

DELAYS OF CONSTRUCTION PROJECTS - THE TRADITIONAL WAY OR THE HYBRID WAY?

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Abstract

Construction projects are a main economic catalysator and motivation for most developing countries. However, many infrastructure projects experience extensive schedule delays in their process. Unexpected increases in budget and schedule delays have become an integral part of construction projects in Israel and worldwide. At any given moment, millions of projects worldwide have one thing in common - the wish to succeed. A successful construction project meets its time, budget, and quality goals. Numerous comprehensive studies have found that about a quarter to a third of the projects fails, while the remainder range from failure to success (Powell-Smith and Stephenson 1989).

This paper, a working paper for a doctoral thesis, examines studies done in this area and suggests a new hybrid methodology of compliance with the schedules at construction project sites. Despite introducing changes in the characteristics of the project during the planning and execution stages in a VUCA world, complex and uncertain environments during construction projects can lead to schedule delays.

Keywords: *business management, project management, construction industry, changing reality, organizations change.*

JEL Classification: L23 L74 O22

1. INTRODUCTION

Construction projects worldwide suffer from budget increases and scheduling delays, becoming an increasingly worse phenomenon (Slevin & Pinto, 1986) due to frequent changes, significant decision-making dynamics, and rapidly changing global transformations. With the Covid-19 pandemic, problems arose in the worldwide supply chain that led to a rise in prices and delays in the

delivery of raw materials, which impacted project management processes and caused scheduling delays.

The result is that everyone involved in the project encounters unnecessary conflicts, inconsistent work methods and norms, and inefficient use of valuable time and resources. Construction projects are characterized by several significant milestones: characterizing needs, initial planning, detailed planning, tender writing, contractor selection, agreement preparation, initial building, and delivery.

There are several types of construction delays which can be categorized as compensable, which is due to the Owner; non-excusable, which is due to the Contractor; and excusable delays, which are expected to unforeseen events or situations that are not the fault of either side (Kraiem & Diekmann, 1987). Each type of delay has its implications, including who is required to cover the consequences of the delay and how to proceed. Regarding excusable delays, it is essential to anticipate some delays due to situations and events that neither side can be aware of during the scheduling. An adjusted schedule method is useful in determining how various delays can impact the completion date and how the schedule can be adjusted because of multiple situations.

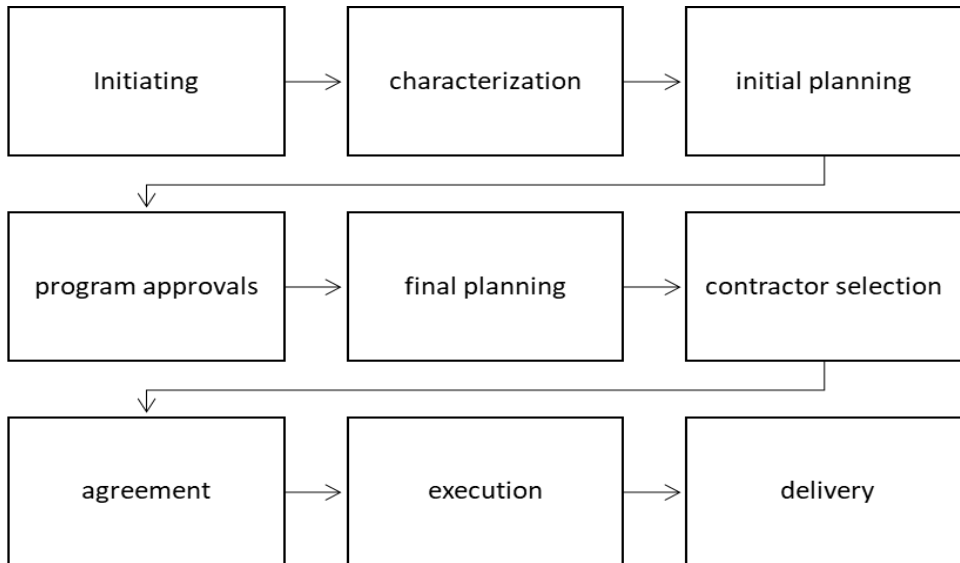
Wei (2010) found that the most effective ways to reduce construction delays and stay within the scheduled time frames are to enforce strict oversight and management, ensure strategic planning, and keep communication channels clear and open.

This paper examines compliance with a construction project schedule despite the introduction of changes in the characteristics of the project during the planning and execution stages of the Waterfall Model. The Waterfall Model is a classical project management model used in the system development life cycle to create a linear and serial approach (Royce, 1970).

The stages of work are serial and resemble how a waterfall must flow from a high to a low pool, hence the name Waterfall Model.

This Model strongly emphasizes the characteristics of all the requirements as a preliminary phase in project planning, a process carried out by the project developer who represents the business requirements on the part of the management. The main problem in the process is the inability to make design deviations without incurring high costs instead of the Agile methodology, which manages a project by breaking it up into several phases. It involves constant collaboration with the project's partners and continuous improvement at each stage. (Manifesto for Agile Software Development, 2001).

Table 1. Most the construction projects are managed according to the traditional Waterfall Model



Source: (Author's waterfall model, construction project's process, 2021)

Many individuals aspire to be entrepreneurs, enjoying the freedom, independence, and wealth that such a career suggests. And more giant corporations want to become more "entrepreneurial," their shorthand for the innovative and adaptive qualities they see in their smaller and often more successful competitors (A Perspective on Entrepreneurship, Farjad Mehdi, April 2006).

If the project's entrepreneur changes the plans or the SOW (Scope of Work), the project manager must go back to the programs and design all projects from the first step. That action changes the project's original T.L (Timeline).

In the 1990s, with the development of online platforms, the disadvantages of the process began outweighing its advantages. The internet allowed constant updates, and processes such as software updates, user reviews, and troubleshooting requirements were received immediately. These generated frequent changes in the product and priorities starting from the execution process. However, since the Waterfall Process relied on complete characterization from the beginning, any change requests became costly and cumbersome.

Effective project management is essential in industry-oriented projects such as construction.

A look into the literature can provide professionals who work in construction to prepare, schedule, and anticipate delays more precisely by using the data and experiences of others. Siddiqui & Faheem (2021) have designed a method of collecting and pre-processing data to statistically analyze the different parameters that can be used to recommend more appropriate schedule delay mitigation measures.

Isiket al. (2008) developed the PMBOK® Management Guide to improve project results. The Institute for Project Management guide includes processes, techniques, instruments, and skills (PMI, 2008). By applying these management techniques, project managers and project teams can improve their chances of success in various projects (Zwikael, 2009). Over the years, additional methods have been developed, such as Agile methodologies. That method is mainly based on the Manifesto for Agile Software Development (Beck et al., 2001). It underpins the belief that initial plans are not effective and that an evolutionary, iterative process is more efficient (Dybå & Dingsøy, 2008). These theories operated in the hardware and software rather than traditional building projects.

Agile Project Management differs from traditional projects and product management, such as the waterfall model, by emphasizing continuous design, flexible scope, living with uncertainty, constant customer interaction, and modifications in the project structure (Serrador & Pinto, 2015).

2. LITERATURE REVIEW

Many studies have been conducted regarding the factors that cause construction delays and increased budgets worldwide.

This review summarizes the leading causes of deviation in construction project schedules and budgeting in research and literature.

Assaf et al. [1995] conducted a field survey for identifying causes of time overrun in Saudi Arabia, which revealed 73 reasons broadly ascribed to owners, consultants, and contractors as labor shortage, delay in interim payment, change orders by owners during construction, delays in checking and approving the design documents, awarding contracts to the lowest bidder, incompetent human resources, among others causes.

Odeh et al. [2002] researched the causes of delays in Jordan by a survey consisting of 28 delay causes categorized into eight groups client, Contractor, Consultant, material, labor & equipment, contract, contractual relationships, and external factors. A ranking of causes based on RII was done, and results revealed the top reason by consultants and contractors as lousy contractor experience and low labor productivity, respectively.

Ahmed, S. M et al. [2002] conducted a study in Florida, the USA, for finding the causes of delays using survey data from general contractors. By the ranking, the data across six categories found that building permits approval,

change order, changes in drawings, incomplete documents, and delayed Inspections as the top five causes of delay.

Sadi A. & Al-Hejji [2006] found 73 causes of delay, which were identified by a field survey with three participating parties. The common causes of delay which all parties reported were [1] changing the order by the owners during construction to avoid delay, [2] delay in progress payment, [3] ineffective planning and scheduling, [4] shortage of labor, [5] difficulties in financing on the part of the Contractor. Towhid Pourroostam & Amiruddin Ismail (2012) surveyed to identify the causes with a questionnaire that cited 28 causes and six effects for delays. It highlighted the ten major factors which reduce the delays by clients, consultants, and contractors.

Similar results were found in another study in Mumbai, which indicated that a significant cause of construction delays resulted in owners' changes in design (Awari et al., 2016). However, additional factors included payments, price changes in raw materials and supplies, and shortages in labor and materials. The overall issues mainly involve financial difficulties, whether on the side of the Owner or Contractor. A secondary issue is changes in design and errors in the construction process. Delay of payments was also the predominant factor in construction delays in a Turkish study (Kazaz & Tuncbilekli), whereas environmental delays were the least influential. As Turkey is a developing country, the issues surrounding finances and cash flow seem to carry the most challenges. The overall issues mostly involve financial difficulties, whether on the side of the Owner or Contractor. A secondary problem is changes in design and errors in the construction process, especially in areas where the economy is less developed.

Acharya et al. [2006] reported frequent interruptions from the public, changed site conditions, failure to provide the required construction site, unrealistic project time estimation, and design errors as critical causes of delay in Korean construction projects among a survey of 208 respondents and 19 delay causes. Alaghbari et al. [2007], using Mean score and ranking, reported top five reasons for delay by contractors were financial problems, shortage of materials on-site, poor site management, construction mistakes, defective work, and delay in delivery of materials to site and coordination problems with others.

The top five reasons for delays by clients were financial problems, slowness in making decisions, contract modifications, lack of coordination with the Contractor, and lack of construction knowledge.

Owolabi et al. (2014) Investigated the causes and effects of delay on delivery time. A random sample of 93 was given a questionnaire structured in Linkert scale format. The results showed that clients have the highest value at 51.1%, contractors have 35.5%, then the consultants have 13.3% of causes of delay in a construction project. The 15 factors are identified and ranked according to the mean index score. The factors include lack of funds, adequate

information from consultants, slow decision-making, and insolvency of contractors.

Late issue of drawings, delay in progress payment by Owner, change orders, the slow decision by owners, and contractors' financial problems were the leading causes commonly reported by Rachid et al. [2019], Ahmad et al. [2019], and Prasad et al. [2019] who studied projects in Algeria, Jordan, and India respectively. Hossain et al. [2019] studied Kazakh construction projects and reported that contractors' related causes like poor planning, rework due to errors in construction, shortage of labor/equipment/materials, and delayed supply of materials were important delay causes. Bounthipphasert et al. [2020] studied road construction projects in Laos. They concluded that contractor cash flow, delayed payment by Owner, difficulties in financing project by Contractor, financial issues related to Owner, and defective equipment and vehicles for the work as the top five causes of delay.

Most construction industry organizations cannot finish the projects within the agreed time frame (Caven, 2012). It represents the factors that delay the project in civil engineering and building projects. Project management staff in the construction industry takes more time than the state before starting the project. It is one of the significant issues in the corporate sector. Harris et al. (2013) stated that completing the project within the timeframe is efficient in the construction industry.

3. DISCUSSION

In the construction industry, execution delays mean exceeding the length of performance from the date specified in the contract or beyond the agreed-upon date for delivery of the project. The uncertainty leads to financial implications (Lo et al.).

Outstanding claims relating to time are a Contractor requirement for an extension during the project or an extension for a particular activity beyond the agreed-upon duration and define the delay in executing the project and its cost. These claims are widespread. In Nigeria, for example, the construction industry's performance in terms of meeting schedules was poor, and seven in ten projects had suffered delays in execution. A similar proportion of projects ending in exclusion was also found in Saudi Arabia, with only 30% of construction projects completed on time, and the average exception duration is 10-30 % (Soon & Sambasivan, 2007).

Execution delays are also common in construction projects in Hong Kong and result in lawsuits and budget irregularities (Lo et al., 2006). Soon & Sambasivan (2007) found a correlation between the causes of time anomalies and the causes of budget irregularities which quickly lead to disputes, lawsuits, arbitrations, and courts. Kaming et al. (1997) dealt with the relationship between

budget deviations and time anomalies and, even more importantly – found a strong connection between their factors. However, budget deviations were found to be more common than time anomalies. In conclusion, while most projects suffer from the two "diseases" together, there are no projects that suffer only from time-lapses without budgetary implications. Research categorizes delays into four primary ways:

- Critical or Noncritical delays
- Excusable or Non-excusable delays
- Compensable or Non-compensable delays
- Concurrent or Non-concurrent

Figure 1. Delays that affect the duration or completion of the project are critical.

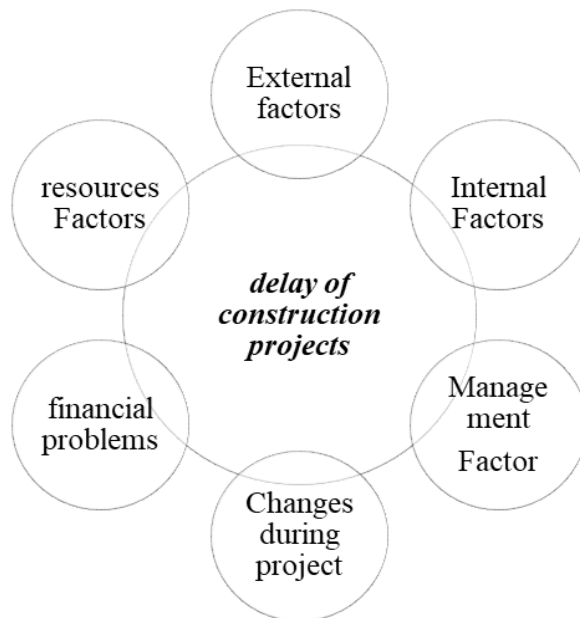


Figure .1 Causes for construction delays, Ahmed et al. (2003)

3.1 The main reasons for the delay in constructions projects in most of the literature:

External factors: external factors that influence the delays are - Government laws, global supply chain, permits, weather and unforeseen events, and accidents. The literature indicates external factors that may affect the performance and schedules of construction projects in terms of time.

A comprehensive agreement among all scholars and researchers that the external factors are unfamiliarity & changes with local laws, construction permits, social & cultural factors, and weather conditions (A. Assaf & Al-Hejji, 2005; Doloi et al., 2011; Jarkas et al., 2014; Sambasivan & Soon, 2006; Frimpong et al., 2002). In more articles, the external factors have been ranked first in the overall top causes of time overrun (Alnuaimi & Almohsin, 2013). When they studied projects from 2007-to 2008, weather conditions were the first factor contributing to delays. Another external factor that has to do with laws and permits, Elawi et al. (2015) found "land acquisition" is the first ranked cause that contributes to delaying the project's completion date in Mecca-Saudi Arabia.

Internal Factors: technical and design, change in characteristics, company strategy, cost overrun.

Management Factors: leadership, communication & safety, organizational changing structure. Construction projects can sometimes proceed for more than two years, and changes may occur within the organization. The changes can be in the organizational structure, the administrative decisions, the initial budget given to the project, and the organization's strategy. Sometimes a project can be canceled entirely due to these changes.

Changes during the project: design issues, new consults

Even if the construction contractor could absorb minor changes while construction, principal, and multiple modifications will affect the progress of the project because the Contractor must spend time on alterations and changing course rather than the original plan of the project, the probability of the changes in design during engineering phase is high, and that could be because there are many interfaces involved at this stage. Different vendor inputs are needed as well as client input and intervention. Therefore, changes may come from the design company, the vendors themselves, or even the owners.

Financial problems: cash flow, company finance problem, prices increase, financial claims, lawsuits. Although the design is usually the cause of variations in the project and is often undesired, owners are obligated to implement them to complete the project promptly and with adequate quality. Moreover, typically these changes are agreed upon by all parties, especially between the Owner and the main construction contractor. As noted above, one of the effects of variation is legal claims. Alnuaimi et al. (2010) found that financial claims were the second most prevalent factor of interpretation after the effect of the time delay of the project. Also, Desai et al. (2015) mention that financial claims mainly originate from variations as time delays lead to legal claims. Moreover, legal claims are one of the main factors of project delays and budgeting issues (Alnuaimi & Almohsin, 2013; Memon et al., 2011).

Resources Factors: Material, equipment, and human resources. Project resources are the people, capital, and material goods required for a project's successful execution. During a construction project, resources must be identified

and allocated by frequent changes. The resources include the internal and external teams and managers.

Every activity in the project's activity list needs to have resources assigned to it. Before posting resources to the project, availability must be checked. Resource availability includes information about what resources can be used on the project, when they're available, and the conditions of their availability.

4. CONCLUSION

In the construction industry, a delay in execution means exceeding the performance length from the specified date in the contract or beyond the agreed-upon date for project delivery. The uncertainty leads to financial implications (Lo et al., 2006). Outstanding claims relating to time are the Contractor's requirement for an extension during the project or an extension for a particular activity beyond the agreed duration and define the delay in executing the project and its cost. Delays in the project schedules directly affect the project's budget, and the issue can become political in public projects.

In a dynamic world that changes daily, flexible methodologies are needed to manage traditional construction projects. Construction projects are usually executed in the Waterfall Model, but procedures must be incorporated from the Agile method.

This article outlines the problems that cause delays and the need to make construction projects flexible, fast, and suitable for frequent changes.

According to various researchers, the following recommendations can be made to minimize the delays:

- Prepare effective planning and scheduling
- Proper site management and supervision
- Using up-to-date technology
- Procurement of material
- Coordination between the parties involved in the project
- Use of adequate construction methods
- Estimate the initial cost for the projects
- Owners should make decisions quickly
- Progress payment should be made on time
- Manage the financial resources

Delaying schedules in construction projects is global and relevant worldwide, from India, Malaysia, Europe, the United States, to Israel. According to the literature, the main reasons for the delay in schedules in the project are frequent changes on the part of the work order, an estimate of cost and lack of budget in the project, the problem of raw materials and supply chains, and resource management in the project.

The Agile methodology is a way of managing a project by breaking it up into several phases. It involves constant collaboration with the project's partners and continuous improvement at every stage. (Manifesto for Agile Software Development, 2001).

By adopting the Agile method to traditional construction projects, the project can be divided into short sections to track and manage changes while in the project and not long after, to make quick decisions in conjunction with stakeholders and entrepreneurs, and after making these decisions to move on to the next step.

We live In a VUCA world ((short for volatility, uncertainty, complexity, and ambiguity).

A reality that changes daily and brings many challenges to the owners, contractors, consults, and project managers. It is necessary to make quick decisions in short intervals and not expect the project's initial planning to be relevant even after long, often years of execution.

References

- 1) Abdalla M. Odeh & Hussien T. Battaineh (2002), "Causes of construction delay: Traditional contracts." *International Journal of Project Management*.
- 2) Abdul-Malak, M. A., El-Saadi, M. M., and Abou-Zeid, M. G. (2002). "Process Model for Administrating Construction Claims." *Journal of Management in Engineering*, 84- 94.
- 3) Adams, J. R., and Barndt, S. E. "Behavioral Implications of the Project Life Cycle," in *Project Management Handbook*, ed. Cleland, D. I. and King, W. R. (Van Nostrand Reinhold. New York, 1983), pp. 222-244.
- 4) Aftab Zahaeed Menon., Ismal Abdul Rahman., MohdRazaki Abdullah., Ade Asmi, Abdul Aziz., "Time overrun in construction projects from the perspective of a project management consultant (PMC)", *Journal of Surveying, Construction, and Property*, 2011, vol-2, issue-(1), pp. 54-66
- 5) Alexander Schuhmacher and Oliver Gassmann and Markus Hinder: The present and future of project management in pharmaceutical R&D, "Drug Discovery Today" (2020)
- 6) Arditi, D. (2012). *Construction Quality Management: Principles and Practice*. *Construction Management and Economics*, 30(6), pp.500-501.
- 7)
- 8) Awari, S., Jamgade, M., & Patil, U. (2016). Identifying the cause of delay in the construction industry in the Mumbai region. *International Journal of Modern Trends in Engineering*, 2(7), 539-543.
- 9) Caven, V. (2012). *Organization Management in Construction*. *Construction Management and Economics*, 30(6), pp.494-496.
- 10) Chester, M. and Hendrickson, C. (2005). "Cost impacts, Scheduling impacts, and the Claims Process during Construction". *Journal of Construction Engineering and Management*, 102-107.

- 11) Felipe Albuquerque and Alvaire Silveira Torres and Fernando TobalBerssaneti (2020) "Lean product development and agile project management in the construction industry"
- 12) Harris, F., McCaffer, R. and Edum-Fotwe, F. (2013). Modern construction management. Hoboken, N.J.: Wiley-Blackwell.
- 13) Johnsson, H. (2012). Construction Purchasing and Supply Chain Management. Construction Management and Economics, pp.1-2.
- 14)
- 15) Kazaz, A., Ulubeyli, S., & Tuncbilekli, N. A. (2012). Causes of delays in construction projects in Turkey. Journal of Civil Engineering and Management, 18(3), 426-435.
- 16) Owolabi James D, Olusanya, etc., (2014) "Causes and Effect of delay on project construction delivery time."
- 17) M. steven Palmquist and Mary Ann Lapham and Timothy Chick and IpekOzkaya "Parallel Words: Agile and Waterfall Differences and Similarities" (October 2013) Margarita BOGDANOVA, Evelina PARASHKEVOVA, Mariela STOYANOVA, Agile Project Management in Public Sector – Methodological Aspects, Journal of European Economy (2020)
- 18) Nathan Bennett and G. James Lemoine (Harvard Business Review, 2014)
- 19) Powell-Smith and Stephenson Some building contract problems, 1989 Sadi A. Assaf, Sadiq Al-Hejji (2006), "Causes of delay in large construction."
- 20) Salgado, E. G., &Dekkers, R. (2018). Lean product development: nothing new under the sun? International Journal of Management Reviews, 20(4), 903–933.
- 21) Schaffhauser-Linzatti, M. (2012). Construction Management: Subcontractor Scopes of Work. Construction Management and Economics, 30(9), pp.812-814.
- 22) Shokri, S. and Haas, C. (2012). Risk Management for Design and Construction. Construction Management and Economics, 30(8), pp.711-713.
- 23) Slevin and Pinto, (1986, pp. 57-58), From the article "The Project Implementation Profile: New Tool for Project Managers," which appeared in Project Management Journal, September 1986.
- 24) Siddiqui, M. A. W., & Faheem, M. I. (2021, May). Schedule Delay Modeling of Large Infrastructure Projects in India. In International Conference on Structural Engineering and Construction Management (pp. 1031-1041). Springer, Cham.
- 25) Sweis, G., Sweis, R., Hammad, A. A., & Shboul, A. (2008). Delays in construction projects: The case of Jordan. International Journal of project management, 26(6), 665-674.
- 26) Towhid Pourrostan and Amiruddin Ismail (2012) "Causes and Effects of Delay in Iranian Construction Projects"
- 27) Wei, K. S. (2010). Causes, effects, and methods of minimizing delays in construction projects. A project reports.
- 28) Yawop Frimpong., Jacob Oluwoye., Lynn Crawford., "Causes of delay and cost overruns in construction of groundwater projects in developing countries: Ghana as a case study", International Journal of Project Management, 2003, vol- 2, issue-(1), pp. 321-326.