contract obligations are performed.”

	circumstances which existed at the time when the contract obligations are performed.”	
1999 FIDIC guide on Sub-Clause 8.4	If the Engineer (under CONS or P&DB) or Employer (EPCT) fails to determine extensions of time in accordance with Sub-Clause 8.4 and 20.1 there would thereafter be no “Time for Completion” (Time is said to be at large), the Contract would be construed accordingly (Sub-Clause 8.6 may be inapplicable, for example), and the Contractor’s obligation would be to complete within a time which was reasonable in all the circumstances.	“the Contractor’s obligation would be to complete within a time which was reasonable in all circumstances.”

It is evident that there is a consensus between the different case studies that what constitutes a reasonable time has to be contemplated in relation to the circumstances which existed at the time when the contractual obligations are performed. On one hand, in the case of *Neodox Ltd v. Swinton and Pendlebury Borough Council*, the judge’s decision seems to be the most general among the rest of the cases, stating that the obligation to compute a reasonable time depends on all the relevant circumstances of the observed case. On the other hand, both judges in the case of *Pantland Hick v. Raymond & Reid* (shipping case, 1893) and in the case of *Astea v. Time Group* (2009) decided that “the only sound principle is that the ‘reasonable time’ should depend on the circumstances which actually exist.” The judge’s decision in *British Steel Corporation v. Cleveland Bridge and Engineering Co. Ltd* (1984) added more precision to the assessment of Lord Herschell in *Pantland Hick v. Raymond & Reid*, specifying that the term “existing circumstances”, which other judges advocated, particularly designates the circumstances during which contractual obligations were performed but excluding circumstances which were under the Contractor’s control.

Oon's statement is quite inclusive of the judges' statements listed above, mentioning "all relevant circumstances and factors" and indicating that these are the conditions existing at the time where "contractual obligations are being performed."

The explanation provided by the 1999 FIDIC guide however is considered to be vague. The expression "all circumstances" is quite ambiguous for the complicated context of a time-at-large situation. The most logical interpretation would be that it is comprehensive of all the circumstances that the Contractor will be encountering when completing the Works and fulfilling his duties. Briefly, the common description deducted from the analysis above somehow resolves the problem or the question of referring to the "circumstances" governing the progress of the Contractor as well as their time setting.

Recalling Lord Herschell's full statement in the shipping case, he said "the only sound principle is that the 'reasonable time' should depend on the circumstances which actually exist. If the cargo has been taken with all reasonable dispatch under those circumstances, I think the obligation of the consignee has been fulfilled. When I say the circumstances which actually exist, I, of course, imply that those circumstances, in so far as they involve delay, have not been caused or contributed to by the consignee". We note here that the expression "contributed to" introduces some ambiguity when it comes to attributing to each circumstance the responsibility of a certain party. It might seem simple and straightforward to exclude all the circumstances that were caused by the Contractor. On the contrary, implementing this task to the conditions ruling the work of the Contractor can be quite challenging. For instance, the disturbance of the Contractor's financial capabilities, the focal problem discussed in the next part of this research, is a debatable realization, and deciding whether the actions or

the measures taken by the Contractor contributed to it or whether it is a resulting effect that completely and strictly falls under the responsibility of the Employer, is not a simple exercise.

3.5.2 Evolution of Circumstances

The circumstances which govern the computation of a reasonable time are, according to the previous section, the ones which exist at the time when the contract obligations are being performed. Nevertheless, the question of the origin of these circumstances remains unanswered in the available literature. Are the circumstances happening as the Contractor moves on with the Works traceable back to the original breaching event which led to time being called at large or to any of the earlier circumstances?

3.5.2.1 The Chance of Getting Financially Disturbed

After declaring time to have become at large, there could be two possible scenarios:

- The breaching (delaying) event is of the type that delays or ceases progress later on at a future point in time while the Contractor at the present moment is still making progress and getting revenues on accomplished work. A typical example of such event would be a variation order (V.O.).

- The breaching event already incurs delay to the Contractor, leading to disrupted work or a slower progress rate. In this case, the Contractor will not be making any progress on Site and therefore not getting a revenue on accomplished Works. In other terms, his account will not be replenished, and his financial resources will eventually start to drain, and potentially stretch out. This is the case where the Contractor faces a legitimate disruption to his work because he is prevented from

performing his contractual obligations. It could result from a late possession of site (at the beginning of the project) or of a certain zone (interim), delayed payment or non-payment by the Employer, and suspension.

After the Contractor declares time to have become at large, a concept that the Employer will never admit or support, he would be dealing with a new set of circumstances which affect his financing plans as explained above. This is due to the fact that he already incurred expenses by way of accommodating for the delay that resulted from the breaching act or incident that is out of his control, in the case where he was not granted an EoT (and therefore denied the recovery of his losses), or in the case where the act itself does not offer him any EoT according to the contract.

The diagram below demonstrates how the breaching event (or breaching cause, C_b) most likely generates several realizations (cause-effect links) which form the initial set of circumstances ruling the performance of the Contractor after declaring time to have become at large. This example depicts how a breaching act can incur delay right when it occurs. Other circumstances may rise at a later stage in the project from new emerging Employer's risk events and their interaction with the existing set of circumstances.

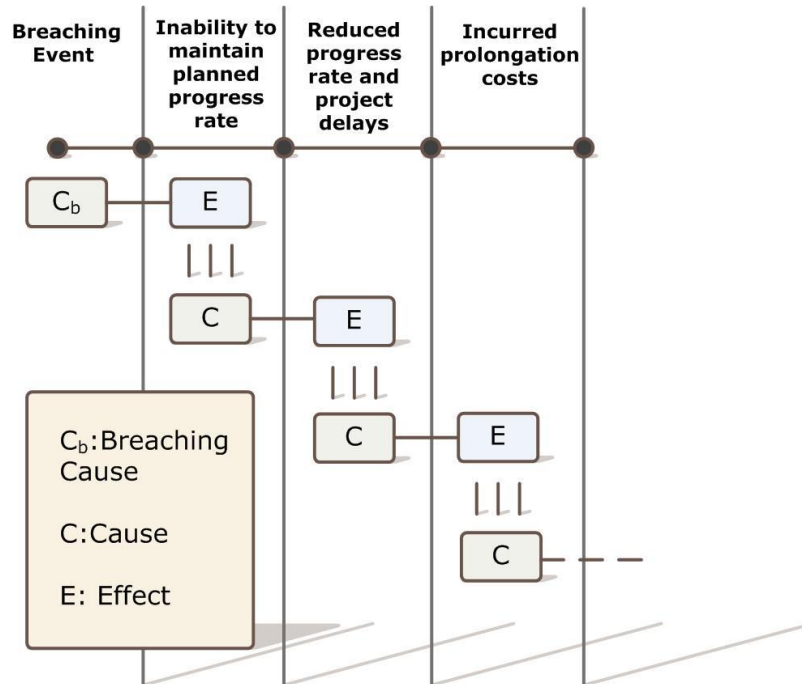


Figure 2 Cause-Effect Chain Resulting from Breaching Event

In this cause-effect chain emanating from the initial breaching event, there may be a point in time where the Contractor’s financial capabilities get distressed up to the extent of being exhausted. Such event is considered to be a detrimental condition, and which will most certainly be the seed to new upcoming cause-effect links, or realizations governing the performance of the Contractor. This diagram illustrates a simple introduction to the concept of “circumstances” contemplated in the computation of a reasonable time that is to be further clarified in the upcoming Chapters.

CHAPTER 4

SCHEDULE ADMINISTRATION

4.1 Computation of Reasonable Time: Revisiting

There are two schools of thought in the computation of a reasonable time:

- When the burden to prove a reasonable time falls on the Contractor:
 - The Contractor can update his schedules prospectively according to actual progress of the Works.
 - The Contractor can opt to another strategy and show that the time taken to finish the Works is reasonable by doing a retrospective analysis after completing the works. In this case, he would still need as-built schedules and records.
- When the burden of proof falls on the Employer:
 - The Employer would have to conduct a retrospective analysis to prove that the time taken by the Contractor to finish the Works is unreasonable. This analysis consists of illustrating all of the events and circumstances that are considered to be under the control of the Contractor and which stretched the time to complete the works. In this case, the Employer needs to have access to as-built programs and records to be able to carry on such exercise (As-Built But-For Analysis).

The second part of Chapter III clarified the notion of defining circumstances that govern the computation of a reasonable time, which is a core question and debatable problem in time-at-large callings. In conclusion of this discussion, the circumstances which control the process of calculating a reasonable time for the

Contractor to complete his Works are the ones which exist at the time when performing his contractual obligations. The question which arises at this stage is how accurately can the Contractor reflect the circumstances dictating his progress without contemporaneously documenting them as events and the way they impact his work activities through properly updated schedules?

4.2 Relevance of Schedule Administration

This Chapter aims to aggregate and underline all statements, both in the AACE International Recommended Practice Protocol and the standard conditions of contract in the 1999 FIDIC, which advocate the idea of the Contractor maintaining his obligation to produce schedule updates in time-at-large situations. This collection of principles and conditions will prove that upholding this duty will be to the advantage of both project parties, the Contractor and the Employer. On one hand, the indications in the AACE protocol are more technical and focus on how schedule updates exactly serve delay analysis methods, whereas the conditions in the FIDIC provide a general idea on how producing updates can spare the Contractor from having future or further complications with the Employer.

4.3 AACE Protocol

The AACE protocol proposes several methods of forensic delay analysis. The protocol does not discuss true prospective schedule analysis methods. **Prospective** analyses are performed in real-time prior to the delay event or in real-time. In other words, they consist of the analyst's best estimate of future events. A Prospective analysis occurs while the project is still underway and may not evolve into a forensic

context which is the core concentration of this protocol. **Retrospective** analyses are performed after the delay event has occurred and the consequential impacts are known. The timing may be soon after the delay event but prior to the completion of the overall project, or after the completion of the entire project.

4.3.1 Principles Advocating for Regular Schedule Updates

The goal behind the discussion below is to find the AACE principles which support the argument that the Contractor should maintain his contractual duty of producing schedule updates. These principles are narrowed down to the following list.

4.3.1.1 “Basic Premise and Assumptions, part e”

This part e, entitled “*No forensic schedule analysis method is exact,*” calls for the following: “*The level of accuracy of the answers produced by each method is a function of the quality of the data used therein, the accuracy of the assumptions, and the subjective judgments made by the forensic schedule analyst.*”

It is clear that the accuracy of the results of any delay analysis method highly depends on the quality of the input data, which is considered to be best when schedule updates were produced contemporaneously. In the case where information and assumptions are fed into the analysis after the completion of the project, the updates recreated would be greatly affected by the quality of such figures which aren't fixed or constant values, but rather variable and evolving with time.

4.3.1.2 Underlying Fundamentals and General Principles

A. Underlying Fundamentals

Part A generally states that ***“The critical path and float values of uncompleted work activities in CPM schedules change over time as a function of the progress (or lack of progress) on the critical and non-critical work paths in the schedule network. Only project circumstances that delay work that is critical when the circumstances occur extend the overall project. Thus, when quantifying actual project delay, the accuracy in quantification is increased when the impacts of potential causes of delay are evaluated within the context of the schedule in effect at the time when the impacts happen.”***

Based on the paragraph above, it is evident that when the impacts of any delaying event are prospectively evaluated at the time when the event itself happens, the Contractor will have a more accurate quantification of the delay and consequences likely to result from the breach or the event on hand. This is due to the fact that doing the exercise contemporaneously would be more comprehensive of all the conditions and assumptions that have to be incorporated in the analysis, and which can be incomplete or not as accurate when assessed retrospectively after the project is fully completed.

B. General Principles

This section in the protocol provides a set of principles which should be considered while conducting any forensic delay analysis method.

- Update Float Preferred Over Baseline Float

This sub-section calls for the following: ***“If validated, contemporaneous updates exist, relative float values for activities in those updates at the time the schedule activity was***

being performed are considered more reliable compared to relative float values in the baseline for those same activities.”

Briefly, the float values presented in schedule updates are more accurate and reliable than the ones initially shown in the pre-planned original schedule, since the activities and their sequence are most likely to evolve with the changing circumstances that are bound to happen.

- Sub-Network Float Values

The sub-section entitled “Sub-Network Float Values” states that: *“What is critical in a network model may not be critical when a part of that network is evaluated on its own, and vice versa.”* The AACE further explains that *“The practical implication of this rule is that what is considered critical to a Sub-Contractor in performing its own scope of work may not be critical in the master project network. Similarly, a schedule activity on the critical path of the general Contractor’s master schedule may carry float on a Sub-Contractor’s sub-network when considered on its own.”*

One can conclude that any change in the Sub-Contractor’s schedule may affect the General Contractor’s overall schedule, especially when their work activities are interdependent. Hence, it is important to maintain and control a continuous production of schedule updates for the Sub-Contractor’s work in order to generate precise and correct schedules of the Contractor.

- All available schedules must be considered

As for the selected last paragraph of Section B, it states the following: *“Regardless of the method selected for analysis, all available sources of planning and schedule data created during the project, including but not limited to, various versions of baselines,*

updates and as-builts, should be examined and considered, even if they are not directly used for the analysis.”

When delaying events occur, the original baseline schedule and assumptions may change. These modifications will have an impact on the flow of the Works, and such effects should be reflected in the schedule updates. Factors which could be modified include financial plans, resource related plans, availability of Sub-Contractor company, sub-network changes discussed above... Thus, any delay analysis method will require the examination of all versions of schedules, from baseline schedules to updated ones in order to have an evaluation that is comprehensive of all the necessary adjustments.

4.3.1.3 As-built Schedules Section of Protocol

This division explains how to construct as-built schedules through the following methods: *“There are two different approaches to creating an as-built schedule. The first one is to create an as-built schedule from scratch using various types of progress records, for example, the daily log. The resulting schedule is defined by and potentially constrained by the level of detail and the scope of information available in the project records used to reconstruct the as-built. The best source for as-built data is a continuous daily history of events on the project developed and maintained by persons working on the project. Traditionally, there are Contractor’s daily reports, but there may also be owner’s daily inspection reports or a scheduler’s daily progress report. These daily records can be augmented as required by other primary sources such as certified payrolls and timesheets, completion certificates, inspection reports, incident reports, and start-up reports. Secondary sources such as weekly meeting*

minutes or progress reports can also provide insight into what happened. All of these types of data are useful in producing an accurate as-built schedule, which is basically the last update up to the considered point in time.

The second approach is to adopt the fully progressed update as the basic as-built schedule and modify or augment it as needed. Often a fully progressed update is not available and the analyst must complete the stat using of the schedule using progress records. A subset of this approach is to create a fully progressed baseline schedule from progress records. In implementing this approach, it is important to understand the exact scope of the activities in the baseline schedule before verifying or researching the actual start and finish dates.”

The two paragraphs above list all the types of data and records (payrolls, timesheets, completion certificates, inspection reports, incident reports, and start-up reports, weekly meeting minutes, progress reports ...) which could help in producing as-built schedules by providing the actual start and finish dates for work activities. Therefore, the level of detail and accuracy in these records dictates the quality of the produced schedule updates. Referring to all these various sources in order to create as-built schedules is definitely a more practicable and accurate exercise when done contemporaneously rather than at the end of the project. The produced as-built schedules constitute a crucial input to the time analysis conducted by the Contractor or the Employer when trying to prove whether the time taken to finish the Works was reasonable or not. The table below presents a summary of this part of the research.

Table 3 Relevant AACE Protocol Principles and their Implications

Principles	Statement of Importance	Implication
<p>Basic Premise and Assumptions, part e: e. No forensic schedule analysis method is exact. The level of accuracy of the answers produced by each method is a function of the quality of the data used therein, the accuracy of the assumptions, and the subjective judgments made by the forensic schedule analyst.</p>	<p>The level of accuracy of the answers produced by each method is a function of the quality of the data used therein, the accuracy of the assumptions, and the subjective judgments made by the forensic schedule analyst.</p>	<ul style="list-style-type: none"> • Prospectively produced schedules are more reliable than retrospectively created ones. • They rely on more accurate data and assumptions contemplated at the time when the delaying event occurs (or as the circumstances are unfolding).
<p>Underlying Fundamentals and General Principles</p> <p>Underlying Fundamentals: The critical path and float values of uncompleted work activities in CPM schedules change over time as a function of the progress (or lack of progress) on the critical and non-critical work paths in the schedule network. Only project circumstances that delay work that is critical when the circumstances occur extend the overall project. Thus, when quantifying actual project delay, the accuracy in quantification is increased when the impacts of potential causes of delay are evaluated within the context of the schedule in effect at the time when the impacts happen</p>	<p>Thus, when quantifying actual project delay, the accuracy in quantification is increased when the impacts of potential causes of delay are evaluated within the context of the schedule in effect at the time when the impacts happen.</p>	<ul style="list-style-type: none"> - Doing the delay analysis contemporaneously (at the time when the event or breach occurs) would be more accurate. - Such exercise would be inclusive of all the differing conditions and assumptions that must be incorporated in the analysis.

General Principles		
<p>Update Float Preferred Over Baseline Float</p> <p>If validated, contemporaneous updates exist, relative float values for activities in those updates at the time the schedule activity was being performed are considered more reliable compared to relative float values in the baseline for those same activities.”</p>	<p>If validated, contemporaneous updates exist, relative float values for activities in those updates at the time the schedule activity was being performed are considered more reliable compared to relative float values in the baseline for those same activities.</p>	<ul style="list-style-type: none"> • The float values presented in schedule updates are more accurate and reliable than the ones initially shown in the pre-planned original schedule. • Schedule updates are thus needed for exact float values.
<p>Sub-Network Float Values</p> <p>What is critical in a network model may not be critical when a part of that network is evaluated on its own, and vice versa. The practical implication of this rule is that what is considered critical to a Sub-Contractor in performing its own scope of work may not be critical in the master project network. Similarly, a schedule activity on the critical path of the general Contractor’s master schedule may carry float on a Sub-Contractor’s sub-network when considered on its own.</p>	<p>The practical implication of this rule is that what is considered critical to a Sub-Contractor in performing its own scope of work may not be critical in the master project network. Similarly, a schedule activity on the critical path of the general Contractor’s master schedule may carry float on a Sub-Contractor’s sub-network when considered on its own.</p>	<p>Representing the flow of Sub-Contractor work as well as any potential change is crucial since it may affect the overall schedule. Hence the work activities related to sub-Contractors should be updated.</p>
<p>All available schedules must be considered</p> <p>Regardless of the method selected for analysis, all available sources of</p>	<p>Regardless of the method selected for analysis, all available sources of planning and schedule data created during the project, including but not</p>	<ul style="list-style-type: none"> • The original baseline and assumptions may change. • The impact on the flow of the Works, and such consequences should be

<p>planning and schedule data created during the project, including but not limited to, various versions of baselines, updates and as-builts, should be examined and considered, even if they are not directly used for the analysis.</p>	<p>limited to, various versions of baselines, updates and as-builts, should be examined and considered, even if they are not directly used for the analysis.</p>	<p>reflected in the schedule updates.</p> <ul style="list-style-type: none"> • Factors which could be modified include: <ul style="list-style-type: none"> - financial plans, - resource related plans, - availability of Sub-Contractor company, - sub-network changes discussed above...) • It is fundamental to examine all versions of schedules, from baseline schedules to updated ones <ul style="list-style-type: none"> - As a result, the evaluation would be comprehensive of all the necessary adjustments.
<p>As-built schedules</p> <p>The best source for as-built data is a continuous daily history of events on the project developed and maintained by persons working on the project. Traditionally, there are Contractor's daily reports, but there may also be owner's daily inspection reports or a scheduler's daily progress report. These daily records can be augmented as required by other primary sources such as certified payrolls and timesheets, completion certificates, inspection reports, incident reports, and start-up reports. Secondary sources can also provide insight into what happened.</p>	<p>The best source for as-built data is a continuous daily history of events on the project developed and maintained by persons working on the project</p>	<p>The Contractor and the Employer's personnel should be able to keep track of all the changes happening to the network activities in order to construct as-built schedules that are as accurate as possible.</p>

4.3.2 Delay Analysis Methods

4.3.2.1 Overview

The following section briefly explains the different methods of delay analysis in the AACE protocol.

I. Observational

The observational method consists of analyzing through examining a schedule, by itself or in comparison with another, without applying any changes to the schedule to simulate any specific scenario.

- **Static Logic Observation**

A specific subset of the observational method, the static logic variation compares an as-planned set of network logic to the as-built state of the same network.

- Gross Mode or Periodic Mode

On one hand, the implementation of the gross mode to the static logic method considers the entire project duration as one whole analysis period without any segmentation. On the other hand, the implementation of the periodic mode breaks the project duration into two or more segments in order to run specific analysis that focus on each segment. Since this is an application of the static logic method, the segmented periods are *not* associated with any changes in logic that may have occurred contemporaneously with these project periods.

- **Dynamic Logic Observation**

In contrast with the static logic variation, the dynamic logic variation entails the use of schedule updates whose network logic may differ from the baseline and from each other. This variation considers the actual changes in logic that occurred during the project.

- Contemporaneous / As-Is or Contemporaneous / Split

Both implementations need schedule updates that were prepared contemporaneously during the project. The as-is implementation evaluates the differences between successive updates in their unaltered state, whereas the split implementation bifurcates each update into the pure progress and the non-progress revisions such as logic changes. The purpose behind the bifurcation is to isolate the schedule slippage (or recovery) caused solely by work progress based on existing logic during the update period from that caused by non-progress revisions newly inserted (but not necessarily implemented) in the schedule update.

- Modified or Recreated

This pair also involves the observation of updates. The modified implementation requires the extensive modification of the contemporaneous updates, while the recreated implementation is about the recreation of entire updates in case no contemporaneous updates exist in the first place.

II. Modeled

Unlike the observational set of methods, the modeled method requires an intervention by the analyst beyond mere observation. In fact, the analyst inserts or extracts activities representing delay events into or from a CPM network and compares the calculated results of the “before” and “after” states.

- **Additive Modeling**

The additive modeling method consists of comparing two schedules by adding schedule elements (i.e. delays) to the first schedule for the purpose of modeling a certain scenario.

- **Subtractive Modeling**

For the same purpose of creating a scenario, the subtractive modeling method consists of comparing a CPM schedule with another one that the analyst has created by subtracting schedule elements (i.e. delays) from the first schedule.

- **Single Base, Simulation or Multi-Base, Simulation**

This basic implementation pair occurs under the additive and the subtractive modeling methods. The distinction is whether when the modeling (either additive or subtractive) is performed, the delay activities are added to or extracted from a single CPM network or multiple CPM networks.

For example, a modeled analysis that adds delays to a single baseline CPM schedule is a single base implementation of the additive method, whereas one where delays are extracted from several as-built simulations is a multi-base simulation implementation of the subtractive method.

A single base additive modeling method is typically called the impacted as-planned. Similarly, the single simulation subtractive method is called the

collapsed as-built. The multi-base, additive simulation variation is referred to as a window analysis.

III. Specific Implementation

• Fixed Periods vs. Variable Periods / Grouped Periods

These specific implementations are the two possible choices for segmentation under all basic implementations except gross mode and the single base / simulation basic implementations. They are not available under the gross mode because the absence of segmentation is the distinguishing feature of the basic gross mode. They are not available under the single base / simulation basic implementation because segmentation assumes a change in network logic for each segment; the single base simulation uses only one set of network logic for the model.

In the fixed period specific implementation, the periods are fixed in date and duration by the data dates used for the contemporaneous schedule updates, usually in regular periods such as monthly. Each update period is analyzed. The act of grouping the segments for summarization after each segment is analyzed is called blocking.

The variable period/grouped period specific implementation establishes analysis periods other than the update periods established during the project by the submission of regular schedule updates. The grouped period implementation groups together the pre-established update periods while the variable period implementation establishes new periods whose lines of demarcation may not coincide with the data dates used in the pre-established periods and/or which can be determined by changes in the critical path or by the issuance of revised or recovery baseline schedules. This

implementation is one of the primary distinguishing features of the variable period analysis method.

- **Global (Insertion or Extraction) vs. Stepped (Insertion or Extraction)**

This specific implementation pair occurs under the single base, simulation basic implementation, which in turn occurs under the additive modeling and the subtractive modeling specific methods. Under the global implementation delays are either inserted or extracted all at once, while under the stepped implementation, the insertion or the extraction is performed sequentially (individually or grouped).

Some of these forensic delay analysis methods require having schedule updates, and some others can be achieved by merely having as-built programs or records. The next section outlines all of the delay analysis techniques which depend on continuously updated schedules.

4.3.2.2 Forensic Delay Analysis Methods Requiring Updated Schedules

The following sections lists the delay analysis methods which rely on schedule updates, as well as the disadvantages of having to recreate them at the end of the project.

- **Observational / Dynamic / Contemporaneous As-Is (MIP 3.3, MIP being Method Implementation Protocols)**

MIP 3.3 is a retrospective technique that relies on forward-looking calculations made at the times the updates were prepared. That is, it primarily uses information to the right of the updates' data dates. Because the method uses schedule updates whose logic may have changed from the previous updates as well as from the baseline, it is considered a dynamic logic method.

It is labeled contemporaneous because the updates it relies on were prepared contemporaneously with the project execution as opposed to reconstructed after-the-fact as in MIP 3.5.

- Observational / Dynamic / Contemporaneous Split (MIP 3.4)

MIP 3.4 is identical to MIP 3.3 in all respects except that for each update an intermediate file is created between the current update and the previous update consisting of progress information without any non-progress revisions. The “split” label distinguishes this method from MIP 3.3 by the fact that the updates are evaluated after the bifurcation process that splits the pure progress update from the non-progress revisions.

- Observational / Dynamic / Modified or Recreated (MIP 3.5)

MIP 3.5 looks like MIPs 3.3 or 3.4 except that it uses contemporaneous schedule updates that were extensively modified or ‘updates’ that were completely recreated. MIP 3.5 is usually implemented when contemporaneous updates are not available or never existed. The fact that it does not use the contemporaneous updates places this method in a fundamentally different category from the standpoint of the nature of source input data.

The section explaining the caveats in using the minimum protocol (or conditions requiring enhanced protocols or the disadvantages of using MIP 3.5) is proof of how crucial it is to progressively produce revised contemporaneous schedule updates as the works proceed. It specifically states that:

- “Where updates are recreated, it is perceived to be an after-the-fact analysis that fails to consider logic changes that would have been incorporated in view of contemporaneous project circumstances.

- To be credible, recreated schedule updates must be accurate both in reported progress to date and in the network's representation of contemporaneous means, and consistent with other project documentation during the update periods reflecting the real-time perspective of project conditions, the state of mind, and knowledge of the project participants.

- It is relatively time consuming and therefore costly to implement compared to MIPs 3.3 or 3.4 because it requires substantial support to justify the modifications or the reconstruction.

- The analyst should anticipate significantly more scrutiny and challenges regarding the reliability of the data and logic.”

• **Modeled / Additive / Single Base (MIP 3.6)**

MIP 3.6 is a modeled technique since it relies on a simulation of a scenario based on a CPM model. The simulation consists of the insertion or addition of activities representing delays or changes into a network analysis model representing a plan to determine the hypothetical impact of those inserted activities to the network. Hence, it is an additive model. In the case of a time impact analysis (TIA), which is a technique falling under this category of delay analysis, the last schedule update is needed.

• **Modeled / Additive / Multiple Base (MIP 3.7)**

MIP 3.7 is a multiple base method, distinguished from MIP 3.6 as a single base method. The additive simulation is performed on multiple network analysis models representing the plan, typically an update schedule, contemporaneous, modified contemporaneous, or recreated. Each base model creates a period of analysis that confines the quantification of delay impact.

- **Modeled / Subtractive / Multiple Base (MIP 3.9)**

MIP 3.9 is a multiple base method, distinguished from MIP 3.8 which is a single base method. The subtractive simulation is performed on multiple network analysis models representing the as-built schedule, typically updated schedules, which may include contemporaneous, modified contemporaneous, or recreated schedules.

4.4 The Standard Conditions of Contract: 1999 FIDIC

The next stage is a pillar in this research. It consists of detecting and discussing the Sub-Clauses in the FIDIC which are related to the Time for Completion of the project in order to get a grip of all the contractual requirements and eventualities which provide some guidance on how to deal with the time-at-large situation on hand.

4.4.1 Sub-Clause 8.3 – The Programme

Sub-Clause 8.3 entails the obligations pertaining to the programme submitted by the Contractor to the Employer/Engineer. It states that the Contractor shall submit a detailed programme within 28 days after receiving the notice under Sub-Clause 8.1 concerning the commencement date. However, and most importantly, it states that ***“the Contractor shall also submit a revised program whenever the previous program is inconsistent with actual progress or with the Contractor’s obligations.”***

The Sub-Clause then lists the required features of submitted programme. Moreover, the third paragraph indicates that ***“the Contractor is still responsible for giving notice to the Engineer of any future event (for example variation orders) that will delay the “expected time for completion” or increase the Contract Price”***. This implies that the Contractor is under the continuous obligation to include all new

surfacing events or realizations in updated schedules with new estimated completion dates. In addition to this, the Sub-Clause states that ***“if, at any time, the Engineer gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor’s stated intentions, the Contractor shall submit a revised programme to the Engineer in accordance with this Sub-Clause.”***

The Employer’s personnel are stated to be entitled to rely upon the programme. The FIDIC guide explains that they may, for example, need to arrange for certain people to be available when particular parts of the Works are being executed, or when particular Contractor’s Documents are to be submitted for review. More of them may need to be on Site during periods when the rate of progress is at its peak, especially if the Contractor’s personnel will be working multiple shifts, including night-work.

The third paragraph of Sub-Clause 8.3 requires the Contractor ***“to give notice of probable future events which may adversely affect the Works, and particularly those which may increase the actual time required for completion.”*** The FIDIC guide points out to the fact that it is the actual time for completion which is referred to as being affected, not the Time for Completion to which the Contractor is entitled, so the obligation to notify includes events other than those listed in Sub-Clause 8.4. In fact, anticipation of future problems is an important part of project management. Making the reference in this paragraph to the “actual Time for Completion” instead of “Time for Completion” hints to the possibility of dealing with situations that deviate from the original plan, and which could be a time-at-large calling.

The guide adds for this Sub-Clause “that an experienced Contractor will always prepare an up-to-date programme,” and further clarifies that under the second

and the last sentences of Sub-Clause 8.3, *“the Contractor should revise the programme whenever the previous programme is inconsistent with:*

- *Actual progress (which may be either behind or ahead of the current version of the programme);*

- *The Contractor’s obligations (accelerated completion would be consistent with such obligations), or*

- *His stated intentions (for example, “the arrangements and methods... for the execution of the Works” mentioned in Sub-Clause 4.1)”*

4.4.2 Sub-Clause 8.6 – Rate of progress

Sub-Clause 8.6 states that if actual progress is too slow and behind the programme under 8.3 for a reason that is not listed under the Time Extension provision in the contract, then the Engineer may instruct the Contractor to prepare and submit a revised programme and revised methods proposed to expedite progress and meet the Time for Completion. However, if these methods cause the Employer additional costs, then the Contractor shall subject to Sub-Clause 2.5 (Employer’s claims), pay to the Employer these costs in addition to any incurred delay damages. The Sub-Clause particularly states that:

“If, at any time:

- (a) Actual progress is too slow to complete within the Time for Completion, and/or***

- (b) Progress has fallen (or will fall) behind the current program under Sub-Clause 8.3 [Programme]***

other than as a result of a cause listed in Sub-Clause 8.4 [Extension of Time for Completion], then the Engineer may instruct the Contractor to submit, under Sub-Clause 8.3 [Programme], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within Time for Completion.

Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the number of the Contractor's Personnel and/or Goods, at the risk and cost of the Contractor. If these revised methods cause the Employer to incur additional costs, the Contractor shall, subject to Sub-Clause 2.5 [Employer's Claims] pay these costs to the Employer, in addition to delay damages (if any) under Sub-Clause 8.7."

In conclusion, a diligent Contractor would produce the schedule update on his own and have the Employer aware of the necessary changes right ahead when they appear, instead of waiting for him to issue such instructions under Sub-Clause 8.6. This instruction by the Employer is an action that typically, and according to the FIDIC guide, may be rendered inoperable in a time-at-large setting as explained later. However, it may still be applicable, and therefore it is to the advantage of the Contractor to avoid it in the first place by maintaining his obligation to produce revised schedules under Sub-Clause 8.3.

4.4.3 Sub-Clause 15.1 – Notice to Correct

Sub-Clause 15.1 states that if the Contractor fails to comply with a contractual obligation then the Engineer may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time. Concerning the topic of this

research, not meeting the Time for Completion is considered a failure to carry out an obligation by the Contractor. In his turn, the Engineer can act according to Sub-Clause 15.1 and serve the Contractor a notice to correct this failure and finish the rest of the Works within a “reasonable time”.

4.4.4 Sub-Clause 15.2 – Termination by the Employer

This Sub-Clause lists the different events subsequent to which the Employer can terminate the contract with the Contractor. The first condition or failure by the Contractor mentioned in the Sub-Clause which entitles the Employer to such action is the failure of the Contractor to comply with a notice to correct under 15.1 (as instructed by the Engineer). Thus, the non-compliance of the Contractor with 15.1 can harm him by yielding to the termination of the contract.

4.5 FIDIC Guide Concerning Sub-Clauses 8.4 and 20.1 – Consequences of Time-at-Large

The guide provides the following clarification in the case where the Engineer or the Employer fails to determine extensions of time in accordance with Sub-Clauses 8.4 and 20.1:

- “There would thereafter be no Time for Completion (Time is said to be at large),
- The contract would be construed accordingly (Sub-Clause 8.6 may be inoperable, for example) and
- The Contractor’s obligation would be to complete within a time that was reasonable in all circumstances”.

If Sub-Clause 8.6 is rendered inoperable, then the Engineer cannot instruct the Contractor to expedite the works in order to meet the Time for Completion.

Similarly, as mentioned in several cases in the literature, if Sub-Clause 8.7 is inoperable when time is declared to have become at large as a result of the Employer preventing EoTs to be granted or agreed upon, then the Contractor is no longer liable to pay delay damages (Fawzy and El-Adaway, 2014 and Salwa et al., 2013).

However, in this case of time being called at large, no annulment has been reported in the guide concerning Sub-Clause 8.3, therefore implicitly pointing to the fact it would still be applicable. In other words, the statement in Sub-Clause 8.3, *the Contractor shall also submit a revised program whenever the previous program is inconsistent with actual progress* is still viable.

4.5 Synthesis of Findings

In trying to prove the reasonableness of the time taken to finish the works in a time-at-large situation, the Contractor may opt to two possible routes:

- Relinquish his contractual obligation of producing schedule updates and keeping the Employer current with the progress on Site according to all of the existing and emerging conditions.
- Willingly and consciously maintain his contractual responsibility of regularly producing schedule updates and transparently documenting the reality of the progress on Site. It seems that a diligent Contractor would adopt this strategy; keep the Employer up-to-date with every new target completion date to finish the project so that he does not operate under the Sub-Clauses discussed above (8.6, 15.1, 15.2). This places more of a burden on the Employer, whom presented with legitimate time analyses, cannot

ignore the reality of things. Subsequently, he would think twice or reconsider before taking any action towards the Contractor.

4.6 Proposed Guidelines – Part I

Based on the conclusions of Chapters III and IV, this section offers a set of guidelines to which project parties can refer to when dealing with a time-at-large situation.

1. For the period where the Contractor is the only party culpable for delay, the time risk structure remains enforceable.

- The burden of proof rests on the Contractor and he could choose to present prospective time analyses or a retrospective analysis at the end of the project.

- A diligent Contractor would resort to the prospective method of progressively presenting new completion target dates with every schedule update in order to diminish the probability of the Employer of taking action under Sub-Clauses 8.6 (ideally rendered inoperable in a time-at-large situation), 15.1 and 15.2.

- The Contractor could mistakenly not fulfill the contractual requirements of producing schedule updates. As a result, he would have to conduct a retrospective time analysis.

2. For the period where the Employer is the one culpable for delay as a result of an act of prevention he committed, the time risk structure lapses.

- The burden proof shifts to the Employer, who would conduct a retrospective analysis (As-Built But-For Analysis) at the end of the project in

order to prove that the time taken by the Contractor is unreasonable and that there were delay periods deemed to have been under the control of the Contractor.

- The Contractor still needs to provide the Employer with records, data, as-built schedules or information.

3. Even when the Contractor and the Employer conduct retrospective studies, the AACE protocol methods and fundamental principles as previously discussed in this Chapter clearly outline the need to still keep regularly updated schedules for the sake of the accuracy of the time analysis.

4.7 Proposed Guidelines- Part II

Recalling the introduction in Pickavance's research:

“Whether time has become at large **is a matter of law** dependent upon the terms of the contract and the facts that are alleged to defeat the applicability of the liquidated damages provisions. What is a reasonable time to complete once time has become at large **is a matter of fact** depending upon the circumstances as to how time has become at large, the date on which time became at large, and the materials available from which such a calculation could be properly made. It follows that the law and facts are inextricably bound and it is not possible to deal with one aspect satisfactorily without also dealing with the other.”

The first and third conditions (or facts) listed above which dictate the computation of a reasonable time respectively stated as **the circumstances as to how** time has become at large and **the available materials and records for such computation**, will prevail in the flowchart of proposed guidelines below which

summarizes the conclusions of this Chapter and paves the way to the upcoming section of the research. However, there will remain some uncertainty as to how the second mentioned fact, **the date on which time became at large**, feeds into the suggested model.

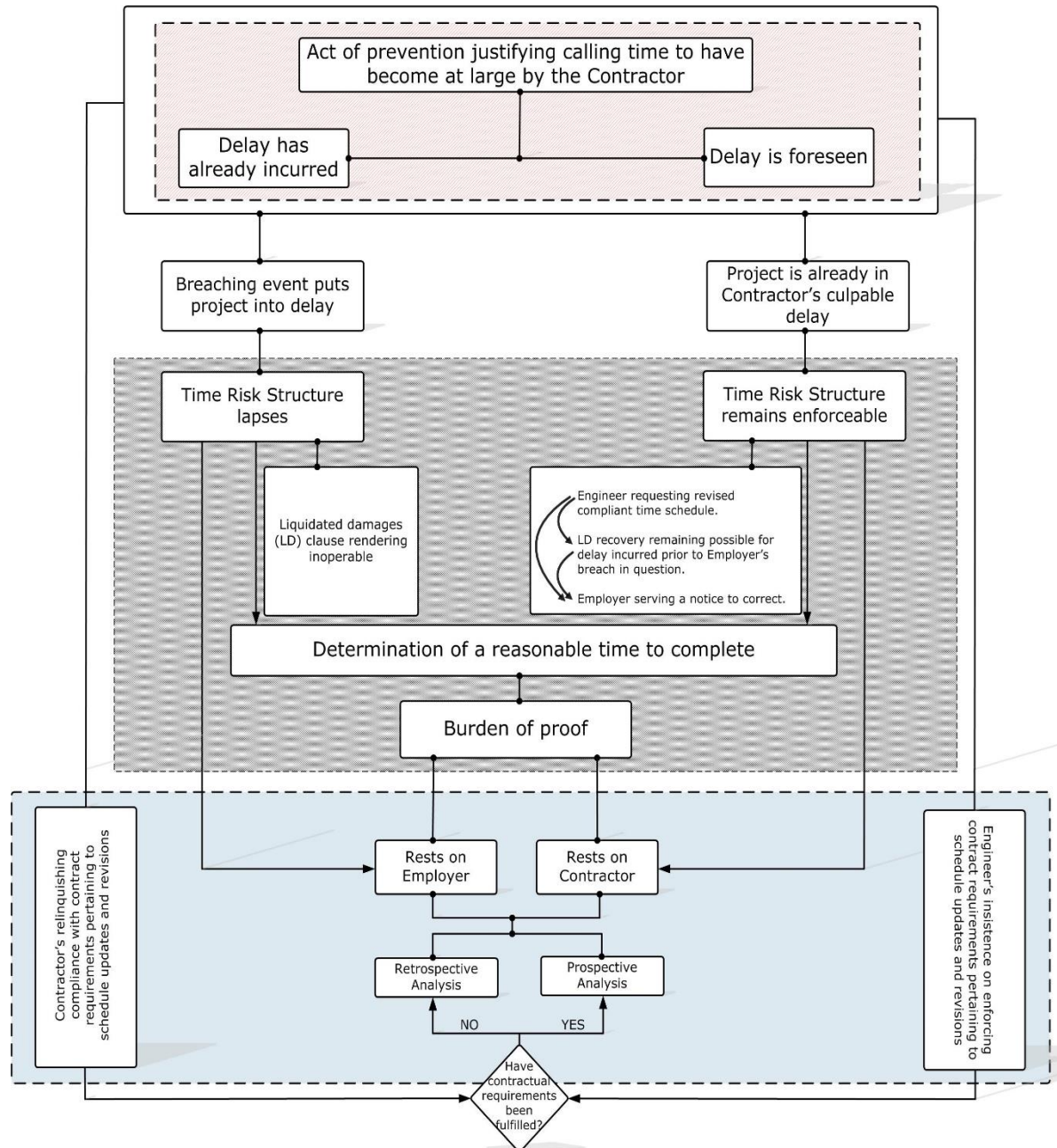


Figure 3 Summary of the Possible Time-at-Large Scenarios

4.7.1 Flow-chart – Remarks

- The circumstances (and by circumstances Pickavance means causes) as to how time has become at large relate to the first box in light red (the act of prevention which justifies calling time to have become at large by the Contractor).

- The available materials (or information) relate to the lower blue box in the diagram (availability of schedule updates or as-built records and data).

- The grey area in the middle intends to delineate the matters of law which can be judged either by adjudication or arbitration. The board of adjudication ruling for instance that the time risk structure remains enforceable will obligate the Contractor to progressively produce schedule updates and thus conduct a prospective analysis as he moves on with the Works.

- When the Employer commits an act of prevention, there are two possibilities:

- The delay has already incurred (typically the case of delayed payments)

- The delay is yet to happen (typically the case of directed variation orders)

- When the time risk structure remains enforceable, the Engineer may take the actions specified in the box (requesting a revised schedule, recovering liquidated damages by the Employer, issuing a notice to correct) either consecutively, or by opting to one or two options only (as shown by the arrows).

- The Engineer's insistence on enforcing the Contractor to fulfill the contractual requirements pertaining to schedule updates can help in pushing the Contractor to produce prospective time analyses which prove the reasonableness of the time taken to finish the Works.

- By contrast, when the Contractor relinquishes his contractual obligations to produce revised schedules, the only option would then be to conduct a retrospective analysis after the completion of the works.

CHAPTER 5

REASONABLE TIME COMPUTATION: THEORETICAL MODEL

5.1 Circumstances and Schedule Administration: Recapping

Chapter III dwelled on the question of enforceability of the contractual time risk structure and the way the burden of proof shifts from one party to the other according to the committed breach. In addition to this, it demonstrated the different causes which could be included in the time analysis put forward by the Contractor to the Employer and which were specifically extracted from the FIDIC standard conditions of contract related to time and delays. Finally, the Chapter concluded that such causes would emerge in an environment of evolving circumstances governing the computation of a reasonable time by reigning at the time when the Contractor is performing his contractual obligations. Chapter IV on the other hand offered all the statements and principles which support the notion that the Contractor is still supposed to present schedule updates to the Employer even in time-at-large situations.

5.2 Theoretical Framework - Foundation

Chapter V relies on the findings of both Chapters III and IV in order to formulate a theoretical framework on the quantification of what would be considered a “reasonable time” to complete the Works. On one hand, it will rely on the conclusion of Chapter III concerning the “circumstances” which dictate the performance of the Contractor. On the other hand, this part of the research will rely on the chosen standard conditions of contract (FIDIC) and AACE protocol principles narrowed down in

Chapter IV in order to formulate the suggested theoretical framework. The model will consist of an equation supported by a graphical representation, which serves as a visualization in order to illustrate and verify the principles on which the model relies.

5.3 Governing Circumstances

As demonstrated at the end of Chapter III, the circumstances or realizations inflicted on the progress of the Contractor, and which are sets of cause-effect links considered to be the by-products of the initial breaching event, could exacerbate to more severe events such as the Contractor becoming financially disturbed at a certain point in time during the project. The next part of this Chapter will expand on the case where the Contractor reaches such stage and may have to deal with other emerging events.

5.4 Rationale Behind the Disturbance of the Contractor's Financial Capabilities

In the case of occurrence of any event that grants the Contractor an extension of time (EoT) to the original Time for Completion, a diligent Contractor will put forward a notice and then a complete claim with the corresponding particulars filed in time to request for such extension. The denial of this claim will create for the Contractor new obstacles to face and overcome.

When the Employer denies an EoT request put forward by the Contractor, the latter will be incurring extra expenses (which he cannot recover) when he has already fallen into the delay, which will naturally threaten or rule his construction financing plans. The Contractor will find himself under a new kind of pressure dictating the way he finances construction. These unplanned for prolongation costs will drastically impact

his ability to maintain a good financial plan in place and will rather create a new financial status for the job. As a result, this sets a new tone to the progress of the Works.

To be specific, the Contractor will be unable to make exact projections on a new time for completion due to the uncertainty pertaining to the rate at which he can progress at this point in time. Now that he is incurring a lot more overhead compared to what was originally premeditated, over a span that is considerably large compared to the original time for completion, his competence to properly continue financing the job will be challenged and jeopardized. Having to deal with a new rate of progress, the Contractor will most certainly have to reshuffle priorities for work activities and ordering materials.

For instance, a delayed payment by the Employer, or a late possession of site, or encountering a differing site condition are all events which lead to the repercussions explained in this section above. These situations cause the Contractor an interruption right when they occur by already dragging him into the delay. In other terms, he will face a slow progress rate on the project, or even deal with a suspension stalling the Works for a while, and therefore incurring prolongation costs. These effects will result in the disturbance of the Contractor's financial capabilities, which in its turn, will be the seed to new emerging effects that the Contractor has to mitigate as he moves on with the construction works. Particularly, the scenario in which the Contractor suffers from delayed payments establishes more severe consequences, where the Sub-Contractors and suppliers may leave the Contractor, who in turn has to rebuild his trust in the market again in order to get new partners on board.

It should be noted that some of these circumstances may have remedies for the Contractor to resort to in the contract, like taking the initiative to suspend or terminate

the agreement. However, Contractors usually do not opt to these options and rather settle for other resolution methods with the Employer.

5.5 Theoretical Model

The theoretical framework relies on several components which are core to the Contractor's time delay analysis.

5.5.1 The Initial Requested EoT

The first component or benchmark to depart from in the computation of a reasonable time should be the initial EoT (the virtual EoT) that should have been granted to the Contractor in the first place, representing the minimum baseline to depart from. This statement was previously stated in the literature review and supported by both Pickavence (2006) and Ying (2007).

5.5.2 Effect of the Initial Set of Circumstances

When the Contractor suffers from a financial disturbance, he will be subject to a set of circumstances that limit and dictate his performance as explained above. For instance, he may become unable to pay his Sub-Contractors, or to properly place purchase orders on time. Such circumstances create a certain dynamic process and affect the work activities of the Contractor by delaying their start dates and/or stretching their initial durations.

5.5.3 The Interaction Between the Existing Set of Circumstances and New Emerging Events

Any new surfacing event which would normally grant the Contractor an EoT under the contract, will not be treated or quantified distinctly or independently from the effect of the existing chain of circumstances (the current set of cause-effect links). New Employer's risk events like variation orders and differing site conditions, come each in different timings, and thus a new set of circumstances will be generated in the specific contemplated window of time. The section below further elaborates on this fundamental aspect.

The critical problem of the financial disturbance of the Contractor may affect the mitigation of the potential upcoming Employer's risk events. For instance, when the Employer instructs the Contractor with a variation order (V.O.), the latter, suffering from financial problems, will most likely be unable to open a letter of credit for this V.O., and subsequently not be able to purchase the necessary material or execute the required changes without first solving his monetary complication.

In the diagram below, the arrow traveling from the first plane (Tier 1) to the second plane (Tier 2) shows the migrating effect of this focal issue (the financial capabilities of the Contractor being distressed) in the initial sequence of realizations (cause-effect chain) to other events' planes, where the initial cause (the financial capabilities of the Contractor being distressed) launches other series of cause-effect links in each new Employer's risk event's plane.

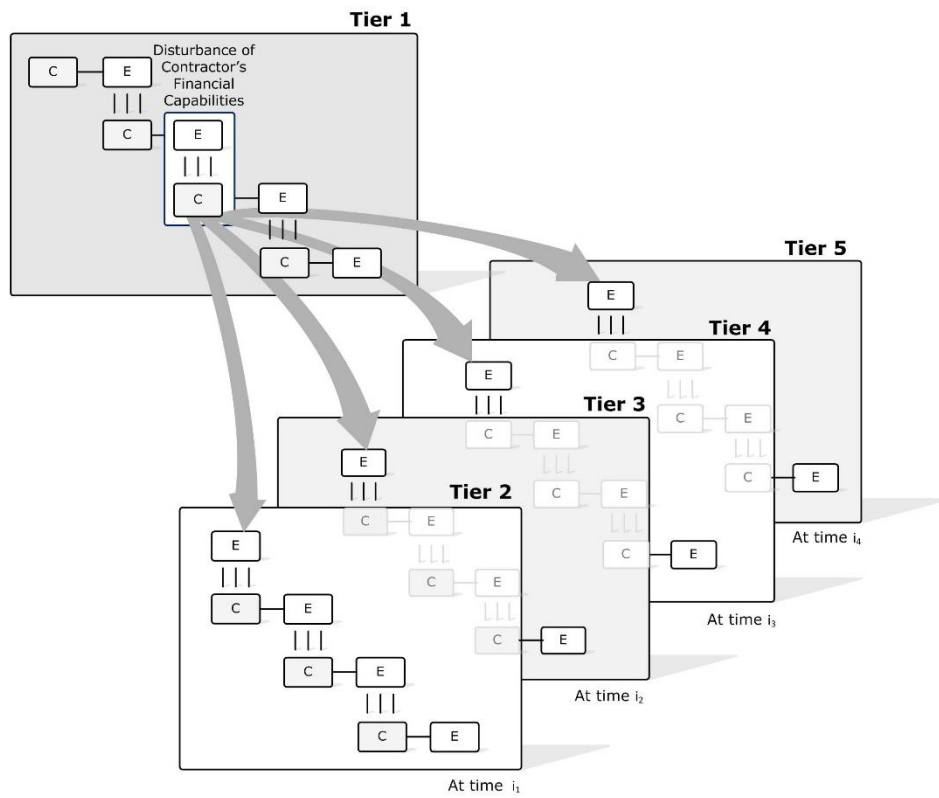


Figure 4 Interaction Between Existing Set of Circumstances and New Emerging Events

The following figure is a more detailed visualization of the events cascading from the initial breaching event, forming the initial set of circumstances and also interacting with a new Employer's risk event:

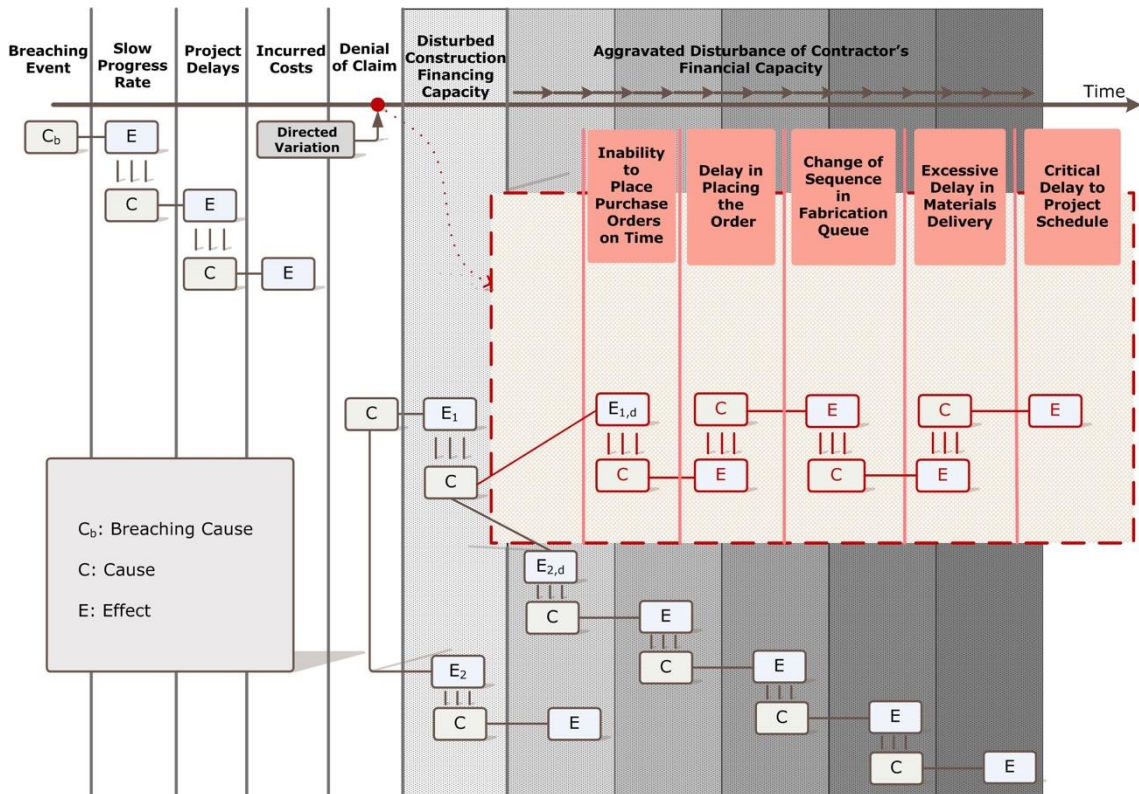


Figure 5 Interaction between Existing Set of Circumstances with a Directed Variation Order

- The cause-effect links in grey represent the initial set of circumstances generated from the breaching act by the Employer;
- The events considered as causes or seeds to new conditions in this cause-effect chain could have multiple effects and not only the ones depicted in the diagram. For instance, the denial of claim could have two effects;

- E_1 being the disturbance of the Contractor's financial capabilities,

and

- E_2 being the levying of liquidated damages by the Employer, which can have subsequent effects definitely contributing to the disturbance of the Contractor's financial capabilities being aggravated with time.

• The disturbance of the Contractor's ability to finance the project (presented in the grey shaded area) will be the trigger to different effects;

- $E_{1,d}$ is the effect of the Contractor's financial capabilities being distressed on a variation order (V.O.) which occurs at any point in time. Such effect could be the inability to place purchase orders pertaining to this V.O. $E_{1,d}$ itself will be the seed to another effect which is the delay in placing purchase orders, leading to several other consequences. This new set of cause-effect links is presented in the red dashed frame;

- Effect $E_{2,d}$, in the initial set of realizations, is a direct effect of this financial disturbance and could be the inability to pay Sub-Contractors for example;

- The gradient in the grey shaded area intends to imply that the disturbance of the Contractor's financing capability could be gradually aggravated with time to the point where he finds himself financially exhausted or stretched, which will certainly impose on him a severe environment to work around and achieve progress through.

5.5.4 The dynamic impact of the circumstances

As previously mentioned, the benchmark of the original target date is a virtual EoT. However, this figure certainly evolves because it is impossible for the Contractor to predict at an early stage of his analysis all the circumstances that are yet to arise and

the way they would interact with new surfacing events. In fact, the understanding of the circumstances is an on-going progress which evolves with the Contractor's consecutive assessments of the impacts of the circumstances the way they are read at each point in time.

The impact of any new item or risk is ruled and assessed by the current reading of circumstances in the corresponding time window. The set of dynamics varies with every time window according to the circumstances. Thus, both the reading of actual durations of activities in that time window as well as the projections (predicted figures) concerning any activity that is yet to be executed in the subsequent part of the network will definitely change, i.e., could be aggravated or attenuated. To be exact, the circumstances can only be fully understood when the last effect of the last cause materializes. As a result, the moving target date may push forward or in some cases, pull up earlier.

In normal cases, the Contractor does not apply this type of prospective exercise when creating an update. The difference in time-at-large situations is that the circumstances are evolving and are not completely known from the first shot due to the unfolding effects of the initial breaching event, and therefore the time analysis done by the Contractor ideally should be a progressing and developing homework.

5.6 Proposed model

This model focuses on demonstrating how the delays in the overall time for completion would aggregate as a result of the activities' durations and start dates being altered due to the detrimental effect of the Contractor's financial resources being

distressed. The influence of reduced financial capabilities will become the seed of a work activity being delayed or stretched or both, aside of generating additional costs. Based on the deductions made concerning the status of the risk structure and the dynamics of the circumstances governing the progress of the Contractor, a proposed solution could be the following: it seems that the better option for the Contractor when time is called at large, whether the time risk structure remains enforceable or lapses, and whether the burden of proof rests on him or the Employer, is to take the initiative of submitting updated programs by documenting his prospective estimates of the start and end durations of each activity and keeping them live based on his reading of the evolving circumstances.

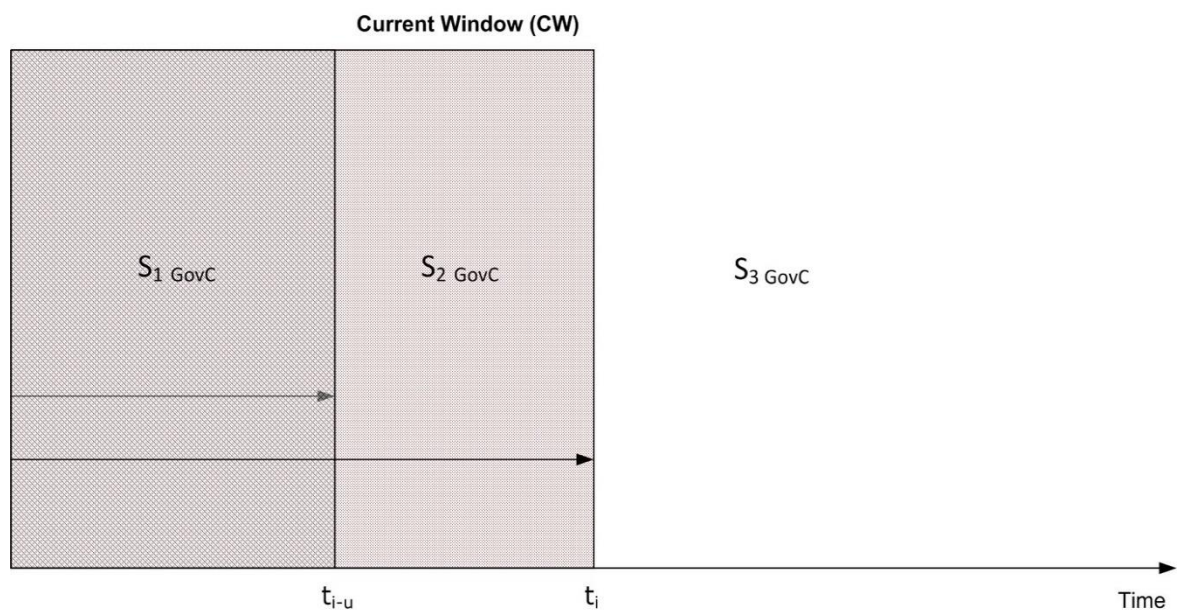


Figure 6 Considered Sets of Activities when Generating a Target Completion Date

The figure above represents on a timeline how a new target date could be generated for each time window, where:

- S_{1GovC} , S_{2GovC} , and S_{3GovC} , represent the three different sets of activities respectively ruled by the corresponding Governing Circumstances;

- GovC designates the circumstances which govern the three sets of activities;
- S_1 is the set of schedule activities updated up until point $t_{(i-u)}$ (inclusive of activities that had started prior to $t_{(i-u)}$ and may not have been completed yet, with u being measurement unit for the update cycle);

- S_2 is the set of activities that were in progress in time window $[t_{(i)} - (t_{(i-u)})]$;

- S_3 is the set of schedule activities still in progress beyond t_i or scheduled to start after t_i .

- Normally, there should be a requirement in the contract concerning the maximum length of certain activities (typically required to be one fourth of the window length). However, this limit imposed on the durations may have to change because of the governing circumstances.

- $S = S_1 \cup S_2 \cup S_3$;

- $S_1 \cap S_2$: Activities which have started prior to $t_{(i-u)}$ and are not yet completed;

and

- $S_2 \cap S_3$: Activities which have started prior to $t_{(i)}$ and are not yet completed.

5.6.1 Moving Target Completion Date

The moving target date will push forward with every new emerging increment in time Δ related to work activities. In other words, Δ in this model designates the spread between 2 successive moving target dates.

While point i in time reflects the end of the current window:

$$\Delta t_{t(i)} = Tfc_{t(i)} - Tfc_{t(i-u)} \quad (1)$$

$$Tfc_{t(i)} = [Re-Sch: S_2; S_3]_{(GovC) t(i)} \quad (2)$$

$$Tfc_{act} = Tfc_{Agreed} + \sum_{t(i)=t(t@L)}^{t(i)=t[Tfc(act)]} \Delta t_{t(i)} \quad (3)$$

Where:

- $\Delta t_{t(i)}$ is the increment in time generated at time $t_{(i)}$ to be added to the actual time for completion;
- Tfc designates the Time for Completion generated after running the rescheduling exercise taking as input the data pertaining to the corresponding set of activities;
- Tfc _{$t(i-u)$} is the Time for Completion generated at time $t_{(i-u)}$;
- Tfc _{$t(i)$} is the Time for Completion generated at time $t_{(i)}$;
- Re-Sch is the rescheduling function;
- Tfc_{act} is the actual Time for Completion;
- Tfc_{Agreed} is the Time for Completion formerly agreed upon (could be the original or amended Time for Completion);
- Tfc_{act} can be computed by prospectively adding to Tfc_{Agreed} the total increments in time calculated from the moment of declaring time to have become at large (ideally) up until reaching the end of the project (the actual final completion date);
- $\Delta t_{t(T@L)} = \text{EoT}$ that would have been otherwise granted in connection with the prevention underlying calling time to have become at large.

5.6.2 Zooming in: Delay in the Start Date and the Increase in the Durations of Work Activities

The following section focuses on the work activities that are included in the sets mentioned in the proposed equation above. A delay in the start of an activity could be due to the inability of the Contractor to open a Letter of Credit for the supplier assigned for the material of the corresponding work activity. The start of a certain activity can be

also delayed due to complications in shipment of material for example, caused by seasonal constraints. The next figure illustrates how work activities can start later than what was originally planned, and the way their durations could stretch, all as a result of being affected by the circumstances governing the progress of the Contractor.

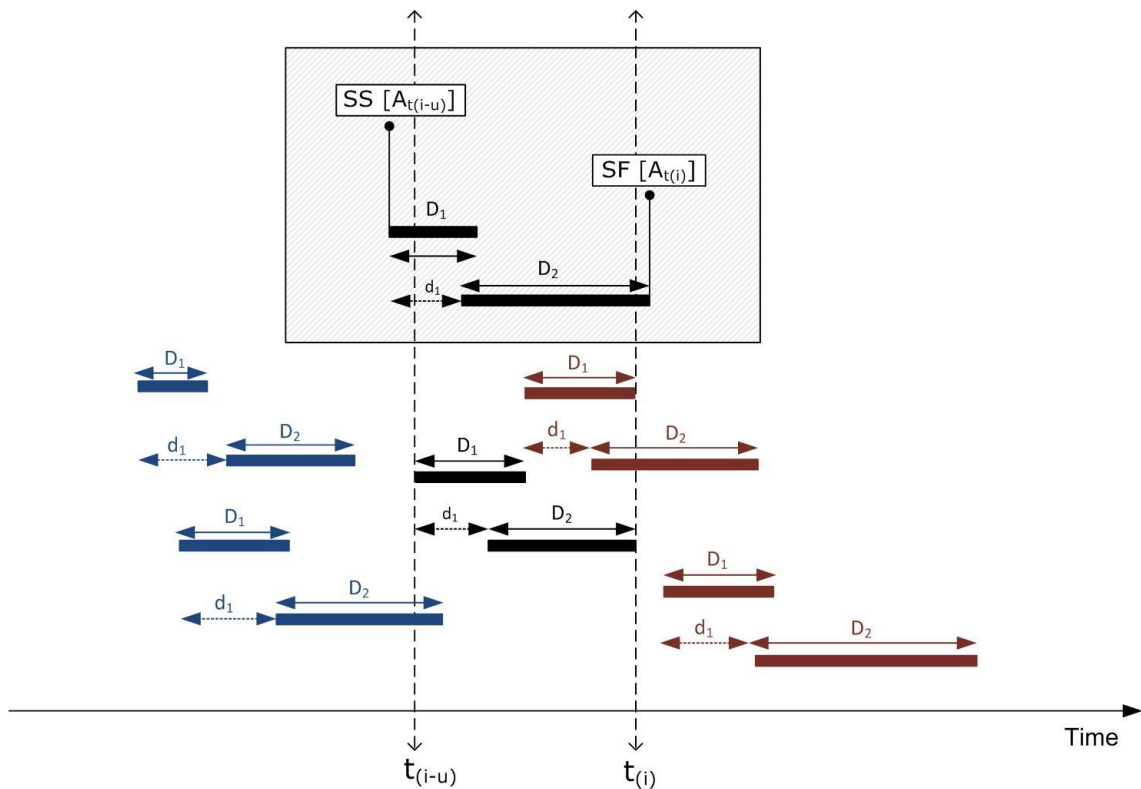


Figure 7 Change in Start Dates and Durations of Work Activities

- The activities in blue represent S_1 ;
- The activities in black represent S_2 ;
- The activities in red represent S_3 ;

Recalling equation (2) $TfC_{t(i)} = [Re-Sch: S_2; S_3]_{(GovC)_{t(i)}}$ which serves to compute the Time for Completion at point $t(i)$:

- The rescheduling function takes as input the increments in time (Δt)

generated for the work activities in each set (in S_2, S_3), each set being governed by particular circumstances.

- A set of activities $S = \{A_1, A_2, A_3, \dots, A_n\}$

In order to generate Δ for an Activity A:

- d_1 is the total delay in the start of activity A;
- D_1 is the duration of Activity A impacted by the governing circumstances

which exist at time $t_{(i-u)}$: $D_1 = \text{Dimp} [\text{GovC}_{t(i-u)}]$;

- D_2 is the duration of Activity A impacted by the governing circumstances

which exist at time $t_{(i)}$: $D_2 = \text{Dimp} [\text{GovC}_{t(i)}]$;

For a certain activity A represented in the hatched grey area in the figure above:

$$\text{SF} [A_{t(i)}] = \text{SS}[A_{t(i-u)}] + d_1 + D_2 \quad (4)$$

$$\Delta A_{t(i)} = \text{SF}[A_{t(i)}] - \text{SF}[A_{t(i-u)}] \quad (5)$$

Where:

- $\text{SF}[A_{t(i)}]$ is the scheduled finish date of Activity A at time $t_{(i)}$;
- $\text{SS}[A_{t(i-u)}]$ is the scheduled start date of Activity A at time $t_{(i-u)}$;
- $\text{SF}[A_{t(i-u)}]$ is the scheduled finish date of Activity A at time $t_{(i-u)}$;
- $\Delta A_{t(i)}$ is the increment in time added to the original duration of Activity A and

that is visible at point $t_{(i)}$.

• $\Delta A_{t(i)}$ generated by this equation tackles the kind of activities corresponding to set S_2 previously introduced. Thus, $\Delta A_{t(i)}$ can be either completely made of actual figures (as-built information), or constituted of both actual and prospective (predicted) values.

- However, at time $t_{(i)}$, the Contractor should also include in the rescheduling function to compute $\Delta_{t(i)}$ the foreseen or prospective figures of the activities that are yet to be achieved after point $t_{(i)}$ in time.

This method shall be applied prospectively at every considered point in time $t_{(i)}$ for each activity in order to allow for the rescheduling exercise to take place and thus generate a new target date. The difference between the Time for Completion produced at time $t_{(i)}$ and the Time for Completion produced at the precedent point in time $t_{(i-u)}$ produces the consecutive Δ_t s. The increments in time resulting from equation (1) $\Delta t_{t(i)} = \text{TfC}_{t(i)} - \text{TfC}_{t(i-u)}$ become more accurate with each exercise as some predicted figures and durations of activities become actual ones and as the circumstances unfold. The exercise of adding every generated Δt to the agreed Time for Completion produces the anticipated actual Time for Completion.

5.6.3 Remarks on Theoretical Model

The proposed model in this research greatly deviates from how the Contractor normally administers the generation of schedule updates in a classical case. When the Contractor usually produces an update, he only reflects when a certain activity started and when it finished. He does not revise the sequencing relationship between work activities nor include the durations of future activities that are yet to be executed.

CHAPTER 6

VALIDATING PROPOSED GUIDELINES AND THEORETICAL FRAMEWORK

6.1 Case Study I

6.1.1 Overview

The first case study is for a residential complex in the MENA region. It is a case where the Contractor declared time to have become at large after the Employer delayed successive payments and did not respond to his requests/proposed revised schedules. The timeline of the case with its relevant stations and milestones are presented in the next page.

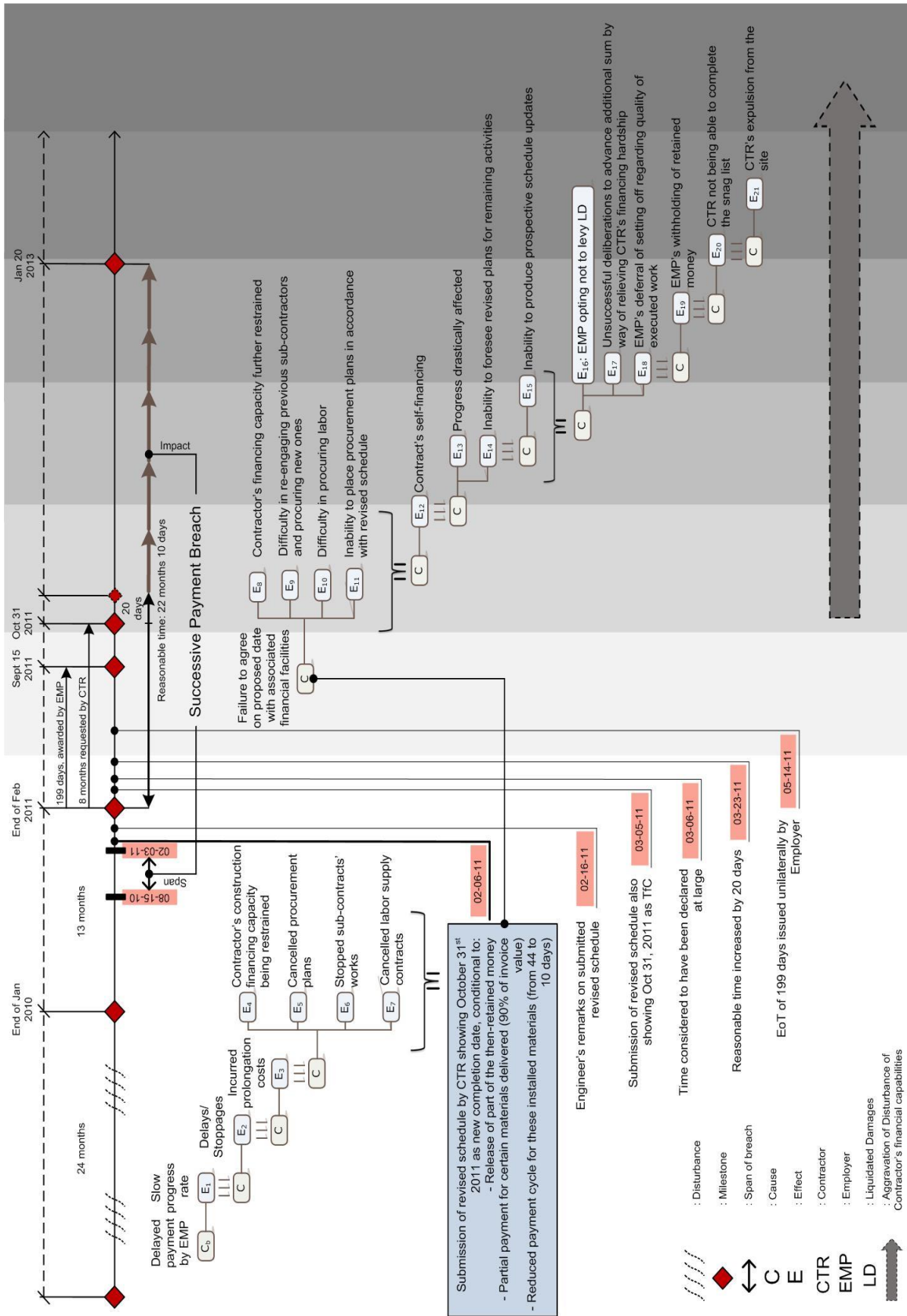


Figure 8 Case Study I Timeline - Important Events and Milestones

6.1.2 Remarks on Timeline

- The original Time for Completion is 24 months (End of January 2010);
- The amended Time for Completion adds 13 months to the original Time for Completion (End of February 2011);
- The disturbance which occurs in the original duration is due to, respectively:
 - Complications resulting from a joint venture of the Contractor outside this project; and
 - Delayed payments by the Employer.
- The additional duration of 13 months is a non-compensable period;
- The table below summarizes the important events of the case with their corresponding dates;

Date	Action
02-06-11	Contractor submits a revised schedule showing October 31 st , 2011 as an updated completion date that is conditional on: <ul style="list-style-type: none"> - Release of part of the retained money; - Partial payment for materials delivery (90% of their value); - Reduced payment cycle for woodwork package (from 44 to 10 days).
02-16-11	Engineer submits remarks on the revised schedule (agreeing with the date of completion by Contractor but suggesting adjustments as to the work sequence and activities).
03-05-11	Contractor submits revised schedule also showing October 31 st , 2011 as Time for Completion.
03-06-11	Contractor declares time to have become at large.

03-23-11	Contractor shows that a reasonable time to complete the Works would be 20 days after the previously submitted new Time for Completion on October 31 st , 2011.
05-14-11	Employer extends time unilaterally by 199 days.

6.1.3 Justifying Time Being Called at Large

According to the model below presented by Abdul-Malak and Jaber (2018), time being called to have become at large by the Contractor in this case can be directly justified through the fact that the excusable delay on hand (delayed payments by the Employer) not being included in the EoT Clause is considered to be a prevention by the Employer or a failure of the EoT mechanism. Such conditions defend the right of the Contractor to call time to have become at large.

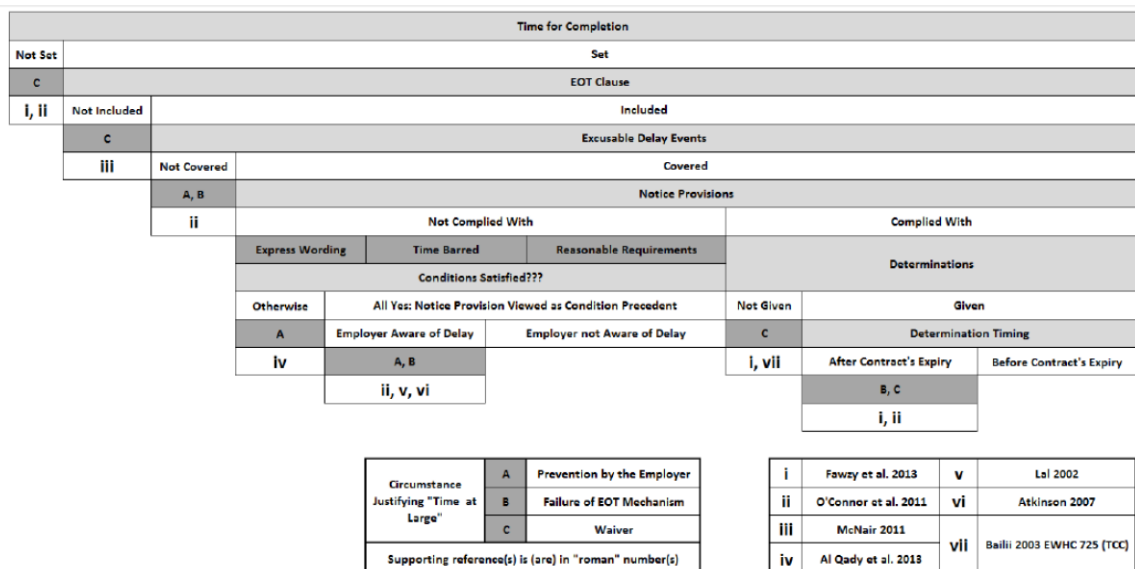


Figure 9 Justifiability of Calling Time to Have Become at Large

6.1.4 Status of Time Risk Structure

Before the end of February 2011, the only delaying event is a breach by the Employer and that is committing another delayed payment, pushing the Works beyond the agreed Time for Completion. There is no culpable delay by the Contractor. This implies that for this case, the time risk structure lapses and the burden of proof thus falls on the Employer to show that the time taken by the Contractor to complete the Works is unreasonable.

6.1.5 Circumstances

In this case, the Contractor deals with an initial set of circumstances when the Employer delays payments before the end of the original Time for Completion which eventually led to the effects listed to the upper left of the figure:

- E₁: Slow progress rate;
- E₂: Delays/Stoppages;
- E₃: Incurred Prolongation costs;
- E₄: Contractor's construction financing capacity being restrained;
- E₅: Cancelled procurement plans;
- E₆: Stopped Sub-Contracts' works; and
- E₇: Cancelled labor supply contracts.

The Contractor could have dealt with this set of circumstances had the Employer agreed to the conditions that he proposed when submitting a revised program showing a new Time for Completion on October 31st 2011. However, the Employer did not settle for this agreement. Not being able to agree on the proposed completion date with its associated financial facilities resulted in the following effects:

- E₈: Contractor's construction financing capacity being further retrained;
- E₉: Difficulty in re-engaging previous Sub-Contractors or procuring new Sub-Contractors;
- E₁₀: Difficulty in procuring labor; and
- E₁₁: Inability to place procurement plans in accordance with the revised schedule.

The effects listed above became the seed to another fact that is the self-financing of the contract (E₁₂). This effect became the cause of two other realizations, that are the progress being drastically affected (E₁₃) and the inability of the Contractor to foresee revised plans for remaining activities (E₁₄). E₁₄ was in fact the reason behind E₁₅, the Contractor's inability to produce prospective schedule updates. It is a detrimental outcome since the Contractor is not managing to plan or foresee a new completion time as he moves on with the Works. He could merely present as-built schedules which do not demonstrate new target dates that he could commit to. This status of the Contractor generated in its turn the following effects:

- E₁₆: Employer opting not to levy liquidated damages;
- E₁₇: Unsuccessful deliberations to advance an additional sum by way of relieving the Contractor's financing hardship; and
- E₁₈: Employer's deferral of setting off regarding quality of executed work.
- E₁₇ being the decision of the Employer to postpone setting off regarding the quality of executed work until a later point in time became the seed to new effects as follows:

- E₁₉: Employer's withholding of retained money;
- E₂₀: Contractor not being able to complete the snag list; and

- E₂₁: Contractor's expulsion from the site.

6.1.6 Milestones of the Employer

1. The Employer was well aware of the financial difficulties that the Contractor suffered from. Acknowledging such circumstance, he offered, from outside the contract conditions, 5% of the contract price conditional to Contractor dropping all previous claims concerning compensations. Nevertheless, they did not agree to such terms and the existing set of circumstances got further aggravated.

2. Even though the wood work executed by the Contractor did not match the standards specified in the specifications, the Employer did not set off on the quality of the woodwork at the time when it was implemented because he was cognizant of the prevailing circumstances governing the Contractor. In other words, had the Employer set off on the quality of the wood, the Contractor could not be able to complete his job. For that reason, the Employer decided to defer the deduction (setting off) until a later point in time. Indeed, the Employer resolved his acceptance of an inferior quality of the woodwork by his withholding of retained money at the take-over certificate. As a result, shown in the cause-effect links to the bottom right of the figure, the Contractor had no money to do the snag list, got expelled from Site and the Employer appointed another Contractor to continue to work.

3. The Employer did not levy delay damages. Had he levied liquidated damages, the works would completely stop because of the contract self-financing situation of the Contractor (his financing solely depending on the billing cycle). With that factor controlling the performance of the Contractor, it was not an option for the Employer to collect delay damages at the time. In addition to this, the prevailing

circumstances could have been worse had the Employer levied liquidated damages. In other words, not opting to this contractual right is part of the circumstances which allowed for the self-financing of the contract (even if it was proceeding at a slow rate). Briefly, this condition is an over-arching circumstance that has prevailed during the reasonable time. One can conclude that these milestones by the Employer interacted with the existing set of circumstances governing the work of the Contractor in a way that created a net effect of circumstances prevailing until the take-over certificate (ToC).

6.1.7 Reflecting on Case Study I

In this case study, the only breach is delayed payments by the Employer which took the project beyond the time for completion. Therefore, the time risk structure lapses.

Consequently, the burden of proof rests on the Employer who will have to show through a retrospective analysis that the time taken to complete the Works is unreasonable. He would be able to show this by filtering out the delaying events which were under the control of the Contractor (*As-Built But-For Analysis*). However, in this case, he would not be able to conduct such exercise since during the “reasonable time”, there were not any delaying events committed by the Contractor. The reasonable time in this case is a result of the financial difficulty suffered by the Contractor. And so, resorting to this method after the completion of the project is not a realistic solution. The existing circumstances do not lend themselves to allow the Employer to show what should have been a reasonable time.

In addition to this, the Contractor was unable to foresee and produce prospective time analyses because of his financial hardship (and the self-financing of the contract), had the burden of proof rested on him. In other words, the Contractor lost

his ability to foresee the prospective figures of the start dates and durations of the activities that were yet to be executed (pertaining to the set of activities S_3 according to the proposed model explained in Chapter V). He could not apply, for the major part of the project, the suggested theoretical model which relies on reflecting how the circumstances have impacted the time window that he would be considering and how they are expected to affect the activities past point $t_{(i)}$. He only presented a prospective delay analysis for the first 20 days (after October 31st, 2011) after he endorsed time to have become at large.

So, the only option was for both, the Employer and the Contractor to resort to a retrospective analysis with the benefit of hindsight. As a result, the proposed guidelines and the theoretical model proposed in this research are not exactly practicable for this specific case.

6.2 Case Study II

6.2.1 Overview

The second case study is for a 400-room hotel in the MENA region, considered to be of high-end luxury, high urban design standards as well as technical standards for firefighting and guests evacuation plan. It is a case in which the Contractor declared time to have become at large after the Employer issued many successive directed changes without allowing for proper extensions of time. The timeline of the case with its relevant stations and milestones are presented in the next page.

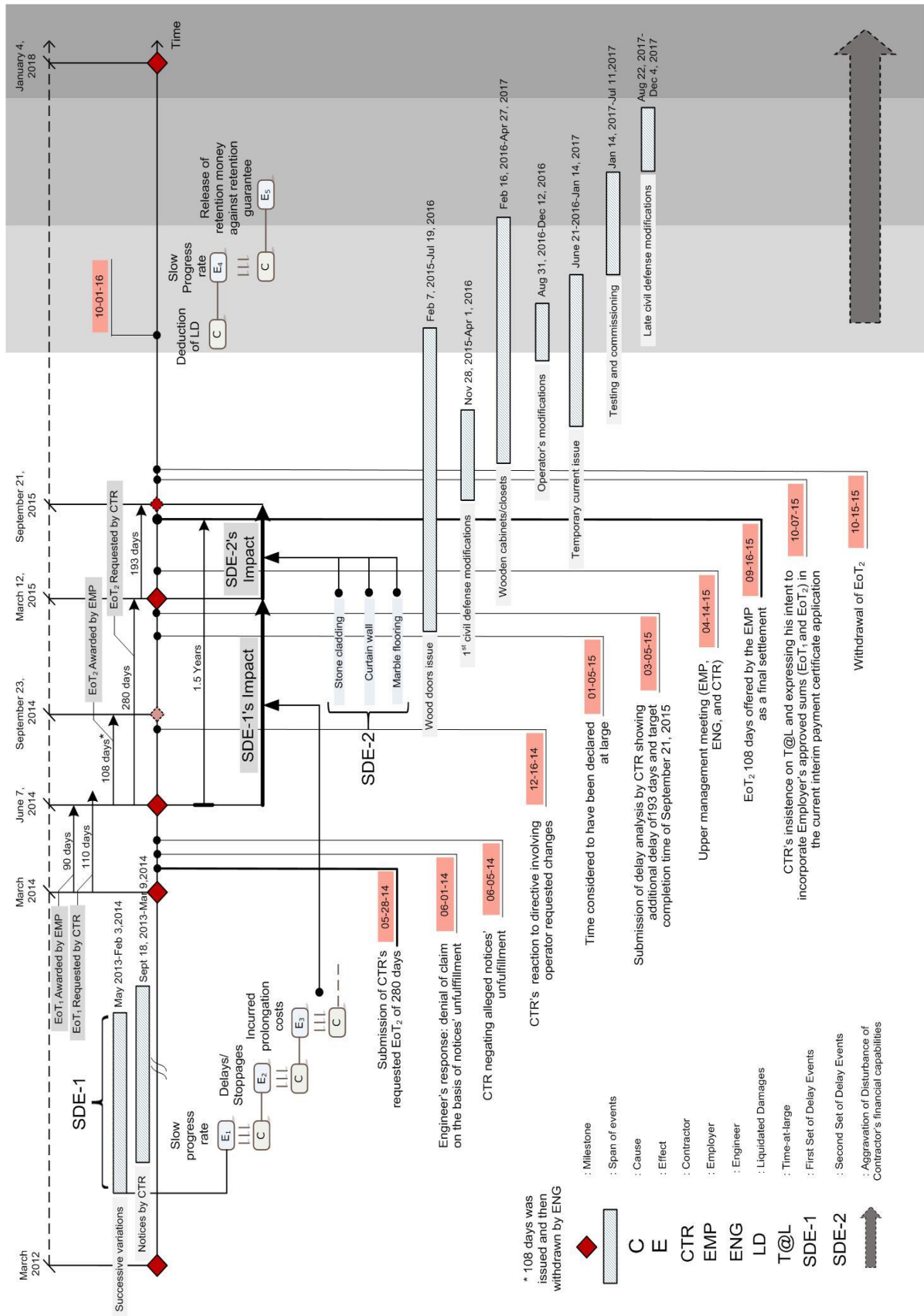


Figure 10 Case Study II Timeline – Important Events and Milestones

6.2.2 Remarks on Timeline

- The original Time for Completion is 24 months (March 2014);
- The amended Time for Completion adds 90 days to the original Time for Completion (June 7, 2014);
- The table below summarizes the important events of the case with their corresponding dates;

Date	Action
05-28-14	Contractor submits requested extension of time EoT ₂ of 280 days showing completion on March 12, 2015.
06-01-14	Engineer denies claim for EoT ₂ on the basis of notices' unfulfillment.
06-05-14	Contractor negates alleged notices' unfulfillment.
12-16-14	Contractor reacts to directive involving operator requested changes.
01-05-15	Contractor declares time to have been declared at large.
03-05-15	Contractor submits delay analysis showing additional delay of 193 days and target completion of September 21, 2015.
04-14-15	Upper management meeting (EMP, ENG, and CTR).
09-16-15	EoT ₂ 108 days offered by EMP as a final settlement.
10-7-15	Contractor insists on time-at-large and expresses his intent to incorporate Employer's approved sums (from EoT ₁ and EoT ₂) in the current interim payment certificate application.
10-15-15	Employer withdraws EoT ₂ of 108 days.
10-01-16	Employer levies liquidated damages

6.2.3 Justifying Time Being Called at Large

According to the model presented by Abdul-Malak and Jaber (2018), time being called to have become at large by the Contractor in this case can be justified through multiple means or routes.

1- The excusable delay (successive variations by the Employer) being covered by the EoT Clause:

- Notice provisions complied with according to the Contractor:
 - The EoT was awarded after the expiry of the contract, which is considered a failure of the EoT mechanism or a waiver by the Employer to have his project delivered by a specific date.
- Notice provisions not complied with according to the Engineer:
 - Notice provisions are not viewed as condition precedent in the 1987 FIDIC (signed contract at the time), which leads to the conclusion that it is an act of prevention by the Employer.
 - Had they been viewed as condition precedent, the Employer was aware of the delay that he is incurring, which is considered an act of prevention by the Employer or a failure of the EoT mechanism.

6.2.4 Time Risk Structure

When it comes to the time risk structure, there could be different stances:

- Employer's point of view:
 - The Employer could argue that the Contractor is already in culpable delay past the agreed completion date (for the requested 280 days). Thus, the

time risk structure remains enforceable for this period, for which he can levy liquidated damages.

- Even for the period that followed the 193 days, the Employer could argue that the delaying events caused by sub-contractors' works are considered to be Contractor's culpable delays for which he can levy liquidated damages.

- Contractor's point of view:

He could argue that the Employer committed an act of prevention leading to the time risk structure lapsing based on several facts:

- When the Engineer alleged that the Contractor did not fulfill notice requirements for his extension of time claims, it could have been due to the fact that the Contractor served them without proper referencing to the relevant clauses to establish his eligibility or that he did not serve them within 28 days. The Engineer denied him the claim on the basis of not having served the notices, but he did not question the reason behind the time extension request, which hints or implies that these reasons were under the Employer's control.

- The fact that the Employer acknowledged that the Contractor deserved additional time of 108 days after a year and a half from the amended Time for Completion means that he is responsible for pushing the completion date beyond June 2014. He witnessed the delay as he went beyond the normal instructions without allocating proper extra time for them, which is an act of prevention by itself. Therefore, the time risk structure lapses and he should not have levied liquidated damages.

6.2.5 Circumstances

In this case, the Contractor deals with an initial set of circumstances when the Employer instructs him with successive variations before the end of the original Time for Completion which eventually led to the effects listed to the upper left of the figure:

- E₁: Slow progress rate;
- E₂: Delays/Stoppages; and
- E₃: Incurred Prolongation costs.

The impact of these successive variations, which also placed the Contractor in this initial set of circumstances, is manifested in the 280 days requested by the Contractor in his second claim for a time extension, which is in this case a prospective time impact analysis.

6.2.6 Reasonable Time

After declaring time to have become at large, the Contractor submitted a prospective delay analysis, as suggested by the theoretical framework, showing the impact of several issues pushing the date for completion to September 21st, 2015. These issues were related to:

- Stone cladding;
- Curtain wall; and
- Marble flooring.

As for the reasonable time stretching up to the actual completion date on January 4, 2018, it was the result of different events and issues listed below:

- Wood doors issue;
- First civil defense modifications;

- Wooden cabinets/closets;
- Operator's modifications;
- Temporary current;
- Testing and Commissioning; and
- Late civil defense modifications

6.2.7 Case Study in Accordance to Dispute Timeline

The dispute timeline stipulated for under the 1987 FIDIC is represented below.

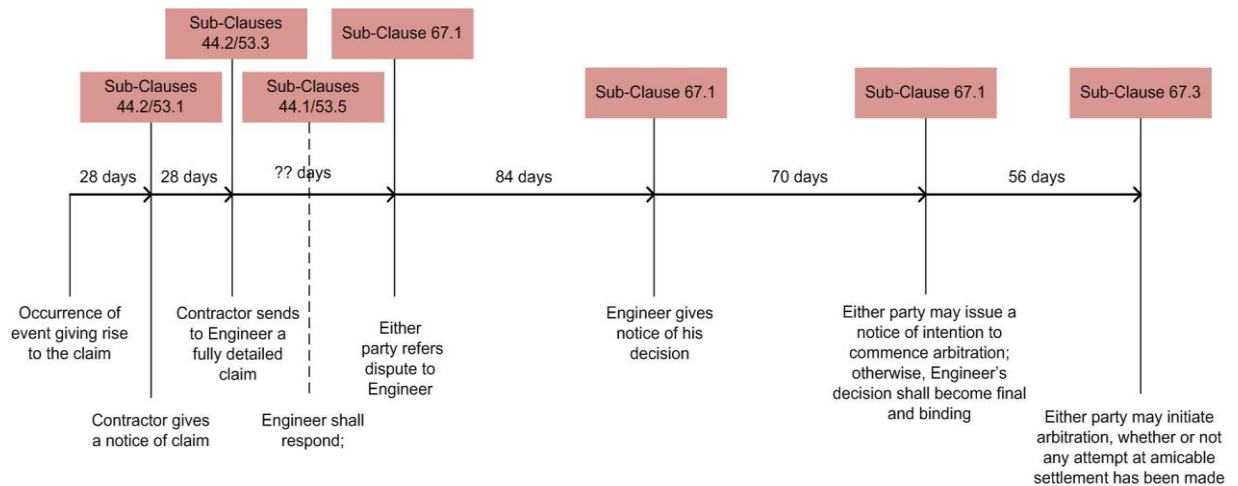


Figure 11 Dispute Timeline in the 1987 FIDIC

In this case, where the contract between the parties was 1987 FIDIC, the Contractor did not want to refer the matter as a dispute in order not to get an objection from the Engineer. In other words, all the important events and milestones fall within the unregulated period in which the Engineer shall respond to the claims put forward by the Contractor. It was only after the Employer levied liquidated damages (as shown on the timeline of the case), when the Contractor referred the matter as a dispute for the Engineer's decision and then eventually opted to amicable settlement.

6.2.8 Reflecting on Case Study II

In this case study, the time risk structure lapses because of the successive variations directed by the Employer and taking the contract beyond the time for completion. By contrast to the first case study, the Employer would be able to demonstrate, through a retrospective study, what a reasonable time to complete the Works should have been

by removing the culpable delays caused by Contractor. He would have been able to show this by collapsing the as-built schedules from the delaying events related to sub-contracts works for wood doors (considered to be under the control of the Contractor). On the other hand, the Contractor can counter-argue with another retrospective analysis at the end of the project. Had the burden of proof rested on the Contractor, the latter could have produced prospective revised updates since he was not subject to financial difficulties. In conclusion, the proposed guidelines and theoretical model offered by this research can well be applied for this case study and suggest realistic and viable solutions as opposed to the first case study for which they do not.

6.3 Comparison Between the Two Case Studies

Each case has its own chronology of events and circumstances. In the first case study, the financial disturbance elaborated in previous Chapters of this research prevailed at an early stage in conjunction with declaring time to have become at large by the Contractor as a result of the delayed payments by the Employer, which was shortly after the breach. The sets of circumstances governing the progress of the Contractor were directly emanating from the successive delayed payments by the Employer and the disagreement about a new completion date. The effects resulting from their inability to agree on a new completion date aggravated the disturbance of the Contractor's financial status (represented in the grey gradient getting darker with time) which eventually imposed the realization of the self-financing of the contract during the reasonable time. In the second case study, the act of prevention consisted of successive technical changes related to design issues of hotel bathrooms over a long period of time. The set of circumstances were at the beginning related to design changes and then became operator introduced changes, whereas at a later point in time and after the time for completion had passed, the circumstances were mostly resulting from delays of complications and issues from authorities (late civil defense modifications, temporary current issues, more operator changes, testing and commissioning...).

As for the timing of declaring time to have become at large by the Contractor, it prevailed in the second case study later than that of the first case study. The reason being that the Contractor was more patient in the second case where there were more deliberations and discussions between the Contractor and the Engineer.

In the first case study, the Employer could not levy liquidated damages because of the exhaustion of the Contractor's financial capabilities. By contrast, in the second

case where the Contractor could have proven that the time risk structure lapses, the Employer did levy liquidated damages which led to a lower progress and induced financial difficulty towards the last couple of years of the project. As a result, the Employer then had to release retention money against a retention guarantee in order for the Contractor to be able to complete the Works.

One on hand, shortly after declaring time to have become at large, the Contractor in the first case study presented a prospective delay analysis showing a reasonable time of 20 days beyond the last presented time for completion. Nevertheless, the effect of self-financing of the contract was a limitation that made it almost impossible for the Contractor to produce any revised schedules with predicted completion target date as the theoretical model of this research suggest.

On the other hand, it seemed that the Contractor in the second case study could have maintained this routine or obligation to produce revised schedules (conduct prospective time analyses with new target completion dates) as the theoretical model suggests. He could have continued to produce prospective analyses showing target completion dates as he did for the 280 and then the 193 days, probably up until the point in time where the Employer levied liquidated damages leading to a lower progress on Site.

In both cases, the Contractor could have proven that the time risk structure lapses and therefore the burden of proof rests on the Employer. In order to demonstrate how the Employer's actions led to time being declared at large and finishing the works at the actual time for completion, the Contractor could have, to his best ability, illustrate and reflect the dynamics of the circumstances governing his progress in his schedule updates. As a result, when the Employer resorts to a retrospective analysis after the

completion of the Works in order to show what a reasonable time should have been, the Contractor would be able to counter-argue with a retrospective rationale based on what he produced as as-built schedules, data and records.

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1 Summary

In light of the discussion entertained in this research, cost and schedule overruns are bound to happen in construction projects. The Contractor and the Employer may face disagreements concerning the Extension of Time requests put forward by the Contractor, and in more severe cases, enter disputes which stretch even after the agreed Time for Completion. The Contractor may in some cases call time to be at large, which implies that the Time for Completion would be no longer applicable. In such cases, some contractual mechanisms may be rendered invalid. For instance, the liquidated damages clause will be rendered inoperable since there is no date from which the delay damages can be calculated. The time taken by the Contractor to finish the rest of the Works after calling time to have become at large, should be “reasonable” for both the Contractor and the Employer. However, realistic observations show that they are more likely to be in disagreement about the “reasonableness” of the time taken to complete the Works.

Had there been guidelines that explain how to compute such a reasonable time to complete the Works, the on-going dispute between the contractual parties could become easier to solve. Exploring the available literature resulted in basic simple guidelines to begin with when tempting to calculate such “reasonable time”.

There were two fundamental sources to rely on for this matter. The model proposed by Jaber (2013) outlined the different components which could feed into the time taken by the Contractor to finish the Works, such as the delays resulting from

factors like the financial status of the Contractor, seasonal constraints, resuming procurement, in addition to new arising Employer's risk events.

Pickavence (2006) on the other hand tackles this topic by identifying the two cases of the time risk structure remaining enforceable and the time risk structure lapsing. In the former case, the Contractor is responsible to prove that the overall reasonable time to complete the works is the Time for Completion in addition to extra time caused by Employer's risk events covered by the contract. In the second case, the burden of proof shifts to the Employer. An "overall reasonable" time would be the total time taken to complete the works minus the time consumed by events and matters that fall under the Contractor's control, or in other words are classified as acts of breach by the Contractor. Furthermore, contemplating several real-life cases of time-at-large situations taken up to arbitration showed that most judges have attempted to define the kind of circumstances which dictate the Contractor's completion date.

The first part of the research presents a critical synthesis of the literature which attempts to differentiate between an enforceable time risk structure and a lapsing one. Then, a study collects the different rulings of judges on time-at-large cases in order to settle on a unanimous or somehow common definition of the circumstances which govern the work of the Contractor and thus affect the time taken to complete the project.

The second part addresses the schedule administration matter in time-at-large situations. It is a compilation of the AACE protocol principles and FIDIC standard conditions of contract which promote the idea that the Contractor should maintain his contractual obligation of continuously producing schedule updates even after declaring time to be at large.

Based on the two previous discussions, the research then tackles the main goal of this study, and that is proposing a theoretical framework on the computation of what would be considered a reasonable time. The model takes into consideration the two conclusions made concerning the environment imposed on the Contractor as a result of the “circumstances” he is subject to, and the suggested guidelines on the schedule administration side of the dispute. And finally, as a validating tool, two recent case studies are presented with their chronological events and facts in a way which endorses the offered conclusions and guidelines supporting the suggested theoretical framework.

7.2 Conclusions

The following is a list of the conclusions stemming from this research:

1. If the burden of proof were to be assigned according to the status of the time risk structure, the duration of the project would have to be divided into periods which fall under the culpable delay of the Contractor and delay periods solely caused by the breach of the Employer.

2. For the period where the Contractor is the only one responsible for delay, the time risk structure remains enforceable, the burden of proof rests on him, and he can prove the reasonableness of the time taken to complete the works through a prospective or a retrospective analysis.

3. When the delay is resulting from the Employer’s act of prevention, the time risk structure lapses, the burden of proof shifts to the Employer, who can show through a retrospective analysis (As-Built But-For Analysis) that the time taken by the Contractor to complete the Works is unreasonable.

4. The duration figures as well as the start and end dates of the activities to be included in such analyses depend on the circumstances which exist at the time when the Contractor is performing his contractual obligations.

5. The AACE protocol principles and the FIDIC promote the idea that the Contractor should maintain his obligation of producing schedule updates. And since the circumstances governing the progress of the works are evolving, the best and most accurate approach would be for the Contractor to conduct a prospective analysis from the beginning by rescheduling his activities according to the dynamics of the existing circumstances and new emerging ones. In other words, he would be presenting a new completion target date with each schedule update.

6. When the time risk structure lapses, some Sub-Clauses may be rendered inoperable but the one stipulating for the requirements of the programme remains valid.

7.3 Recommendations

At the end of this study, I would like to recommend the following:

1. The Employer should be more careful in drafting the extension of time clause, for it is undeniably a shield that protects him from committing acts of prevention that justify the calling of time to have become at large by the Contractor.

2. The FIDIC guide should probably provide further clarification to the section about time-at-large in as far as it concerns the new Time for Completion (probably suggest more precise guidelines pertaining to the definition of “a reasonable time”, instead of the ambiguous existing requirement that the Contractor’s obligation would be to complete within a time which was reasonable in all the circumstances), the Sub-

Clauses that are rendered inoperable, and the contractual obligations of the Contractor that survive such calling.

3. The Contractor should keep his work schedules current and updated, especially when it is highly likely for the burden of proof to rest on his shoulders when it comes to demonstrating the reasonableness of the time taken by him to complete the Works in a time-at-large situation.

4. The Employer should be more active and vigilant in time-at-large cases by following up with the Contractor and requesting revised updates as he moves on with the Works.

7.4 Future Work

Future research may focus more on the practicability of the proposed theoretical framework by attempting to apply it to recent time-at-large cases, since the ones demonstrated in the last Chapter revealed that the financial condition of the Contractor can very well hinder him from applying prospective production of revised plans. More effort can be put into identifying the exact timing at which the circumstances governing the work of the Contractor start feeding into the delay analysis. In addition to this, upcoming investigation could attempt to quantify the aggravation of these circumstances with time, and how such values can be implemented into the time analysis in order to prove the reasonableness of the time taken to finish the Works.

7.5 Significance of the Research

The different parties to a construction project, in which time has been set at large, are likely to disagree whether the time taken to finish the works is reasonable or not. The importance of this work lies in providing Contractors and Employers a structured platform of guidelines, which they can rely on when dealing with the implications of time-at-large situations. More particularly, this research strives to help Contractors in the process of quantifying and defending the reasonable time taken to finish the execution of the works, in order to minimize the chances of having to alternatively resort to costly disputes resolutions means. In addition, the recommendations that are sought in this research concerning the administration of the construction work schedule under a time-at-large calling shall have the effect of allowing the Employer and engineer all reasonable opportunities to oversee the progress with the remaining works, leading to their completion within a continuously updated target date.

BIBLIOGRAPHY

- AACE International Recommended Practice No. 29R-03, Forensic Schedule Analysis, 2011.
- Abdul-Malak, M. A., Jaber, A. E., Multi-Layered Framework for Testing the Justifiability of Time-at-Large Callings, 2018.
- Abdul-Malak, M. A., Jaber, A. E., Project Conditions Justifying Time-at-Large, Resilient Structures and Sustainable Construction, ISEC Press, Greenwood Village, CO, 2017.
- Abdul-Malak, M. A., Khalife, S., Models for the Administration of Structured Construction Contract Notices, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 9(3): 04517017, 2017. DOI:10.1061/(ASCE)LA.1943-4170.0000228
- Abdul-Malak, M. A., Khalife, S., Classification and Analysis of Notice Requirements for Construction Contract Administration, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 9(3): 04517016, 2017. DOI:10.1061/(ASCE)LA.1943-4170.0000241
- Aibinu, A. A., Avoiding and Mitigating Delay and Disruption Claims Conflict: Role of Precontract Negotiation, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 1(1), pp. 47-58, 2009.
- Aibinu, A. A., Contractual Approach for Facilitating the Resolution of Dispute Over a Contractor's Failure to Comply with Time Limit for Notice of Delays, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 1(3), pp. 137-146, 2009.
- Arif, F., Morad, A. A., Concurrent Delays in Construction: International Legal Perspective, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 6(1): 04513001, 2014. DOI: 10.1061/(ASCE) LA.1943-4170.0000134.
- Assaad, R., Timing of Liquidated Damages Recovery and Related Liability Issues, 2017.
- Al Qady, M., Kandil, A., Stuckey, J. M., Mahfouz, T., Legal Review of Conditions Precedent to Dispute Resolution in Construction Contracts, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 5(1), pp. 27-34, 2013.
- Black, H. C., Black's Law Dictionary, B. A. Garner, ed., Thomson/ West, St. Paul, MN, 2004.

- Braimah, N., Understanding Construction Delay Analysis and the Role of Preconstruction Programming, *Journal of Management in Engineering*, 30(5):04014023, 2014.
- Brawn, D., Extensions of Time and Liquidated Damages in Construction Contracts in England and Wales, *International Journal of Law in the Built Environment*, 2012.
- Caplicki, E. V. III, Guidry, R. A., Liquidated Damages for Delay in Construction Contracts, *Construction Accounting & Taxation*, 16 (5), p.14, 2006.
- Chappell, D., The JCT Design and Build Contract 2005, 3rd Ed., Blackwell, London, 2007.
- Chappell, D., Understanding JCT Standard Building Contracts, 9th Ed., Routledge, London, 2012.
- Clause 22.1 of PAM 98 Form, Clause 26.1(a) of CIDB Standard Form of Building Contract (2000 Edition) and Clause 40 of IEM. CE 1/89.
- Davidson, R. A., Maguire, M. G., Ten Most Common Causes of Construction Contractor Failures, *Journal of Construction Accounting & Taxation*, 13(1), p.35, Jan/Feb 2003.
- Dobbin, R. T., Understanding Liquidated Damages: A Conversation with Construction Attorney, *Construction Accounting & Taxation*, 17(3), p. 19, May/June 2007.
- Fawzy, S., El-Adaway, I., Ahmed, M., White, R., Administering Extension of Time under National and International Standard Forms of Contracts: A Contractor's Perspective, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 8(2): 04516001, 2016. DOI: 10.1061/(ASCE)LA.1943-4170.0000182.
- Fawzy, S. A., El-adaway, I. H., Time At Large within the Common Law Legal System: Application to Standard Forms of Contract, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 6(1): 04513002, 2014. DOI: 10.1061/(ASCE)LA.1943-4170 .0000124.
- Gibson, R., Construction Delays: Extensions of Time and Prolongation Costs, London, Taylor & Francis, 2008.
- Harris, M., The Importance and Value of Notice Provisions in Construction Contract, Long International, Littleton, CO., 2015.
- Jaber, A., The Calling of the Construction's Contract Time to be at Large and Its Arising Obligations and Onuses (Master's Dissertation), 2013.
- Jaeger, A-V., Hök, G-S., FIDIC - A Guide for Practitioners, Springer, New York, 2009.

- Kazaz, A., Ulubeyli, S., Tuncbilekli, N.A., Causes of Delays in Construction Projects in Turkey, *Journal of Civil Engineering and Management*, 18(3), pp. 426-435, 2012.
- Kenley, R., Financing Construction: Cash flows and Cash Farming, 11 New Fetter Lane London EC4P 4EE, Spon Press, 2003.
- Khalfan, M.M.A., McDermott, P., Swan, W., Building Trust in Construction Projects, *Supply Chain Management: An International Journal*, 12 (6), pp. 385-391, 2007.
- Kheng, O. C., Extension of Time and Liquidated Damages in Construction Contracts, 2003
- Knowles, R., 150 contractual problems and their solutions, 2nd Ed., Blackwell, London, 2005.
- Lim, T., Essence of Time in Construction Contracts, *Australasian Journal of Construction Economics and Building*, 9(2), p. 1, 2012.
- Linares, T., Time at Large and Extension of Time Principles, *Expert's Corner: Project Value Delivery*, 2013.
- Lynch, B.G., "The Employer's risk?", *Building Journal Hong Kong, China*, June, pp. 66-9, 2003.
- Mansfield, N.R., Ugwu, O.O. and Doran, T., "Causes of delay and cost overruns in Nigeria construction projects", *International Journal of Project Management*, Vol. 12, pp. 254-60, 1994.
- Manzur, A., Ganesan, N., Mathews V., A Study on Delays in Construction Projects, *Applied Mechanics and Materials*, Vol. 857, pp. 24-29, 2016, <http://doi:10.4028/www.scientific.net/AMM.857.24>
- McNair, D., Position Paper on Liability. Retrieved from Dlapiper.com in 2011.
- Mewing, A., The Old Rule, the True Rule and Contract Administration Notices in Construction, *Building and Construction Law Journal*, 30(2), pp. 88–106, 2014.
- Miller, J., and Smith, K. C., Boilerplate Matters: Giving Notice. Corporate Practice Newswire, Chadbourne & Parke LLP, New York, pp. 40–41, 2012.
- Norazian, M. Y., Hamimah, A., Assessing Extension of Time Application in Malaysian Construction Industry: Views from professionals, *Procedia - Social and Behavioral Sciences*, Vol. 105, pp. 54 – 63, 2013.
- O'Connor, C. J., Q. C., and Laudan, D., Time at Large in Canada, *Journal of the Canadian College of Construction Lawyers*, Vol.71, 2011.

On Cheung, S., Hoi Yan Pang, K., Anatomy of Construction Disputes, *Journal of Construction Engineering and Management*, 139(1), pp. 15-23, 2013.

On Cheung, S., Wing Yiu, T., Are Construction Disputes Inevitable?, *IEE Transactions on Engineering Management*, 53(3), 2006.

Oon, C. K., Extension of Time and Liquidated Damages in Construction Contracts. Seminar on Construction Contracts and Arbitration, Ipoh, Malaysia, 18 October 2003.

Pilateris, P., McCabe, B., Contractor financial evaluation model (CFEM), *Canadian Journal of Civil Engineering*, 30(3), p. 487, Jun 2003.

Seeley, I.H., Quantity Surveying Practice, Macmillan, London, 1997.

Shabbar, H., Ullah, F., Ayub, B., Thaheem, M. J., Hamza, F. G., Empirical Evidence of Extension of Time in Construction Projects, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 9(3): 04517008, 2017. DOI: 10.1061/(ASCE)LA.1943-4170.0000217

Shen, L., Drew, D. and Zhang, Z., Optimal Bid Model for Price-Time Bi-Parameter Construction Contracts, *Journal of Construction Engineering and Management*, Vol. 125, pp. 204-9, 1999.

Snijders, C., Tazelaar, F., Dispute Resolution and Litigation in the Construction Industry. Evidence on Conflicts and Conflict Resolution in The Netherlands and Germany, *Journal of Purchasing & Supply Management*, Vol. 16, pp. 221-229, 2010.

Soren, L., Soren, W., Exploration of the Reasons for Delays in Construction, *International Journal of Construction Management*, 14(1), pp. 36-44, 2014. <https://doi.org/10.1080/15623599.2013.875267>.

Spittler, J. R., and Jentzen, G. H., Dispute Resolution: Managing Construction Conflict with Step Negotiations, *AACE Transactions*, D9, pp. 1-10, 1992.

S. P. Wong, P., Maric, D., Causes of Disputes in Construction Planning Permit Applications, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 8(4): 04516006, 2016.

Thomas, R., Smith, G.R. and Cummings, D.J., Enforcement of Liquidated Damages, *Journal of Construction Engineering and Management*, Vol. 121, pp. 459-63, 1995.

Totterdill, B. W., FIDIC Users' Guide: A Practical Guide to the 1999 Red and Yellow Books, Thomas Telford, London, 2006.

Trauner, T. J., Construction Delays: Understanding Them Clearly, Analyzing Them Correctly, Butterworth-Heinemann, Oxford, U.K, 2009.

Tuuli, M. M., Baiden, B.K., Badu, E., Assessment and enforcement of liquidated damages in construction contracts in Ghana, *Structural Survey*, Vol. 25, No. 3/4, pp. 204-219, 2007.

Tweeddale, A., FIDIC Clause 20: A Common Law View, *Construction Law International*, 1(2), pp. 27–30, 2006.

Vasilyeva-Lyulina, A., Onishi, M., and Kobayashi, K., Delay Analysis Methods for Construction Projects: Mathematical Modelling, *International Journal of Transportation*, 3(1), pp. 27–36, 2015.

Ying, O. R., Time at Large and Reasonable Time for Completion (Master's Dissertation), 2007.

List of case studies

Astea (UK) Ltd. v. Timegroup Ltd., EWHC 725, TCC, (2003)

Barque Quilpue Ltd v. Brown 2 KB 261, (1904)

Bethlehem Steel Corporation v. City of Chicago 234 F. Supp. 726, (1965)

British Steel Corporation v. Cleveland Bridge and Engineering Co., Ltd., 24 BLR 94, (1984)

Dunlop Pneumatic Tyre Co Ltd v. New Garage and Motor Co., Ltd., AC 79, (1915)

Holme v. Guppy, 3 M&W 387, (1838)

Mayfair Construction Company v. Waveland Associates Phase I Limited Partnership, 249 Ill. App. 3d 188, (1993)

Mike M. Johnson Inc. v. Spokane County, 150 Wn.2d 375, (2003)

Multiplex Construction Pty Ltd v. Abgarus Pty Ltd, 33 NSWLR 504, (1992)

Multiplex Constructions (UK), Ltd., v. Honeywell Control Systems, Ltd. (No. 2), EWHC 447 (TCC), (2007)

Neodox Limited v. Borough of Swinton and Pendlebury, 5 BLR 38, (1985)

Osceola County, Fl v. Bumble Bee Construction 479 So.2d 310, (1985)

Pantland Hick v. Raymond & Reid, AC 22, HL, (1893)

Peak Construction (Liverpool), Ltd., v. McKinney Foundations, Ltd., 1 BLR 111,
(1970)

Platt Pacific Inc. v. Bruce D. Andelson et al., 6 Cal. 4th 307, (1993)

Rapid Building Group Ltd v Ealing Family Housing Association Ltd. ,29 BLR 10, CA,
(1984)

Shawton Engineering, Ltd., v. DGP Group International, Ltd., EWCA Civ 1359, (2005)

SMK Cabinets v. Hili Modern Electrics Pty Ltd., VR 391, (1984)

Wise v. United States 249 U.S. 361, (1919)

