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An expert analytical approach to reducing construction project delays from ineffective scheduling

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Abstract

The study investigated the effects of ineffective scheduling on the completion of construction projects; identified causes of poor planning and ineffective scheduling of construction projects by industry experts; and provided possible research solutions and industry experts recommendations to solve ineffective scheduling. Using a combination of online surveys, physical questionnaires, and statistical analysis, including the Relative Importance Index (RII), the Reliability Test, and the Statistical Package for the Social Sciences (SPSS). The analysis of factors influencing construction project scheduling reveals a hierarchy of challenges, with "Time Overrun" and "Cost Overrun" emerging as the most significant concerns, obtaining RII values of 0.8892 and 0.8246, respectively. The "Compromise of Project Quality," ranked third with an RII value of 0.8077, highlights the adverse effects of ineffective scheduling, where time constraints and rushed work undermine the quality of construction projects, potentially resulting in costly rework and repairs. Moreover, the research identified the top three recurring causes of ineffective scheduling, including "Poor Decision-Making Regarding Activity Criticality," "Lack of Finance for Project Execution," and "Lack of Expertise in Scheduling." Addressing these core issues is essential for stakeholders seeking to enhance scheduling efficiency and reduce delays. Additional influential elements, such as "Inaccurate Estimate of Materials Requirement," "Insufficient Project Details Available," and "Inadequate Knowledge of Project/Work Activities," also warrant attention in scheduling improvement strategies. These insights illuminate the critical areas requiring attention to enhance project scheduling practices and strengthen the construction industry's reputation. In conclusion, this research provides a comprehensive roadmap for stakeholders, offering practical steps to enhance construction efficiency and mitigate project delays through improved scheduling practices.

Nomenclature and units

1.0 Introduction

The persistent challenge of achieving timely and cost-effective project completion remains prevalent on a global scale, exhibiting a concerning trend of exacerbation over time (Alinaitwe et al., 2013).

Different aspects of the construction business can cause delays, which in turn can cause disagreements amongst the project's stakeholders. Different procurement strategies may differ in the degree of owner involvement in project control during construction, the owners' ability to make modifications during the execution phase, and the risk distribution between owners and contractors. (Salah, 2020).

According to Ahmed et al. (2002), a delay occurs when a construction project is not finished in the allotted time. It is regarded as one of the most prevalent issues in public construction projects globally, particularly in Middle Eastern nations where the economy heavily depends on the export of natural gas and petroleum (Le-Hoai et al., 2008). Delays can have a tremendous influence on construction companies, resulting in increased expenses, missed opportunity costs, reputation harm, arbitration, litigation and, in the worst situations, the outright abandonment of projects. According to Ki and Cheung (2011), there is a direct correlation between construction delays and both project performance and customer satisfaction.

Because of the growing complexity of the construction process, delays and claims are frequent. In the past, owners would assign contractors the majority of the risks. These hazards include unanticipated site conditions, inflation, accidents, low labor productivity, unfavorable weather, and a lack of resources and competent labor. As a result, construction contracts are getting increasingly complicated. In the construction sector, delays and lawsuits have grown commonplace. If this phenomenon is not effectively managed, it will slow down development and make many construction projects less successful (Salah, 2020).

One risk that frequently arises and has the potential to result in losses during a construction project's execution phase is project delay. Financial and economic issues, inexperienced contractors, consultants that take too long to supervise work, sluggish decision-making, utilizing the wrong consultants when giving orders, and a shortage of supplies are the primary risk factors for delays (Rauzana and Dharma, 2022).

The construction industry, which is project-centric (Kabirifar and Mojtahedi, 2019), is closely linked to urbanization and industrialization processes (Lopes and Abreu, 2011). According to Oladinrin et al. (2012), Nigeria's construction sector comprises a varied range of businesses dispersed throughout the country. Contractors are organizations involved in carrying out building projects (Abosede et al., 2019). This industry includes both the civil or heavy engineering sector (such as roads, drainage, bridges, tunnels, and railroads) and the building sector (such as commercial, residential, and industrial structures).

The construction industry is considered a key sector of the economy, responsible for transforming diverse resources into tangible structures through careful planning, precise design, and meticulous construction activities, in both developed and developing nations (Isa et al., 2013). The industry is often seen as a catalyst for economic growth, especially in developing countries (Oladinrin et al., 2012). This is primarily due to the interdependence of various sectors of the economy on the products and services provided by the construction industry, which facilitates the smooth execution of their respective operations (Osuizugbo, 2020). A contractor who assumes full responsibility for the project's completion, or as specified in the contract agreements, typically coordinates or performs the construction work. The construction industry contributes to a country's overall Gross Domestic Product (GDP) (Aiyewalehimi *et al*., 2019).

Approximately $10 trillion is spent on construction-related goods and services each year, making up 13% of the GDP and making the construction industry one of the biggest contributors to the global economy (McKinsey Global Institute, 2017). According to Essays UK (2018), less than 16 percent of Nigeria's GDP comes from the building industry. In Nigeria's construction sector, small contractors have grown to be significant players who help the nation's economy flourish, create jobs, and reduce poverty (Mafimidiwo and Iyagba, 2015).

Although the sector makes a substantial contribution to the prosperity of the country, it also faces a number of problems and difficulties, such as low productivity, disintegration, poor quality control, a lack of standards, and volatility (Osuizugbo, 2020; Soewin and Chinda, 2018).

According to Souvik et al. (2022), the existence of hangers, disregard for real resources, an outdated timetable, logical mistakes, and a lack of project information are the top five reasons for bad scheduling. Alabi (2018) conducted a study using Ibadan, Nigeria as a case study and identified a number of key factors that hinder project scheduling performance. These factors include: ineffective leadership, a lack of schedule contingency, a lack of support from project stakeholders in the development of the plan and schedule, contract violations, and a lack of resource leveling in the schedule. Ineffective scheduling is currently caused by a variety of variables that vary by state.

Many strategies that have only been of academic interest have been developed to cut down on delays and schedule overruns. Furthermore, research on the impact of time waste on reducing delays has either been negligible or restricted to particular segments of the construction industry (Ali and Arun, 2005). Errors beginning in the planning stages are primarily responsible for the observed delays, which go beyond the actions of contractors. These mistakes indicate a lack of vision, as scheduling procedures have not been well defined (Towhid et al., 2011).

According to Almutairi (2016), delays have been found to be a major source of issues in construction projects. These issues include lengthening the construction period, delaying the start of project use, and exceeding the budgeted cost during the planning and design phases of the project. Project timelines that exceed predetermined goals may jeopardize client satisfaction. The ensuing consequences may impact the construction sector and the nation's economy as a whole, particularly in developing nations where the construction sector's ability to provide the necessary infrastructure is a key indicator of wealth (Muya et al., 2013).

There is now an urgent need for revolutionizing construction practice, technology, mentality, work practice, and processes, and to maintain continuous improvement through effective benchmarking and performance measurements. Such a change

would ensure an advantage over conventional practice (Ibrahim *et al*., 2010). Reducing time waste is the key to minimizing delays. 'Delay' and 'Time Waste' are frequently used interchangeably by project managers. Time is wasted on internal operations. Therefore, if time waste is to be reduced or eliminated, a full understanding of each activity is necessary beforehand.

Scheduling projects with the aid of bar charts, milestone charts, the Critical Path Method (CPM), the Programme Evaluation and Review Technique (PERT), or even Critical Chain Project Management (CCPM) maximizes project value by planning the project to finish at the optimal duration and managing various activities judiciously.

Numerous issues, including those about labour, materials, equipment, finances, the environment, planning, and management, can create delays. Effective scheduling, a fundamental issue in construction, can reduce the time for specific tasks, increase resource efficiency, and thus maximize profits. Since the industry's survival depends on its improved capability and aptitude, all factors should be properly considered in the early stages of starting work to prevent or avoid time risks and minimize the occurrence of delays in subsequent projects. Numerous things influence a project's success. Controlling the project phases and maintaining a high-quality schedule are crucial in the interim.

Scheduling is one of the most important aspects of project management since it establishes when the project will be finished. Additionally, as the deadline needs to be estimated, the timeline and the project managers' trustworthiness are tightly related. Project expenses will rise and profit margins will fall if the project is not finished on schedule (Abolghasemian et al., 2021).

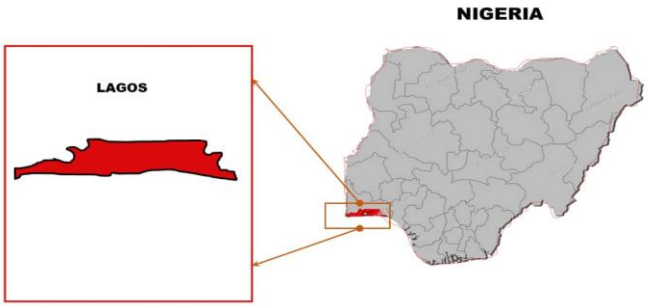
2.0 Materials and Methods

The Study Area

Lagos State is the most populous state in Nigeria and one of the fastest-growing cities in the world with an estimated 20 million people as of 2021. It is situated in the southwestern part of Nigeria, bordered by the Atlantic Ocean to the south. It covers an area of approximately 3,577 square kilometers (1,381 square miles). Geographically, Lagos State is located between latitudes 6° and 6°30' North and longitudes 3°22' and 4°42' East. It Lagos State serves as the economic and financial hub of Nigeria, attracting both local and international businesses. Lagos State has a significant population, estimated to be over 20 million people as of 2021. The population continues to grow rapidly due to factors such as rural-urban migration, high birth rates, and economic opportunities offered by the state (Jamie, 2016).

The construction industry in Lagos State, Nigeria, is a dynamic and rapidly growing sector that plays a pivotal role in the state's economic development and urban transformation. Lagos State's construction industry has experienced remarkable growth over the years, primarily driven by the state's urbanization, population expansion, and increasing infrastructure demands. The need for housing, transportation, commercial spaces, and modern infrastructure has fuelled construction activities. Lagos State has embarked on ambitious infrastructure projects to address the challenges posed by its rapid urbanization. These projects include road construction, bridges, railways, airports, and the development of new urban centres. The construction of iconic landmarks like the Lekki-Ikoyi Bridge and the Third Mainland Bridge underscores the state's commitment to infrastructure development. The demand for housing and commercial spaces in Lagos has led to a thriving real estate sector. Developers are constructing high-rise buildings, luxury apartments, gated communities, and mixed-use developments to cater to the diverse needs of the city's residents and businesses. The State has strategically developed commercial and industrial parks such as the Lekki Free Trade Zone, Lagos State Industrial Park, and the Dangote Refinery complex. These initiatives have attracted significant foreign investments and have the potential to transform Lagos into a regional economic hub. Investment in transportation infrastructure is a key focus area. The construction of modern roads, expressways, bridges, and the Lagos Rail Mass Transit (LRMT) system is essential for improving mobility and reducing traffic congestion in the state. Mixed-use developments are a growing trend, combining residential, commercial, and recreational spaces in integrated complexes. These developments promote sustainable urban living and enhance the quality of life for Lagos residents.

Despite significant progress, Lagos State still faces an infrastructure deficit, particularly in providing adequate housing, reliable public transportation, and essential utilities. Bridging this gap remains a challenge for the construction industry. Land acquisition and regulatory processes can be cumbersome and time-consuming, leading to delays in project execution. Streamlining these processes is crucial to expediting construction projects. The industry faces a shortage of skilled labour, especially in areas like project management, engineering, and specialized trades. Addressing this labour gap is vital for maintaining construction quality and efficiency. The construction industry in Lagos State is poised for continued growth and development. With increasing urbanization, a focus on infrastructure development, and a commitment to creating a conducive business environment, Lagos is likely to remain a hub for construction activities. The adoption of innovative construction technologies, sustainable practices, and public-private partnerships will be instrumental in shaping the industry's future and contributing to the overall progress of Lagos State. As the state continues to evolve, the construction industry will play a pivotal role in shaping its urban landscape and supporting economic growth (Aluko 2002; Ayedun and Oluwatobi, 2011). The map of Lagos State is presented in Figures 1 and 2.



Scale: 1:5
Orientation: S45°W

Figure 1: Map of Lagos on the Nigeria Map

Figure 2: Map of Lagos State Nigeria (Jamie, 2016)

Research Questionnaire

This study used a hybrid of open-ended and a close-ended questionnaire survey to make its findings. The open-ended questions allowed the respondents to give answers from their wealth of experience. The close-ended questions were adopted from previous literature. The developed questionnaire was distributed to industry players. They included project managers, engineers, quantity surveyors, etc.

Research Sampling Size

The survey sample size (n) for this research was determined using simple random sampling (SRS) method across each geopolitical zones of the country. In this approach, sampling is typically done without replacement to avoid multiple selections of the same sampling unit. The resulting difference in variance estimates for with- and without- replacement samples is negligible if the sample is a small proportion of the population.

The questionnaire sample size was calculated using the following equation:

$$n = {n^!}/{[1 + ({n^!}/{N})]} \quad (1)$$

where

N is total number of populations
n is sample size from finite population

n is defined as $= {S^2}/{V^2}$

where:

S^2 is the variance of the population elements.
V^2 is Standard error of sampling population (Mahmoud, 2012)

Data Collection

This study will employ an open-ended questionnaire to examine the reasons behind ineffective scheduling, compare the factors with findings from earlier research, and categorize the causes into groups that industry experts can easily remember.

This study collected data using a combination of online and onsite methods, making use of Google forms and physical questionnaires.

Online Survey through Google Forms

To reach a wide and diverse audience, an online survey was designed using Google Forms. Google Forms provided a user-friendly and accessible platform for respondents to participate in the study. The survey was thoughtfully crafted to gather comprehensive information related to project scheduling factors and other relevant aspects.

Participants were invited to fill out the survey electronically, which allowed for easy data collection from different geographical locations. The online approach offered the advantage of anonymity, encouraging honest responses from the participants.

Printed Questionnaires for Onsite Data Collection

In addition to the online survey, printed copies of the questionnaires were prepared for onsite data collection. This method was adopted to reach individuals who might not have easy access to the internet or prefer traditional pen-and-paper surveys. Project sites and relevant locations were identified, and trained research assistants were deployed to administer the printed questionnaires. This approach allowed for a diverse sample, capturing the perspectives of individuals who may have been excluded from the online survey.

Physical Visits to Project Sites and Construction Offices

In situations where online data collection was not the most efficient method, physical visits to project sites were carried out. These visits allowed researchers to directly engage with key stakeholders, project managers, and other personnel involved in project scheduling.

The in-person approach provided an opportunity for face-to-face interviews and discussions, enabling researchers to gather in-depth insights and clarify any ambiguous responses. It also fostered a stronger connection with the participants, enhancing the credibility of the data collected.

Transfer of Online Responses to SPSS

Upon completion of the survey, the responses were securely transferred to the Statistical Package for the Social Sciences (SPSS) interface. The seamless integration of Google Forms data with SPSS enabled streamlined data management and statistical analysis.

Data Analysis

This data analysis showcases a meticulous and comprehensive approach to assess the survey data. By employing the Relative Impact Index (RII), conducting the Reliability Test, and utilizing the Statistical Package for the Social Sciences (SPSS), a rigorous examination of the collected data was ensured, culminating in valuable insights that contributes significantly to the field. These methods underpin the credibility and validity of the research findings, empowering the research to make informed decisions and recommendations to advance construction project scheduling practices.

The Relative Importance of Index

The study adopted the Relative Impact Index (RII) as its primary method to measure the significance of factors affecting project scheduling. This statistical analysis approach has been utilized by various researchers in previous construction-related problems. The factors were ranked using the following formula:

$$\text{Relative Importance Index (RII)} = \Sigma (5n_5 + 4n_4 + 3n_3 + 2n_2 + n_1) \div 5 \times N \quad (2)$$

Where:

n is the constant responding weighting given to each factor by the respondents on a 5-point scale

n1 is the number of respondents giving the lowest rank of 1, indicating "strongly disagree").

N is the total number of respondents used in the analysis.

The RII ranges from 0.143 to 1, with a higher value indicating a greater impact of the factor. The level of significance for each individual factor is categorized as follows:

$0.143 \leq RII \leq 0.286$ (not significant)

$0.286 < RII \leq 0.428$ (somewhat significant)

$0.428 < RII \leq 0.571$ (moderately significant)

$0.571 < RII \leq 0.714$ (significant)

$0.714 < RII \leq 0.857$ (very significant)

$0.857 < RII \leq 1.0$ (extremely significant), (Kuldeep et al., 2022)

Reliability Test

To assess the internal consistency of the adopted scale, Cronbach's Alpha coefficient was utilized. A coefficient above 0.7 indicates the scale's reliability. The Reliability Test conducted in this research serves as a critical quality assurance step to validate the adopted scale's consistency and accuracy in measuring the intended constructs. Cronbach's Alpha coefficient, a widely recognized and extensively employed statistical tool, was chosen as the method to assess internal consistency. It evaluates the extent to which items within a scale correlate with each other, thereby indicating how reliably the scale measures the underlying construct. By examining the interrelatedness of items, the coefficient provides valuable insights into the homogeneity and reliability of the data collected. The formula for Cronbach's Alpha, denoted as α, is as follows:

$$\alpha = (N / (N - 1)) \times [1 - (\Sigma\sigma^2_i / \sigma^2_t)] \quad (3)$$

Where:

a is Cronbach's Alpha coefficient.

N is the number of items (variables) in the scale.

σ^2_i is the variance of each item.

σ^2_t is the total variance of the scale.

Cronbach's Alpha ranges from 0 to 1, with values closer to 1 indicating higher internal consistency and reliability of the scale. It measures the average correlation between all the items in the scale, reflecting how well the items collectively represent the underlying construct being measured. Higher values of α suggest stronger interrelatedness among items and greater internal consistency, thus increasing the trustworthiness of the scale's measurements.

In this study, a Cronbach's Alpha coefficient value exceeding 0.7 was set as the threshold for acceptable reliability. A coefficient above this threshold indicates that the items within the scale are strongly related to each other, demonstrating high internal consistency. Conversely, a coefficient below 0.7 would suggest potential issues with the scale's reliability, warranting further investigation and potentially the need for refinement (Kuldeep *et al*., 2022).

Statistical Package for the Social Sciences (SPSS)

Statistical Package for the Social Sciences (SPSS), was employed. SPSS is widely used for data management, statistical analysis, and data visualization, making it an essential component of this research project.

SPSS allowed us to efficiently input and organize the collected data, perform descriptive statistics, and conduct inferential analyses to draw meaningful conclusions. The software facilitated the interpretation of complex statistical results and presented them clearly and concisely.

3.0 Results and Discussions

Demographic Profile of Respondents

The analysis of respondent demographics, as derived from the questionnaire data, portrays a predominance of professionals within the construction industry. This group mainly comprised project managers, engineers, and quantity surveyors, all of whom are directly involved in construction projects. The respondents boast a wide range of experience in their respective fields. The survey gathered responses from a total of 130 participants, with the major representation coming from Project Managers, Engineers, and Quantity Surveyors, as depicted in Figure 3.

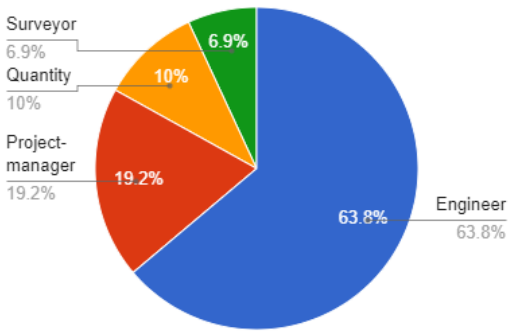


Figure 3: Respondents' Professional Background

Analysis of Activities Involved in the Effects of Project Delays

Table 1 shows the RII values associated with each effect of ineffective scheduling. The results were ranked in descending order based on the RII values, which allowed the prioritization of factors commonly encountered in project scheduling. All seven factors analyzed in this study have demonstrated significance in the context of construction project scheduling.

Table 1: Effects of Ineffective Scheduling

Effects of Ineffective Scheduling of Construction Projects	Total	RII	Category of significance
Time Overrun/ Delays	578	0.8892	ES
Cost Overrun	536	0.8246	ES
Compromise of project quality	525	0.8077	ES
Client relations breakdown	522	0.8031	ES
Dissatisfied clients	519	0.7985	VS
Risks exposure	517	0.7954	VS
Unemployment	438	0.6738	VS

Where ES is Extremely Significant

VS is Very Significant

Notably, four (4) of these factors stand out as extremely significant, as their RII values surpass the 0.80 threshold on the 0 to 1.00 scale.

a. "**Time Overrun**" achieved the highest ranking with an RII value of 0.8892, underscoring its paramount importance in the realm of project scheduling.
b. "**Cost Overrun**" followed "Time Overrun" closely with an RII value of 0.8246, positioning it as another critically significant factor influencing project scheduling outcomes.
    a. These findings affirm the substantial impact of these two factors, categorizing them as exceptionally significant determinants of scheduling outcomes.
c. "**Compromise of Project Quality**" ranked 3rd with an RII value of 0.8077. The research reveals that when projects are poorly scheduled, time constraints and rushed work can lead to a compromise in the overall quality of the construction. The construction team may not have sufficient time to perform tasks with the required attention to detail, resulting in the use of subpar materials, inadequate workmanship, or deviations from the original design intent. As a result, the compromised project quality not only affects the client's satisfaction but may also result in costly rework and repairs, exacerbating delays and cost overruns.
d. **"Client Relations Breakdown"** ranked 4th with an RII value of 0.8031. The study highlights that time delays and cost overruns can strain the relationship between the construction company and the client. Frequent schedule changes or missed deadlines can lead to frustration and dissatisfaction, potentially causing disputes and legal issues. Maintaining strong client relations is crucial for a construction company's reputation and future business prospects. A breakdown in client relations, as evidenced in the research, can negatively impact the company's ability to secure new projects and can lead to reputational damage in the industry.
e. **"Dissatisfied Clients"** ranked 5th with an RII value of 0.7985. The research demonstrates that when projects experience significant delays or cost overruns, clients may not receive the expected value for their investment. Dissatisfaction can arise from not meeting project milestones, objectives, or delivery dates. As a result, dissatisfied clients may refuse to accept the final project, demand changes, or even terminate the contract. This not only affects the current project but can also lead to negative word-of-mouth, making it challenging for the construction company to secure new clients and contracts in the future.
f. **Risks Exposure:** Ranked 6th with an RII value of 0.7954, "Risks Exposure" is a significant concern resulting from ineffective scheduling in construction projects. The research shows that when projects are not well-planned and tightly controlled, unforeseen issues may arise, leading to project disruptions or failures. Risks such as accidents, safety violations, regulatory non-compliance, and environmental incidents become more likely when there is inadequate scheduling and planning. These risks, as indicated by the research, can result in project shutdowns, legal liabilities, financial penalties, and damage to the company's reputation. Effective scheduling helps identify and mitigate risks proactively, reducing the likelihood of adverse events.
g. **Unemployment:** Ranked 7th with an RII value of 0.6738, "Unemployment" is a concerning consequence of ineffective scheduling in construction projects, as revealed in the research. The research highlights that when projects experience time overruns and cost overruns, construction companies may struggle to secure new projects or maintain a steady flow of work. Consequently, they may be forced to downsize their workforce or implement temporary layoffs. This not only affects the employees but can also lead to a loss of skilled workers who seek more stable job opportunities elsewhere. Unemployment in the construction industry, as demonstrated in the research, can have broader economic implications, affecting the livelihoods of workers and their families.

Causes of Project Delays

The Relative Impact Index (RII) was used to discern the factors with the greatest impact, with a threshold of RII > 0.80 indicating a significant occurrence. The selection process involved analyzing

the ranked results provided by all respondents. This approach was employed to ensure the highest degree of accuracy, reliability, and comprehensiveness in the findings obtained from the survey.

Table 2 shows the analysis of the causes of project delay.

Table 2: Analysis of Causes of Project Delay

S/N	Causes	Total	RII	Rank	Category of Significance
1	Poor decision-making regarding activity criticality	561	0.8631	1	ES
2	Lack of finance for project execution	552	0.8492	2	ES
3	Lack of expertise scheduling	528	0.8123	3	ES
4	Inaccurate estimate of materials requirement	519	0.7984	4	VS
5	Insufficient project details available (before the start of the schedule)	518	0.7969	5	VS
6	Inadequate knowledge of project/work activities	518	0.7969	6	VS
7	Inaccurate estimate of human resources required	512	0.7876	7	VS
8	Errors in technical logic (Improper logical relationship between the activities)	507	0.7800	8	VS
9	ES Insufficient support from project stakeholders in the development of plans and schedules	500	0.7692	9	VS
10	Lack of effective leadership	484	0.7446	10	VS
11	Absence of schedule contingency	484	0.7446	11	VS
12	The Schedule is Out of Date (schedule is not updated frequently or as per requirement	483	0.7431	12	VS
13	Lack of resource levelling in schedule	481	0.7400	13	VS
14	Cause [Breach of contract]	476	0.7323	14	VS
15	Incompatibility of planning methods with the project schedule's nature	475	0.7307	15	VS
16	Actual Resources are not considered (unlimited resources are considered mostly) during developing the project schedule	474	0.7292	16	VS
17	Presence of "hangers" (an activity with no successors, leading to unrealistic float)	468	0.7200	17	VS

Where ES is Extremely Significant, VS is Very Significant

The top three ranked causes characterized by the highest Relative Importance Index (RII) were identified. These three factors emerged as the most recurrent causes of ineffective construction project scheduling:

1. **Poor Decision-Making Regarding Activity Criticality:** This factor reflects the significance of making informed, timely, and accurate determinations about the prioritization of tasks within the construction project schedule.
2. **Lack of Finance for Project Execution:** The insufficiency of funds can impede progress, leading to delays and disruptions in the project timeline.
3. **Lack of Expertise in Scheduling:** The absence of expertise in scheduling activities within the construction project is a significant contributing factor to ineffective scheduling. This emphasizes the importance skilled professionals who possess the requisite knowledge and experience in creating and managing project schedules.

These three factors represent the most critical causes of ineffective project scheduling. However, other factors of substantial importance were also highlighted in the survey. These include:

4. **Inaccurate Estimate of Materials Requirement:** The accuracy of material estimations is paramount for project scheduling. Inaccurate estimates can lead to delays and resource shortages, affecting project timelines and budgets.
5. **Insufficient Project Details Available (Before the Start of the Schedule):** The availability and comprehensiveness of project details prior to schedule creation are pivotal. Incomplete or insufficient information can hinder effective scheduling and planning.

6. **Inadequate Knowledge of Project/Work Activities:** A comprehensive understanding of project and work activities is essential for successful scheduling. Inadequate knowledge in this regard can result in suboptimal schedules and project delays.

This study illuminated the primary challenges faced by the construction industry due to ineffective project scheduling. Construction stakeholders must address these factors comprehensively to enhance scheduling efficiency, reduce project delays, and ultimately improve the overall performance of construction projects.

Recommendations to Solving Ineffective Scheduling of Construction Projects by Industry Experts

Ineffective scheduling in the construction industry in Nigeria has long been a pervasive issue, leading to delays, cost overruns, and reduced project efficiency. Industry experts have provided:

i. Real Cost of Materials for Scheduling.
ii. Effective Planning and Decision-Making.
iii. Proper and Timely Decision-Making.
iv. Effective Cost Projection and Foresight.
v. Contingency Provisions.
vi. Timely Material Mobilization.
vii. Project Executive Discipline.
viii. Assigning Tasks to Experts.
ix. Stakeholder Engagement.
x. Utilize Scheduling Software.
xi. Competent Contractors.
xii. Clear Project Scope.
xiii. Funds Availability.

These strategies encompass various aspects, from accurate cost estimation to effective project management. By adopting these measures, the industry can enhance project scheduling, reduce delays, and achieve more successful and cost-effective construction outcomes.

Conclusion

In conclusion, the findings of this research, based on the analysis of factors influencing construction project scheduling using the Relative Important Index (RII) method, provide valuable insights into the challenges faced by the industry shedding light on the critical areas that require attention for improving scheduling efficiency and overall project performance.

The results clearly emphasize that time and cost overruns are the most paramount concerns in construction project scheduling. Time Overrun, with its highest RII value of 0.8892, signifies its exceptional importance, closely followed by Cost Overrun with an RII value of 0.8246. These two factors should be at the forefront of any strategies aim at enhancing project scheduling practices.

Moreover, the study highlights that the consequences of ineffective scheduling extend beyond just time and cost implications. Factors such as the Compromise of Project Quality, Client Relations Breakdown, Dissatisfied Clients, risk exposure, and Unemployment, while having slightly lower RII values, still bear significant implications for project outcomes, client satisfaction, and the industry's reputation.

The research also identifies the top three recurring causes of ineffective construction project scheduling: Poor Decision-Making Regarding Activity Criticality, Lack of Finance for Project Execution, and Lack of Expertise in Scheduling. Addressing these core issues is imperative for construction stakeholders to improve scheduling efficiency and reduce delays. While these three factors take precedence, it is crucial not to overlook other influential elements like Inaccurate Estimates of Materials Requirement, Insufficient Project Details Available (Before the Start of the Schedule), and Inadequate Knowledge of Project/Work Activities. Although ranked lower in RII values, these factors still contribute significantly to scheduling challenges and warrant attention in scheduling improvement strategies.

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Declaration of conflict of interest

The authors have collectively contributed to the conceptualization, design, and execution of this journal. They have worked on drafting and critically revising the article to include significant intellectual content. This manuscript has not been previously submitted or reviewed by any other journal or publishing platform. Additionally, the authors do not have any affiliation with any organization that has a direct or indirect financial stake in the subject matter discussed in this manuscript.

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