

Full Length Research Paper

Delay in Public Project Delivery: Causes and Remedial Measures in Sustainable Built Environment

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ABSTRACT: This study looks into delays in public project delivery and analyzes the causes and corrective measures in the sustainable built environment. The study was directed by four research questions, and the study's research design is a descriptive survey research design. This study's anticipated population is 500 construction stakeholders in Edo state. This study's sample comprises of 50 construction stakeholders from Edo's three senatorial districts. The sample size for the investigation was determined using a purposive sampling technique. The study tool was a structured questionnaire titled "Questionnaire on Project Delivery Delays and Remedial Measures for a Sustainable Built Environment." Cronbach Alpha and reliability index values of 0.67, 0.77, 0.76, and 0.802 were calculated for the four sections of the questionnaire that were administered to the respondents and were all returned and used for data analysis. Descriptive statistics were used to assess the data collected. The statistical means were utilized to

address the research questions posed in this study, and a mean benchmark of 2.50 was employed due to the items being on a four-point scale. The findings indicate that government-related factors such as insufficient project funding by the government, contractor-related factors such as difficulties in project financing errors during construction, unrealizable conditions given to contractor by host community, hostility towards contractors and other workers on project site are causes of delay in public project delivery in sustainable built environment. Based on the findings, it was determined that delays in public project delivery are caused by government-related issues, contractor-related issues, and host-community issues.

Keywords: Sustainable, built environment, construction stakeholders, project, senatorial district

INTRODUCTION

The increasing emphasis on sustainability is generating considerable changes in the construction industry and built-environment legislation. Policies, laws, and regulations all around the world are pressing the construction sector to make long-term adjustments to processes or products in order to promote a more sustainable built environment. A circular constructed environment is intended for lifespan, flexibility, adaptation, assembly, disassembly, reuse, and recoverability, and it takes into account future climatic threats. It employs low-carbon, low-impact, non-toxic materials and reuses resources (materials and products on-site or from other sites). Sustainable building is a prerequisite for a

sustainable built environment, which contributes to overall sustainable development.

The sustainable built environment has several dimensions (environment, society, and economy), a life cycle perspective, and spans dozens of topic areas ranging from material manufacture to building design and engineering to interior environmental quality to community cohesiveness and urban planning. Individual buildings ranging in scale from a single-standing site to an area with several buildings and open space, accompanied by strong socioeconomic interaction between users, related amenities, and urban support services, are referred to as the built environment. The extent of resource consumption

and environmental change currently attributed to the building industry eclipses that of most other industrial sectors. The successful adoption of steps to decrease the negative consequences of the built environment on the natural environment will be critical to global environmental sustainability. The design of structures that meet needs while increasing material and energy efficiencies is a response to the precautionary principle in architecture. Buildings use a lot of energy and resources and produce a lot of garbage. Current building methods bind us to future patterns of resource and energy consumption, trash emissions, and environmental degradation. When our structures are poorly planned, they leave a permanent legacy for the following generation that has negative social, economic, and environmental consequences throughout their life cycle. Delays in project delivery can be a significant barrier to the development of the sustainable built environment.

Recent research, however, reveals that project delays can have negative social, economic, and environmental consequences, thereby impeding the implementation of a sustainable built environment in developing countries like ours. The phrase "delay" in construction refers to something occurring at a later time than anticipated, expected, and stipulated in a contract, or beyond the agreed-upon timeframe for project completion (Esangbedo and Okaka, 2018). According to research, timely completion of projects within budget and to the degree of quality required by the client is an indicator of successful project completion (Chan and Kumaraswamy, 1994).

Delays in public project delivery, according to Abdel et al. (2018), are the biggest barriers to a sustainable built environment. One of the most typical difficulties in the construction sector is project delays. Delays have an adverse effect on project performance, punctuality, and cost. As a result, it's vital to understand the various types of project delays. Delays can be classified into two types: delays caused by the client (compensable delays) and delays caused by the contractor (non-excusable delays). Delays can also be critical or non-critical, as well as concurrent or non-concurrent.

According to Pourrostan and Ismail (2012), project delays are the most significant issues for the construction industry in emerging countries. There are four types of delays: excusable non-compensable delays, excusable compensable delays, and concurrent delays (Ahmed et al., 2002). Excusable non-compensable delays, according to Ahmed et al. (2002), are those that are beyond the control of both the owner and the contractor, while non-excusable delays are those that are the contractor's responsibility.

Delays induced by the project owner are excused compensable delays (client). Delays induced by both the owner and the contractor are referred to as concurrent delays. There are a few requirements that must be met for a delay to be judged excusable and compensable. Satisfying these requirements begins with developing a framework for measuring delay and identifying significant

events that cause such delays (Keane and Caletka, 2008). The causes of delays were also classified by Fashina et al. (2021) into six categories: owners, designers, construction managers, contractors, and resource providers. Abd. Majid and McCaffer (1998) identified 57 causes of delays in their study and classified them into eight categories: client-related delays; finance-related delays; consultant-related delays; contractor-related delays; equipment-related delays; material-related delays; manpower-related delays; and external-related delays.

While outlining the causes of project delays in Malaysia, Sambasivan and Soon (2007) identified improper planning, poor site management, insufficient contractor experience, insufficient client finance and payments for completed work, problems with subcontractors, material shortage, labor supply, availability and failure of equipment, lack of communication between parties, and mistakes during the construction stage as the most significant causes.

Statement of the problem

Despite the fact that project delivery delays have been studied for decades and that many academics have researched their consequences on public and commercial construction projects in other nations, notably in industrialized countries, none of these studies have been undertaken in Edo State. Furthermore, the majority of these studies are focused on specific regions, and their application in the Nigerian construction environment is unknown, restricting industry stakeholders' tools for dealing with the causes of numerous delays. And, as the Nigerian construction industry grows, it is necessary to identify the delay factors that can assist construction stakeholders in focusing their efforts and resources on addressing the most significant factors that influence construction delays in order to achieve optimal and productive results. The goal of this research is to fill a significant knowledge gap by investigating delays in public project delivery and finding the reasons and corrective actions for a sustainable built environment.

Research questions

1. What are government related causes of delay in public project delivery in sustainable built environment?
2. What are contractor related causes of delay in public project delivery in sustainable built environment?
3. What are host community related causes of delay in public project delivery in sustainable built environment?
4. What are the remedial measures for delays in public project delivery in a sustainable built environment?

Purpose of the study

The purpose of this study was to investigate delay in public project delivery and as well identify the causes and

remedial measures in sustainable built environment. The study was specifically designed to:

- i identify government related causes of delay in public project delivery in sustainable built environment;
- ii determine contractor related causes of delay in public project delivery in sustainable built environment;
- iii examined host community related causes of delay in public project delivery in sustainable built environment;
- iv examines the remedial measures for delays in public project delivery in a sustainable built environment;

Significance of the study

The study is expected to be beneficial to the Nigerian construction sector since it would educate them on the dangers of project or construction delays by demonstrating the effect of delay on project delivery. The study will also be valuable to contractors who are given construction contracts, as the study emphasizes the importance of project completion and delivery on schedule. The study will also be useful to academics who want to do research on a similar topic because it will act as a guide for their research. Finally, the research will benefit both academic students and the general public.

Scope and delimitation of the study

Despite the fact that construction projects range in scope from building projects to industrial engineering projects, the causes of delay on these projects are virtually the same, though the cost/time implications may be greater in some than others due to a lack of detailed documentation and expertise. As a result, the research will be limited to diverse building engineering projects completed over the last ten years. The data gathered would be limited to the Nigerian state of Edo.

RESEARCH METHODOLOGY

This study's research design is a descriptive survey research design. A structured questionnaire was used to collect data from a target population in this design. The study's design also allows for the use of a questionnaire to collect data. This study's anticipated population is 500 construction stakeholders in Edo state.

This study's sample comprises of 50 construction stakeholders from Edo's three senatorial districts. These stakeholders include Ministry of Works employees, engineers, architects, and registered contractors. Using Krejcie and Morgan's statistical table, a sample size of 50 respondents was determined (1970). The sample was taken from the study's estimated population. The sample size for the investigation was determined using a

purposive sampling technique.

The research instrument was a structured questionnaire titled "Questionnaire on Project Delivery Delays and Remedial Measures for a Sustainable Built Environment." The questionnaire has four sections: Section A contains data on the government-related causes of delay; Section B contains data on the contractor-related causes of delay to project delivery; Section C contains data on the host community-related causes of delay to project delivery; and Section D contains data on the Remedial measures for a sustainable built environment.

The full questionnaire contains 42 items. Respondents were asked to rate each section of the questionnaire on a four-point scale of strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD). A specialist in building technology from Auchi Polytechnic's Department of Building Technology validated the gadget. The instrument's reliability was also tested utilizing the internal consistency reliability approach. Using this manner, 30 copies of the questionnaire were distributed to thirty (30) people in Edo state, including builders, engineers, architects, and contractors. The collected data was compiled, and the instrument's dependability was calculated using Cronbach Alpha.

The reliability index values for sections A, B, C, and D were 0.67, 0.77, 0.76, and 0.802, indicating that the instrument was quite dependable for the investigation. The verified instrument was distributed to employees of the Ministry of Works, builders, engineers, architects, and registered contractors who had worked in Edo state for at least ten years. The respondents were given 50 questionnaires, all of which were returned and used for data analysis. Descriptive statistics were used to assess the data collected. The statistical means were used to address the research questions asked in this study, using a mean benchmark of 2.50 for the fact that the items are on a four-point scale.

RESULTS

Research question one

What are government related causes of delay in public project delivery in sustainable built environment?

Table 1 clearly shows the mean of replies on government-related delays in public project delivery in the sustainable built environment. According to the table, all of the items presented have a mean greater than the bench mark mean of 2.50. This means that the following government-related causes of delay in public project delivery in the sustainable built environment: insufficient funding after project award by the government, government interference with project performance, a delay in passage of the year's appropriation bill by the national assembly, impractical allocation of resources by the government political

Table 1: Mean and Standard Deviation (SD) Government Related Causes of Delay in Public Project Delivery in Sustainable Built Environment.

S/N	Items	Mean	SD
1.	Insufficient funding after award of project by the government	2.8650	1.0793
2.	Government interference with project performance	2.8467	1.0853
3.	A delay in passage of year's appropriation bill by the N/Assembly	3.0511	1.1279
4.	Impractical allocation of resources by the government	3.2847	0.8849
5.	Political interference	2.8942	1.0689
6.	Introduction of new government policies, regulations, and laws	2.9124	1.0585
7.	Choice of Consultants and contractors due to political consideration	3.0511	1.0329
8.	Slow decision making could be caused by government's bureaucracy	3.1934	0.8660

Table 2: Mean and Standard Deviation (SD) Contractors Related Causes of Delay in Public Project Delivery in Sustainable Built Environment.

S/N.	Contractor-related causes of delay	Mean	SD
9.	Difficulties in project financing	2.7774	0.94427
10.	Errors during construction	3.3540	0.73295
11.	Improper planning and preparation during construction project	3.0036	0.96646
12.	Poor site management and coordination	3.1423	0.88008
13.	Underestimation or overestimation of the project cost	3.3540	0.73295
14.	Conflicts between contractor and other parties	2.9708	0.96792
15.	Delays in the mobilization of workers	3.1095	0.88271
16.	Regular change of sub-contractor's technical staff	3.4672	0.70114
17.	Conflicts in sub-contractor's schedule in execution of project	3.1898	0.86047
18.	Underestimation of the project durations	2.7774	1.01891

interference, introduction of new government policies, regulations, and laws, and incorrect selection of consultants.

Research question two

What are contractors' related causes of delay in public project delivery in sustainable built environment?

Table 2 clearly shows the mean of respondents' replies on contractor-related delays in public project delivery in the sustainable built environment. According to the table, all of the items presented have a mean greater than the bench mark mean of 2.50. This means that the majority of respondents agreed that contractor-related causes of delay in public project delivery in the sustainable built environment are difficulties in project financing errors during construction, improper planning and preparation during construction project, poor site management and coordination, underestimation or overestimation of project cost, conflicts between contractor and other parties, delays in mobilization of workers on a regular basis.

Research question three

What are host community related causes of delay in public project delivery in sustainable built environment?

Table 3 clearly shows the mean of respondents' replies on host community-related delays in public project delivery in the sustainable built environment. According to the table, all of the items presented have a mean greater than the bench mark mean of 2.50. This implies that the majority of respondents agreed that host community-related causes of delay in public project delivery in the sustainable built environment are unrealizable conditions given to contractors by host community, hostility towards contractors and other workers on project site, economic clashes with the host communities where the project is residing, lack of community buy-in into the project, unrest in the community where the project is located, and stopping work due to unrest in the community where the project is situated.

Research question four

What are the remedial measures for delays in public project delivery in a sustainable built environment?

Table 4 clearly shows the mean of respondents' responses to the corrective strategies for public project delays in a sustainable built environment. Table 4 shows that all of the items offered have a mean greater than the bench mark mean of 2.50 for corrective solutions for government-related causes of delays in public project delivery in a sustainable built environment.

Table 3: Mean and Standard Deviation (SD) Host community-related causes of delay in Public Project Delivery in Sustainable Built Environment.

S/N	Host community-related causes of delay	Mean	SD
19.	Unrealizable conditions given to contractor by host community	3.0365	1.0371
20.	Hostility towards contractors and other workers in project site	3.0401	0.9807
21.	Economic clashes with host communities where project is residing	3.1241	0.8766
22.	Lack of community buy-into the project	3.0693	0.9331
23.	Unrest in the community which the project is situated	3.0547	1.0521
24.	Stopping work due to Delay in payments or non-payments of compensation to community	3.1022	0.9201

Table 4: Mean and Standard Deviation (SD) Responses of Respondents on the Remedial Measures for Delays in Public Project Delivery in A Sustainable Built Environment.

The Remedial Measures for Government		Mean	Std. Dev.	Remark
S/N	Related Causes of Delay Delays in Public Project Delivery in a Sustainable Built Environment			
1.	sufficient funding after award of project by the government could enhance project delivery	2.7774	0.9443	Accepted
2.	Non- interference with project performance by the government could enhance project delivery	3.3540	0.7329	Accepted
3.	Timely passage of the year's appropriation bill by the National Assembly could enhance project delivery	3.0036	0.9665	Accepted
4.	Adequate allocation of resources to a given project by the government will enhance project delivery	3.1433	0.8801	Accepted
5.	Setting aside political sentiment in awarding projects to competent and experienced contractors will enhance project delivery	3.3540	0.7329	Accepted
6.	Effective strategic planning and systematic control mechanism will enhance project delivery	2.9708	0.9679	Accepted
7.	Strict adherence to the procurement laws of the Federal Government will enhance project delivery	3.1095	0.8827	Accepted
	Remedial Measures for Contractors Related Causes of Delay Delays in Public Project Delivery in a Sustainable Built Environment			
8.	Reliable sources of funding for project and consistent payment of interim certificates as and when due	3.4672	0.7011	Accepted
9.	Adequate geotechnical investigation at the feasibility stage of any project will prevent errors during construction	3.1898	0.8605	Accepted
10.	proper planning and preparation by contractors before embarking on construction project	2.7774	1.0189	Accepted
11.	Provision of infrastructure for efficient project management by all stakeholders through Value Engineering.	2.9708	1.0991	Accepted
12.	Setting up framework for cash management at the planning stage	3.1277	0.9618	Accepted
13.	Proper estimation of the project durations before commencement	2.9854	0.8208	Accepted
	Remedial Measures for Host Community Related Causes of Delay Delays In Public Project Delivery in a Sustainable Built Environment			
14.	Proper agreement between contractor and host community will enhance project delivery	3.0949	0.8376	Accepted
15.	Peaceful working environment for contractors and other workers in project site will enhance project delivery	2.6752	1.0554	Accepted
16.	Employment of youth in the host communities where the project is residing will enhance project delivery	2.8467	1.0853	Accepted
17.	Adequately consult with the expected beneficiaries of developmental projects will enhance their buy-ins	3.0474	1.1264	Accepted
18.	Early payments of compensation to community	3.2810	0.8841	Accepted

This means that the majority of respondents agreed that adequate funds was available once the government awarded the project. The government's non-interference with project performance could improve project delivery. The National Assembly's timely passage of the year's appropriation bill could improve project delivery. The government's adequate allocation of resources to a given project would improve project delivery. Putting politics aside and awarding projects to skilled and experienced contractors will improve project delivery. An effective strategic planning and control mechanism will improve project delivery and Strict adherence to Federal Government procurement laws will improve project delivery.

Regarding the corrective solutions for contractor-related causes of delays in public project delivery, Table 4 shows that all of the items offered have a mean greater than the bench mark mean of 2.50. This means that the majority of respondents agreed that reliable sources of funding for the project and consistent payment of interim certificates as

and when due, adequate geotechnical investigation at the feasibility stage of any project will prevent errors during construction, proper planning and preparation by contractors before embarking on a construction project, and provision of infrastructure for efficient project management by all stakeholders through value engineering were all important.

Table 4 shows that all of the items presented have a mean greater than the bench mark mean of 2.50 for corrective solutions for host community-related causes of delays in public project delivery in a sustainable built environment. This means that the majority of respondents agreed that a proper agreement between the contractor and the host community will improve project delivery, a peaceful working environment for contractors and other workers on the project site will improve project delivery, employment of youth in the host communities where the project is located will improve project delivery, adequately consulting with the expected beneficiaries of developmental projects will improve their buy-in, and

early implementation will improve project delivery.

DISCUSSION

The purpose of this study was to investigate delay in public project delivery and as well identify the causes and remedial measures in sustainable built environment. The findings from the study were discussed in the following headings:

Government related causes

The findings indicate that government-related causes of delay in public project delivery in the sustainable built environment are insufficient funding after project award, government interference with project performance, a delay in passage of the year's appropriation bill by the national assembly, impractical allocation of resources by the government, political interference, introduction of new government policies, regulations, and laws, and incorrect choice of contractor.

According to Mojibola and Ganiyu (2019), government or client-related delays may take the form of insufficient decision-making, communication, or coordination. According to Eja and Ramegowda (2019), the practice of government ministries and agencies returning unexhausted allocated funds to the national coffer at the conclusion of each fiscal year has left projects with insufficient funds during these times, increasing the likelihood of project failure.

Contractors' related causes

Another finding in this study indicates that contractor-related factors such as difficulties in project financing errors during construction, improper planning and preparation during construction project, poor site management and coordination, and others are causes of delays in public project delivery in the sustainable built environment. This finding is consistent with the findings of Adebayo et al., (2018) and Dosumu and Aigbavboa, (2017), who revealed in their respective studies that a lack of skilled planning, estimation, and scheduling in project implementation has been established to cause significant failure in projects across Nigeria. Poor contractor estimation, time boundaries for implementation, and cost predictions have all been linked to project failures in Nigeria.

Host community related causes

The findings also revealed that host community-related factors such as unrealizable conditions given to the contractor by the host community, hostility towards contractors and other workers on the project site,

economic clashes with the host communities where the project is residing, lack of community buy-in into the project, unrest in the community where the project is located, stopping work due to payment delays or nonpayment of compensation to the community are causes of delay in publication. This finding supports the findings of Sunjka and Jacob (2013), who said that delays in making these payments or non-payments may slow project execution because impacted property owners reject attempts to demolish their properties without provision for replacement.

Recommendations

The remedial measures

The findings also revealed that the remedial measures for delays in public project delivery in a sustainable built environment include:

1. Sufficient funding after award of project by the government.
2. Non- interference with project performance by the government.
3. Timely passage of the year's appropriation bill by the National Assembly.
4. Adequate allocation of resources to a given project by the government.
5. Setting aside political sentiment by awarding projects to competent and experienced contractors.
6. Effective strategic planning and systematic control mechanism.
7. Strict adherence to the procurement laws of the Federal Government.
8. Reliable sources of funding for the project and consistent payment of interim certificates as and when due.
9. Adequate geotechnical investigation at the feasibility stage of any project to prevent errors during construction.
10. Proper planning and preparation by contractors before embarking construction project.
11. Provision of infrastructure for efficient project management by all stakeholders through value engineering,
12. Setting up framework for cash management at the planning stage.
13. Proper estimation of the project durations before commencement.
14. Peaceful working environment for contractors and other workers in project site.
15. Employment of youth in the host communities where the project
16. Adequate consultation with the expected host community or beneficiary of developmental projects.

Conclusion

From the findings it can be concluded that delays in public project delivery are caused by government related issues, contractors related issues and issues relating to the host community.

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