In-Depth Analysis of Factors Influencing the Construction Projects Success – A Review Study

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Abstract

The construction industry is critically influence by factors affecting projects duration, such as labor productivity, material management, design change, cash flow and weather conditions. Understanding these elements is vital for effective projects planning and management, given their significant impact on costs and resource allocation. This literature review aims to systematically analyze the existing body of research to identify and evaluate the factors that influence construction projects duration, thereby a comprehensive understanding useful for project management and stakeholders in minimizing delays and optimizing performance. A thorough review over 88 published articles from diverse geographical context was conducted. Studies were selected based on their relevance to construction time estimation, factors on key themes, including labor dynamics, material management, design changes and technological impacts. The review highlights labor productivity as a primary determinate of projects duration, with poor supervision leading to time overruns. Additionally, the integration of modern technology and IT system enhance resource management, leading to timelier projects completions. Changes in design and inadequate cash flow are significant disruptors, contributing to projects delays cost overruns. Weather conditions and climate changes also directly impact construction construction timeline. The finding underscore the complexing of managing construction projects timelines in different environments. Enhanced planning supervision and the adoption of modern technologies by very important in reducing project duration and improving efficiency. These insights provide a foundation for developing strategies that address the unique challenges of construction projects management.

Keywords: *Construction duration, labor productivity, material management, design changes, modern technology.*

1. Introduction

Construction duration, often referred to as the construction time or project duration, is the amount of time it is expected to take to complete a construction projects. It is a critical factor in project planning and management, as it directly affects the project's schedule and can have a significant impact on costs and other resource. There are many factors that contribute to time duration in construction projects. Time duration occur in very construction project and the magnitude of this time duration varies considerably from project to project. Time duration has been the focus of many studies in both the academy and the industry. In other words, time overrun is a common issue that frequently happens in construction projects worldwide [1], Generally, time overruns happen when a task within a project is not completed by the time the project plan specifies. Meanwhile, cost overruns occurs when the expenses required to complete a project exceed the amount budgeted [2]. A construction project is commonly acknowledged as successful when it is completed on time, within the time, in accordance with specific cations and to stakeholders' satisfaction. In the construction industry, contractors tend to maximize their profit for market growth. To achieve this aim, it is crucial for contractors to carefully identify the factors that affect the success of a project and estimate their impacts before bidding stage [3].

One of the problems of accurately estimating the time duration of construction projects is limited information on the project and the project environment. Around the world, many studies showed that one of the major issues faced the construction projects is time overrun. In construction industry is rare that a project is completed within planned duration. Construction time estimate overrun is widespread in most projects all over the word. Some overrun may happen in the preconstruction phase which is defined as the period beginning of the project to signing of the contract between the owner and contractor. However, some of them may happen in the construction phase or when construction is under way. Nowadays the time duration is one of the main criteria when judging whether a construction project is a failure or not 6. Factors affecting the work estimation time will be reviewed from different literature sources and published significant paper. The literature review consists of more than 88 research published articles identifies related to this topic using comprehensive literature research.

2. Literature review

Factors affecting the work estimation time will be reviewed from different literature source and published papers.

2.1 Construction material

Material management is a process for planning, to ensure the availability of construction material at their point of use when needed and to ensure that right quality and quantity of material are appropriately selected, purchase, delivered, and handled onsite in a timely manner and at a reasonable cost. If materials are purchased too early, interest charges on the excess inventory of materials and materials may deteriorate during storage [4]. The effect of construction material can have major impact on time estimation. In a

study performed in Nigeria, it was concluded that effective management of material in construction projects would reduce the amount of waste generation, increase the quality of construction work, and result in optimum profitability to construction contractors [5].

Construction material for work can have a major impact on time estimation. In a study performed in Nigeria, it was contributed significantly to the cost of any project. Material wastage thus has a negative impact on construction costs, contractor's profit margin, construction duration and can be a possible source of dispute among parties to a project [6] . Construction material foe work can have a major impact on time estimation. In a study performed in Italy, it provided that the main goal of materials management is to ensure a smooth flow of material from the time the materials are ordered until they are used. In order to make materials management on site effective, a proper integrated material handling process that include the planning, identification, procuring, storge, receiving and distributing of material, should be in place [7].

Construction material for work can have a major impact on time estimation. In a study performed in India, it was observed that only large firms use typical protocol and software for material management, hence they faced minimum problems. On the hand medium and small firms lack behind in material management as they don't use any software, or they aren't aware of material management techniques [8]. Material management is an important function in order to improve productivity in construction projects. In a study conducted in UK, it provides clearly important to manage all materials from the design stage to the construction stage. Poor handling of construction material affects the overall performance of construction projects in terms of time, the wastage of material should also be minimized during construction in order to avoid loss of profit foe construction companies [9].

.In a study performance in Kuwait, it was found that for most of the study projects the delivery of materials was accompanied within the agreed price, while less than one half of the projects received their materials on time. Nearly one-fourth of the total project delays were due to the late delivery of materials. Increases in the price of material accounted foe between 13 and 14 percent of the total project cost overruns . [10]. A study carried out by [11] on material and equipment procurement delays in highway projects in Nepal pointed out the significant contribution of material to project performance. . [10] Examined and quantified project related variables affecting the on time delivery of material to the construction site, the material selection time, type of material, their availability in the local market and presence of a supervising engineer all have significant impact on time delivery of material to construction sites. Construction activities are usually done in stage. Each stage depends on the completion of the previous activity. Late completion in an activity can affect the start time of the next activity. Hence, adequate activity planning is required for efficient material logistics on site [12].

2.2 Construction productivity

Material productivity for work can have a major impact on time estimation. In a study performed in Indonesia, it was determined that the groups of factors that give high effect are supervision, material, execution plan and design also equipment factors have high effect [13] . Construction productivity for work can have a major impact on the time estimation. In a study performed in UAE, it was provided that the most significant factors affecting construction productivity in the UAE have been established as work timings, competent supervision, group dynamics, control by procedures, availability of material and climatic conditions [14].

. Construction productivity for work have a major impact on the time estimation. In a study performed in Libya, the result indicate that 10 main top factors negatively affecting labour productivity, which are : lack of labour supervision, experience and skill of labour, construction technology, coordination among design disciplines, errors in design drawings, delay in responding to requests for information, rework , lake of incentive scheme, working overtime, and construction manager's lake of leadership [15].

Construction productivity for work can have a major impact on the time estimation. In a study performed in Singapore, it was founded that the major problem with labour productivity in Singapore are recruitment of supervisors, recruitment of workers, high rate of labour turnover, absenteeism at the workplace, communication with foreign workers, and inclement weather [16]. In most construction site, the best possible performance is unachievable with poor productivity resulting in time overrun and consequently cost escalation of the projects, according to [17].

Previous research efforts have focused on labour productivity measurements and the improvement of profitability through the working environment. Also in Nigeria, several research works have been undertaken to determine the causes and implication of time overrun on construction sites. However, the current study attempts to establish the relationship between time overrun and labor productivity on construction sites. The main objectives include identifying the major causes of time overrun on construction site, determining the factors that affect labour productivity on construction projects and develop a predictive model that will determine the impact of labour productivity on construction site on time overrun on construction site [18].

[19] Stated that labour is success key to any construction project and enhancing construction productivity is the main issue to increase profit and to complete projects on time. In his study [19] found a strong relationship between labour productivity and rework in construction projects. The researched calculated that lake of manpower experience causes mistakes and misuse of resources that negatively affect productivity. Overall, he indicated that the main factors affecting labour productivity in construction projects are lack of experience, rework, delay in payment, mistakes, and material shortages. Trinidad and Tobago are the countries that groups under South American. [20] said that the construction Labour productivity is also one of the important issues in Trinidad and Tobago. Poor Labour supervision will lead to poor Labour performance on the completion time and scope of work of the construction project.

[21] Since workflow variation is significantly correlated with labor productivity performance, the party who caused work flow variation should also be responsible for the reduced productivity. Applying the workflow variation analysis in labor productivity claims can help contractors and owners reach an agreement on who caused productivity losses and who should be responsible for it. Therefore, it can help save time duration on construction projects.

2.3 Workers motivation

Construction worker's motivation foe work can have major impact on the time estimation. In a study performed in Thailand, The needs of Thailand construction workers: mainly higher pay, better accommodation, good welfare, and safety [22]. Construction workers' motivation for work can have major impact on the time estimation. In a study performed in Jordan, motivation models, worker environment/culture, worker incentive and empowerment, worker management [23].

Construction workers' motivation for work can have major impact on time estimation. In a study performed in Hong Kong, it was identified that motivation in the construction industry depends on the relationship between hygiene factors, motivators, extrinsic and intrinsic rewards and some demographic factors like age and industry experience [24]. Construction workers' motivation for work can

have major impact on time estimation. In a study performed in Ghana, to have the right people who are capable of delivering company strategies it is important for employers to put in place good strategies and the resources that employees will embrace in order to be committed to their job and makes their job look like a hobby to them [25].

Motivating project team is highly required for achieving timely completion of projects. Well-motivated workers are promoted to use their highest efforts and thus significantly play a vital role in achieving the timely completion of projects. Motivation inspires the workforce to enhance their performance and hence improve project performance. Well-motivated employees exert more efforts towards achieving the firm's goals through good performance [26]. They continuously look for better ways of efficient work execution to enhance performance. Therefore, project managers should understand the aspects of human behavior to continuously motivate the project team members [27].

Previous studies by [28] and [29] emphasized the importance of appreciation to motivate construction project team members because people need to be respected and their achievements to be appreciated. In addition, appreciating employees for their good work significantly motivates them, makes them work harder, and to be more loyal to the company which can effect on dime duration on construction project. Achievement motivation is defined as the ability that inspires people [30]. [31] identified achievement as the most significant motivator for project engineers in India, followed by appreciation. Also, [32] found that achievement is ranked the second important motivator after salary in the construction industry in Nigeria.

Construction workers' motivation for work can have major impact on time estimation, [33] studied the impact of human factors on the productivity of construction projects in South Africa, which were motivation, skill development, communication, leadership and organizational culture factors. Construction workers' motivation for work can have major impact on the time estimation, [34] studied that the productivity of construction project workforce is associated with motivating them. They also emphasized the significance of motivating workforce because the quality of their performance depends primarily on motivation. Therefore, motivation enhances the productivity of the project workforce. Considered job security as a significant motivator especially for younger employees. [35] found that job security is the most significant factor that influences construction workforce in South Africa.

2.4 Design changes

Changing design for work can have a major impact on time estimation. In a study performed in UK, it was provided that the most common causes of design changes cited by previous researchers was change of requirement or specification by the client. Client's requirements often change during a project for a variety of reasons [36]. Changing design for work can have a major impact on time estimation. In a study performed in Malaysia, it was provided that the design changes caused rework in construction projects while rework is the prevalence cause of loss in productivity. These frequent design-related rework generate costly ripple effects that create delay and disruption to the project life cycle performance which eventually lead to cost overruns and schedule delay [37].

According to [37], the detrimental direct effects of design changes on project performance are rework, schedule delay resulting in longer project duration overruns from the additional resources and wastage involved. Changes in construction projects are very common and likely to occur from different sources, by various causes, at any stage of a project, and may have considerable negative impacts on items such as costs and schedule delays. A critical change may cause consecutive delays (time overrun) in project schedule, re-estimation of work statement, and extra demands of equipment, materials, labor, and overtime [38].

Design change resulted up on considerable negative impacts on items such as costs and time duration. A critical change may cause consecutive delays (time overrun) in project schedule, re-estimation of work statement, and extra demands of equipment, materials, labour, and overtime [39]. Change orders have long been an inherent part of this industry. It is hardly found that a construction project is completed without a change that generally arises as a result of causes attributed to the diverse parties involved in the execution of the project. Once, it has been recognized that the change is formally regulated by issuing an amending order that may have an impact on duration of the project [40].

A fact of life for a construction project is change. Changes may be small, well managed and have little effect on construction projects. On the contrary, the changes can be high, poorly managed and have tremendous negative effects on the performance of construction project, especially in terms of time [40].

[41] points out that poor management of internal and external risks along with unrealistic construction schedule, lack of proper intervention by clients, frequent design changes, shortage of labour and material, delay in approvals/permits and client's financial constraints are major cause of time overrun of UAE projects. In the work by [42], design change is defined as any change to the scope of the work as defined by the contract documents following the creation of legal relations between the principal and the contractor. Often the changes are no fault of the contractors. Design changes may occur in architectural, structural, plumbing and drainage, site works or other aspects of construction.

2.5 Cash flow

Cash flow for work can have a major impact on time estimation. In a study performed in Kuwait, It emerged that there are multiple reasons for different in cash flow in construction projects, including lack of technical skills, different meanings of specifications, incomplete information at tender stage, inadequate supplier management, and errors in project document. Resulting in differences affect all stages of construction projects, including acquiring inventory, raw materials, and paying salaries, causing delays in project completion time, lowering profit margins, and making it more difficult to acquire financial aid [43].

Cash flow for work can have a major impact on time estimation. In a study performed in India, it was determined that in construction industry, material cost comprises of almost 60% of the total project and thus, managing the material is beneficial for a positive cash flow [44]. Cash flow for work can have a major impact on time estimation. In a study performed in Canada, It was showed that "financial management", at 27.72%, plays the most important role in cash flow forecasting. Special caution must be taken in anticipating the following factors' occurrence in the project: change of progress, payment duration, financial position, project delay, improper planning and management, inability to manage change orders, and number of claims. These factors contributed very high percentages on cash flow risk compared with the other factors [45].

According to [46] and [47] the effects of irregular cash flow on construction projects comprise: effecting on time duration; capital lock-up; insolvency; litigation/arbitration; and project abandonment/failed projects. Contractors that do not manage their cash flow effectively will not be able to compete in the construction market. According to studies and investigations, a shortage of cash is a major factor in construction project failure that also can effect on time duration [48]. [49] which mentioned that the quantity, time, and distribution of cash flow are all important elements in construction projects success.

[50] Respondents indicated that the difference in cash flow affects all stages of construction projects, such as purchasing inventory and raw materials, and paying wages, causing delays in project completion time, lowering the profit margin, and increasing difficulties in obtaining financial aid. Cash flow for work can have a major impact on time estimation. [51] showed that the length of negative cash flow period determines the contractor's inability to complete a project. The longer the negative cash flow period, the more likely the project will be halted or terminated. Cash flow for work can have a major impact on time estimation. Contractors cannot survive in the competitive construction industry without effective cash flow management. Studies and investigations have shown that lack of liquidity is a major problem causing construction project failure and also effect on time duration [52].

Cash flow for work can have a major impact on time estimation. [53] indicated that forecasting cash behaviors over a project's duration is a crucial key for controlling project cash effectively. In addition, performing a thorough cash flow analysis for a project is necessary to eliminate or to minimize the possibility of financial failure.

2.6 Weather

Weather in construction work can have a major impact on time estimation. In a study performed in Nigeria, it was provided that in many construction activities, the weather is responsible for adverse effects such as stoppage, productivity loss, cost overrun and delay. Among various weather conditions, rainfall and hot and cold weather are regarded as the major factors that affect building construction [54]. Weather in construction work can have a major impact on time estimation. In a study performed in the USA, it was provided that many construction activities are highly sensitive to rainfall as this can reduce productivity (during the rainfall) and affect construction activities for several days afterward. Extremes of hot and dry weather can also affect human productivity (for example, due to the significance of thermal comfort), and the time needed to complete other aspects of construction activities which are sensitive to weather (weather sensitive activities) such as the delivery of materials such as masonry mortar, paint, seals and sealant, and equipment [55].

The construction industry is always facing with overtime in order to complete a project. The one of the factors delay in construction project is the weather condition in Malaysia, which have significant impacts on time duration on construction projects [56].
[57] they conclude that weather is one of the significant factors influencing construction labor productivity which can effect on time duration in construction projects. [58] Weather events pose major uncertainty factors that negatively impact construction projects' productivity and time duration. The construction industry is extremely vulnerable to delays caused by weather incidents due to the unpredictable nature of outdoor work in the field [59]. The susceptibility of construction processes to adverse weather conditions may result in appreciable time losses [60]. Weather events directly impact the ability to complete construction tasks [59].

Climate change can affect construction sector directly through weather and climate, but can also which can impact to time duration in construction projects [61]. Climate change has a strong impact on the different phases of the project lifecycle. The management practitioners should be researching localized risks of climate change and preparing their works for the predicted hazards which may include increasing temperature, rainfall, wind, mean sea level which can have a major impact on time estimation [62].
The effect of climate change as it poses a risk to projects it must be assessed and managed through the projects lifecycle [63]. Climate change is a highly weather dependent process. Unstable weather may cause time duration and damage to structure and raw materials [64].

2.7 Poor planning and management

Poor planning and management in construction work can have a major impact on time estimation. In a study performed in Jordan, it was provided that poor planning and management of the construction projects may lead to several negative effects on the duration and completion of projects. Construction delays and duration issues are frequently responsible for transforming productive ventures into losing projects. These delays can be reduced or prevented by an increased reprojects planning and successful project management as they are one of the most critical success factors of the construction project accomplishment [65].

Poor planning and management in construction work can have a major impact on time estimation. In a study performed in Nigeria, It was Provided that construction planning can ensure contractors get more profit on construction projects executed and this can be achieved in ways suggested by the respondents some of which are material wastage reduction, laborer's efficiency and on-time material acquisition which will speed up the quick completion of the construction work [66]. Poor planning, scheduling, and management: It is vital to plot the work before the implementation of the project for successful completion [67]. The contractors often fail to provide practical construction programs and work plans at the initial stage and due to which monitoring project progress becomes a time-consuming task [68] and [69] identifies that unrealistic contractual duration projected by clients affect the time performance due to inadequate time provided to the project managers to plan and forecast. Further, [68] identifies that contractor's incompetent site management delays the mitigation of on-site issues.

Using software on construction work can have a major impact on time estimation. In a study performed in India, it was provided that to make project completion on time we must assure proper plane also for proper planning we must use good tools and techniques for scheduling and tracking [70]. There are many risks that are encountering construction projects and threatening its operations. These risks are caused mainly by poor planning and management that affect the progress on time duration in construction projects [71].
The advantages of pre-project planning incorporate expanded benefit, higher quality and decreased hazard [72]. The efforts used up in this early venture stage influence the level of progress amid start-up and in the detailed outline and development stages [73]. This finding is upheld by [74], who utilized straightforward pre-project planning and management techniques to diminish introductory construction duration by 30%.

A construction project is normally recognized to be successful when it is finished within its budget, on its planning time and according to its standards and specifications [75]; [76], [77]. In the development and construction business, contractual workers and engineers tend to limit the duration of their ventures and amplify their profit to increase their construction market share and to provide this sector with successful progression and development. To accomplish this tendency, it is vital for project managers to deliberately recognize the schedules and plans of a project and measure their effects before the implementation stage [78].

2.8 Modern technology

A general motivation for the use of modern construction technology can be that more and more developers seek contractors that can construct buildings faster, in a more productive manner and even taller buildings. Therefore, it can be very beneficial to contractors to incorporate modern construction technologies into their construction processes. These technologies will help them in achieving this goal set by developers [79]. According to [80], the construction industry experiences many problems. These include the use of inappropriate technology and systems to plan, implement, control, and communicate.

[81], Define information as the data and messages that are transmitted between people within a communications network. Information needs are linked to the responsibilities of construction personnel [82], [82] study looked at information needs of specific team members and concluded that managers with good access to timely accurate information:

- Complete projects on time or reduce the duration of time to complete projects.
- Improve resource management.
- Improve plant productivity (equipment).

[82] Researched this area from a slightly different angle, looking at the information needs of specific construction personnel. His study found a wide array of functions within construction organizations and that information needs are inextricably linked to the management responsibilities of each member of the project team. He concluded that personnel who have good access to timely accurate information will:

- reduce or maintain project durations.
- make better use of resources.
- increase labor and equipment productivity.

As suggested by [83], technologies can provide the necessary strategies to achieve a better response to current and future demands and enhance performance and productivity in the construction industry. Case studies of technology implementation and evidence have shown that the application of the additive manufacturing (AM) or 3D printing in construction, for instance, has been found to be beneficial in terms of waste reduction, providing design flexibility and constructability, as well as saving manpower. Similarly, there are numerous productivity benchmark studies that show the tangible and intangible benefits of using building information modelling (BIM). For example, Stanford University's Center for Integrated Facilities Engineering suggested 7%, 40% and 80% reductions in project time and time spent on cost estimation, respectively [84].

[85] Investigated the use of modern electronic communication management systems, and how these systems affect the success of construction projects in the United Arab Emirates. Based on their case study results, electronic communication has a positive effect on time duration and decision-making. [86] investigated the use of IT and its impact on project and company Performance in the construction industry. They found that increased IT use is generally correlated with improved performance, especially for schedule performance. [87] also found that IT use is positively correlated with cost and schedule success at the project level.

Modern Technology for work can have a major impact on time estimation. In a study performed in Turkey, it was determined that the most important factor for implementing IT tools was determined as time saving in business processes. IT can significantly increase the speed of work; thus, the respondents see this as a very important benefit while doing business activities [88]. [89] examined the impact of IT on construction firm performance. Based on the analysis, they found that IT is positively associated with firm performance, schedule performance, and cost performance.

3. Result and discussion

The following section discusses the findings from literature review on factors affecting the time duration in construction projects. the findings from the literature review will be summarised and explained briefly.

- Labor productivity is highly affecting the estimation of work duration.
- Poor Labor supervision will lead to poor Labor performance on the completion time and scope of work of the construction project.
- Labor is success key to any construction project and enhancing construction productivity is the main issue to increase profit and to complete projects on time.
- The best possible performance is unachievable with poor productivity resulting in time overrun.
- Worker's motivation studies found that there is a significant relationship between Extrinsic Motivation and work Performance that can affect the estimation of work duration.
- The importance of appreciation to motivate construction project team members because people need to be respected and Their achievements to be appreciated.
- The significance of motivating workforce because the quality of their performance depends primarily on motivation. Therefore, motivation enhances the productivity of the project workforce.
- Considered job security as a significant motivator especially for younger employees.
- Design changes in building projects are common and a serious issue which also can affect the estimation of work duration.
- The detrimental direct effects of design changes on project performance are rework, schedule delay resulting in longer project duration overruns from the additional resources and wastage involved.
- Design change resulted in considerable negative impacts on items such as costs and time duration.
- Design change is defined as any change to the scope of the work as defined by the contract documents following the creation of legal relations between the principal and the contractor.
- Cash flow contributed very high percentages on affecting the estimation of work duration compared with the other factors.
- The length of the negative cash flow period determines the contractor's inability to complete a project. The longer the negative cash flow period, the more likely the project will be halted or terminated.
- Construction material management can have a negative impact on time as a result which will affect the estimation of work duration.
- Weather in construction activities is highly sensitive to affect the estimation of work duration.

- Weather events directly impact the ability to complete construction tasks.
- Climate change can affect construction sectors directly through weather and climate but can also impact to time duration in construction projects.
- There are many risks that are encountering construction projects and threatening its operations. These risks are caused mainly by poor planning and management that affect the progress on time duration in construction projects.
- The use of software may reduce the time needed for planning and management of the construction.
- Modern technology has a good access to timely accurate information:
    - Complete projects on time or reduce the duration of time to complete projects.
    - Improve resource management.
    - Improve plant productivity (equipment).
- Investigated the use of modern electronic communication has a positive effect on time duration and decision-making.
- Use of IT and its impact on project and company performance in the construction industry
    - especially for schedule performance
- Modern technology and IT effect on time duration and can significantly increase the speed of work in the construction industry.

4. Conclusion

In-depth review of construction project duration and how it is influencing factors points out the complexities which involved with timelines effective in project management. Through review and analysis of over 88 research studies, major influences such as motivation, material management, labour productivity, cash flow, modern technology have been identified as critical elements affecting the construction projects timelines.

The findings underscore that lack of motivation and poor planning and supervision among workers can substantially reduce productivity and lead to delays. Similarly, material management and late deliveries can have a negative impact on time duration. Unplanning design changes either due to investor requests or change of requirement it is preferable to know to minimize the impact on schedules. The state of a construction project's cash flow is a good predictor of it is financial health, also cash flow issues are a common cause of the failure of construction projects. It is necessary efforts to understand the important of cash flow by contractors to schedule project activities. They study highlighted that weather is one of the significant factors influencing construction projects specifically on labour productivity with regard to some variable such as wind and rain, humidity and temperature.

Using of construction technology would be a good benefit to the construction industry and can significantly increase the timeline of work in the construction sites, construction companies should invest in construction technology equipment and incorporate some form of construction technology into their construction process to assist their workers to enhance work efficiency and quality that can improve on the productivity.

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