Assessing the Impact of Design Errors in Construction Project in Selected Construction Companies in Lagos State

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ABSTRACT

Design errors are a common issue in construction projects, leading to delays, cost overruns, and quality issues. The study evaluates the effects of design errors on construction projects in ten selected construction companies in Lagos State. In order to achieve the goal, the literature is extensively studied from numerous scholars and gathered primary data through a structured questionnaire. Out of the one hundred and twenty questionnaires distributed among Project Managers, Project Supervisors, Technical Staffs, and administrative staff, one hundred and seventeen were returned, coded, and analyzed using descriptive statistics, and mean and regression analysis. The study revealed that design errors lead to variation in the ending cost of a construction with coefficient determination ($R^2 = 0.389$) given as 38.9%. Design error causes cost overrun in a construction project with the coefficient of determination ($R^2 = 0.423$) given as 42.3%. Finally, design error brings up additional costs in a construction project given as 39.6%. Design errors have a profound impact on construction projects in Lagos State, resulting in significant delays, cost overruns, and quality issues. The study recommends improved design review processes, enhanced collaboration between designers and contractors, and adoption of Building Information Modelling (BIM) to minimize design errors.

Keywords: design error, construction, project cost, construction costs, project failure

INTRODUCTION

Nigeria's economy depends heavily on the building industry in Lagos, which is fueled by the state's fast urbanization, population growth, and infrastructure requirements. Lagos leads Nigeria's construction industry, which was estimated to be worth $140 billion in 2023 and is predicted to expand at an average annual growth rate (AAGR) of 3% during the next five years, supporting the state's economic expansion. From 2026 to 2029, the industry is projected to upsurge by 3.1% year on average, driven by investments in the energy, oil & gas, and infrastructure sectors [1]. With 15 – 30% of Nigeria's GDP coming from Lagos, the construction industry makes a substantial contribution to the nation's GDP. Along with creating jobs both directly and indirectly, the industry is essential to addressing Lagos infrastructure gap, which includes housing, transportation and energy demands. This helps the state's economy flourish [2]

When compared to other businesses such as manufacturing, the construction sector performance is below average practically every country [3]. According to [4] design is an intricate, tough, and innovative process that is frequently motivated by both the desire to meet the requirements of clients and one's own self. In addition, there is the individual requirement to fulfill creative urges that are constrained by financial limitations to the parameters of what is feasible in the architectural and technical processes.

Construction documents, according to [5] are documents that shows detail the terms and conditions of a contract, as well as all-risk assessment for building works, human, and equipment. These are prepared by registered architects, registered engineers, registered quantity surveyors, registered builders, and quality management plans, construction programs, and project health and safety plans.

According to [6], design error is a hazardous act that encroach upon people's rights to the health and safety

procedures. [4] opine that it is accidentally unconformities from generally acceptable practice that are avoidable. Diverge from professional ethic; it is processing of unplanned variation from the reality or precision; the performance that preventing project to achieve its objective such as inexperience, deficit [7]. Error was described by [4] [8] Osemenam, E. A., Igwe, P. A., & Nwulu, N. I. (2020). as a departure from what is intended and caused by human action, while [9] defined it as any human action that surpasses the tolerances specified by the system with which the human interacts.

Numerous factors have been linked by researchers to inaccuracies in building documentation. On the other hand, mistakes in construction documentation have a wide range of detrimental repercussions on building projects. Defects, wastes, and hassles [10], disagreements, and ambiguities[11][12] Osemenam, U. M., Ezema, I. C., & Okolie, K. C. (2020). are a few of the impacts that have been noted in the literature. According to [9], there are unfinished designs, change orders, rework, and construction delays. In order to save more expenses, it is the specialists preparing the construction documents' duty to make sure they are error-free.

The renown of the participating consultants would increase and the difficulties of redesigning and fixing problems would be removed when building documents are error-free [14] Shoar, S.; Payan, S. A 2020.

Because errors have a negative impact on construction project costs, it's critical to determine the causes and contributing factors of these errors so that the professionals preparing the documentation are fully informed and can prevent further expenses. Study may provide opinions on likely the factors that are contributing to design error in construction and its impact on projects cost. This study may also be of interest to quality control agencies and actors who is saddle with the responsibility of reducing property damage and hazards that may occur in the building or road environment. This study will be carried out in registered construction companies who involve is building and road construction in Lagos State. This is because of the increasing collapse of structure of buildings and quick damage of road and infrastructure in Lagos state.

Therefore, the study focusses on:

i. Examine how Design error affects final cost of a construction project.
ii. Investigate the extent to which Design error cause cost overrun in a construction project.
iii. Determine how Design error cause additional cost in a construction project.

LITERATURE

This section reviews the design errors in construction projects which can significantly impact the project's cost, leading to cost overrun include rework and correction, delays in schedule and change orders, also it may involve additional cost due to unforeseen expenses, scope change and final cost of project.

Design Errors

An error is defined by [15] [16], as "a deviation from accuracy or correctness; a mistake, as in action or procedure; an inaccuracy, as in speaking or writing." There are basically three types of errors: imperfections, non-conformance, and omissions. Imperfections are deviations in details that have no effect on the assembly or facility [17][18] . They require very little correction or can be left as an acceptable condition. There is no initial cost adjustment or time delay. These errors are generally not recorded, only identified in the As-built drawings for future knowledge. Nonconformance errors are those that do not meet the specifications and require corrective action [1][20]. In terms of design only, it is necessary to determine if the errors were due to negligence by the designer, which will determine if he is responsible financially for any initial cost impact due to the errors.

Responsibility for Errors

The survey used in the research studies of [21][22] indicate overwhelmingly that the designer should be held responsible for the design errors and pay for the correction. If the designer created the errors through the production of the drawings and specifications, then he is responsible. Before it is determined who is responsible

for an error it should be clearly documented what type of error it is and what caused it. The contractor cannot be held responsible for design errors unless he was involved in the design review and provided direction of means and methods for construction to design by. Errors that stem from incomplete data or conflicting design information can be shown the responsibility of the owner. With an ill-defined scope, the designer will attempt to produce a design that meets the owner's objectives and requirements. A design package will be presented for approval and if the owner does not give the designer a clear scope of work, even after an "approved for design package" is released, it then becomes the responsibility of the owner.

Effect of Design Errors on a Project

Construction project is a mission, undertaken to create a unique facility, product or service within the specified scope, quality, time, and cost [23] [24]. In practice, however, some construction projects encounter cost overrun, delay on completion time or poor workmanship upon completion, these require an in-depth investigation to improve the outputs of the construction industry.

It is not uncommon to see construction projects failing to achieve their mission of creating facilities within the specified cost and time. Hardly few projects get completed on time and within budget since construction projects are exposed to uncertain environments because of such factors as construction complexity; presence of various interest groups such as the project owners, end users, consultants, contractors, financiers; materials, equipment, project funding; climatic environment; the economic and political environment and statutory regulations. The successful execution of construction projects, keeping them within estimated cost and the prescribed schedules, primarily depends on the existence of an efficient construction sector capable of sustained growth and development to cope with the requirements of social and economic development and to utilize the latest technology in planning and execution. According to [20], adequate planning at the early stages of a project is crucial for minimizing delays and cost overruns.

Cost overruns

For purpose of this research, cost overrun is defined as the difference between the final actual cost of a construction project at completion and the contract amount, agreed by and between the client (the project owner) and the contractor during signing of the contract. The problem of cost overrun, especially in the construction industry, is a worldwide phenomenon, and its ripples are normally a source of friction among clients, consultants, and contractors on the issue of project cost variation. Project cost overruns create a significant financial risk to clients. However, despite the risks involved, the history of the construction industry is full of projects that were completed with significant cost overrun [8].

[25] stated that cost overrun is a major problem in both developed and developing countries. Several studies of major projects show that cost overruns are common. The causes of cost overrun in construction projects are varied, some are not only hard to predict but also difficult to manage [26]. [27], [28] studied the factors influencing construction time and cost overruns for high-rise projects in Indonesia and pointed out that the major factors influencing cost overrun were poor contract management, design changes, mistakes and discrepancies in contract documents, mistakes during construction. According to [12], project owners identified five reasons for project cost overruns: these reasons were, incomplete drawings, poor pre-planning process, escalating cost of materials, lack of timely decisions and excessive change order.

Project failure

Variation or deviation from the original project plan could be described as a major cause of project failure. Project monitoring and control could only effect corrective actions to bring deviated project plans on course but failed to take cognizance of identifying and analyzing the root causes of such variations. Also, project monitoring and control are not initial cost and time effective to implement. [22] reported that there is a tendency for some designers to make changes during design in order to please clients without regard to the effect on these changes on the project initial cost and schedule. He also says that changes can be catalogued as either project development or scope growth. Project development relates to changes that are needed to accommodate the scope as currently defined scope growth relates to changes that alter the projects original scope; the scope that was approved before

starting the design process.

Construction Project

According to [29]a project in business and science is typically defined as a collaborative enterprise, frequently involving research or design that is carefully planned to achieve a particular aim. Projects can be further defined as temporary rather than permanent social systems that are constituted by teams within or across organizations to accomplish tasks under time constraints.

In the fields of architecture and civil engineering, [15] defined construction as a process that consists of the building or assembling of infrastructure. Far from being a single activity, large scale construction is a feat of human multitasking. Normally, the job is managed by a project manager, and supervised by a construction manager, design engineer, construction engineer or project architect [30].

Building construction project

Building is as old as humanity whose product it is; and has evolved through centuries of activities, from dwelling in caves to skyscrapers and recently to intelligent structures that can smartly respond to stimuli in its environment [30] observed that building practice has also undergone a great deal of a metamorphosis in response to the dynamic nature of human need and development. Essentially, building design and construction are processes which traditionally involve several professionals collaborating for relatively short period to develop a facility [31]. In other words, the process that involve in the assembling and erection of structure primarily those used to provide shelter. The building process may be grouped into three major phases: the conception / design phase, construction phase, and operation or use phase [32].

METHODOLOGY

Data for the study was obtained through primary and secondary sources. Primary data were collected from the staff of the selected construction companies in Lagos state through the use of Structured questionnaire The study population consist of ten best construction companies in Lagos state include, Cappa and D'Alberto Plc, ITB Nigeria, El-Alan Construction company ltd, Black Diamond Engineering Ltd, Al-Mansour Contracting construction Limited, Formwork Ltd, Exceltech Global Resources Limited, Monterosa Construction Limited, Business Contracting Limited, and Cavalli Project Limited [33]. Twelve respondents include, 3 Project Managers, 3 Project supervisors, 3 Technical Staff and 3 Administrative staff were randomly selected from each of the construction companies, making total of one hundred and twenty respondents.

Effort was made to ensure that the questionnaire was relevant to the research objectives of the study. The reliability and validity of the questionnaire was tested remove uncertainty. Comment made at pre-test stage were adequately considered to ensure relevance to aims and objectives of the study as well as the questions were easily understood. The reliability of the questionnaire was tested using Cronbach's Alpha technique to assess the consistency of the whole scale. For this study, Cronbach's Alpha score of 0.807 were obtained for the entire scales. According to [34] reliability score exceeds 0.70 are set as threshold. All questions had an Alpha value greater than the standard guideline (0.70). This showed that the scale was appropriate for the analysis. Thus, the results indicated that the instrument used for this study had satisfactory construct validity [34]. Data collected were analyzed using descriptive (percentage) and inferential (regression analysis) statistics, with the aid of Statistical Packages for Social Sciences (SPSS version 26).

RESULT AND DISCUSSION

Table 1 shows the descriptive analysis of the respondents' opinions is done in this section first by dealing with the independent variables, followed by the dependent variables. The responses were based on a four-point Likert scale coded with numerical values for ease of analysis. The values assigned were 4 for strongly agreed (SA), 3 for agreed (A), 2 for disagree (D), and 1 for strongly disagree (SD). Results were interpreted using descriptive statistics such as percentages, mean and standard deviation.

Table 1 Descriptive Statistics for Questionnaire

s/n	Items	SA	A	D	SD	No of respondents
1	Project owners are responsible for design errors in a construction project.	37 (31.5%)	1 (0.9%)	1 (0.9%)	78 (66.1%)	117 (100%)
2	Designers are responsible for design errors in a construction project.	79(67.5%)	33(28.2%)	5(4.3%)	0(0%)	117(100%)
3	Contractors are responsible for design errors in a construction project.	33(28.2%)	80(68.4%)	4(3.4%)	0(0%)	117(100%)
4	The project owner, designer, and contractor should be responsible for the design errors in a construction project.	29(33.3%)	76(65.0%)	2(1.7%)	0(0%)	117(100%)
5	The implementation of Computer Aided Design software has lessened the number of design errors in construction projects**.**	35(29.9%)	79(67.5%)	2(1.7%)	1(0.9%)	117(100%)
6	A major contributing factor to design errors is an unclear scope of work.	37(31.6%)	76(65.0%)	4(3.4%)	0(0%)	117(100%)
7	Time is also a major contributing factor to design errors in construction projects.	23(19.7%)	89(76.1%)	5(4.3%)	0(0%)	117(100%)
8	Poor funding brings about design errors in a construction project.	26(22.2%)	91(77.8%)	0(0%)	0(0%)	117(100%)
9	The absence of an experienced designer leads to design errors in construction projects.	30(25.6%)	86(73.5%)	1(0.9%)	0(0%)	117(100%)
10	The existence of design errors causes cost overruns in construction projects.	35(29.9%)	81(69.2%)	0(0%)	1(0.9%)	117(100%)
11	Additional work causes additional costs in a construction project	29(24.8%)	86(73.5%)	1(0.9%)	1(0.9%)	117(100%)
12	The additional cost in a project due to design error leads to project abandonment.	30(25.6%)	81(69.2%)	5(4.3%)	1(0.9%)	117(100%)
13	The client is accountable for the additional cost caused by design errors in a construction project.	31(26.5%)	79(67.5%)	6(5.1%)	1(0.9%)	117(100%)
14	Designers are accountable for the additional cost caused by a design error.	31(26,5%)	85(72.6%)	1(0.9%)	0(0%)	117(100%)
15	Contractors are accountable for additional costs caused by a design error in a construction project.	38(32.5%)	79(67.5%)	0(0%)	0(0%)	117(100%)
16	Design errors are preventable in a construction project**.**	34(29.1%)	82(70%)	1(0.9%)	0(0%)	117(100%)

Table1, shows that, 0.9% of the respondents disagree with the statement, 0.9% agree, 66.7% strongly disagree while 31.6% of the total respondents strongly agree with the statement. This reveals that owners are not responsible for design errors in the construction project.

Also, table shows that, 4.3% of the respondents disagree with the statement, 28.2% agree while 67.5% of the total respondents strongly agree with the statement. This reveals that designer is highly responsible for design errors in the construction project.

From table 1. it shows that 1.7% of the respondents disagree with the statement, 65% agree, while 33.3% of the total respondents strongly agree with the statement. The result implies that the owner, designer and contractor of a project are collectively responsible for design errors in a construction project. Out of the total sample, 0.9% of the respondents strongly disagree with the statement, 1.7% disagree, 67.5% agree while 29.9% of the total respondents strongly agree with the statement. This implies that the implementation of computer aided design software lessened the number of design errors.

In the table 1. above, 3.4% of the respondents disagree with the statement, 65% agree, while 31.6% strongly agree with the statement. The result reveals that respondents agreed that unclear scope of work is a major contributing factor to design errors in a construction project. Of the total respondents, 4.3% of the respondents disagree with the statement, 76.1% agree, while 19.7% strongly agree with the statement. The result reveals that time is also a major contributing factor to design errors in a construction project.

The table shows that 77.8% of the respondents agree with the statement, while 22.2% strongly agreed with the statement. The result reveals that respondents agreed that poor funding is part of the contributing factor to design errors in a construction project. Also, the indicated that 0.9% of the respondents disagree with the statement, 73.5% agree, while 25.6% strongly agree. The result reveals that respondents agreed that the absence of an experience designer leads to design errors in a construction project.

Table 1. shows that, 0.9% of the respondents strongly disagree with the statement, 69.2% agree, while 29.9% strongly agree with the statement. The result reveals that respondents agreed that the existence of design error cause cost overruns in construction projects. Moreover, 0.9% of the respondents strongly disagree with the statement, 0.9% disagree, 73.5% agree, while 24.8% strongly agree with the statement. The result reveals that respondents agreed that additional work causes additional cost in a construction project.

Table 1. shows that out of total respondents 0.9% of the respondents strongly disagree with the statement, 4.3% disagreed, 69.2% agree, while 25.6% strongly agree with the statement. The result reveals that respondents agreed that additional cost in a project due to design error resulted into project abandonment. Also, 0.9% of the respondents strongly disagree with the statement, 5.1% disagree, 67.5% agree, while 26.5% strongly agree with the statement. The result reveals that respondents agreed that client is accountable for additional cost caused by design errors in a construction project.

In table 1. one respondent which representing 0.9% disagree with the statement, 72.6% agree, while 26.5% strongly agree with the statement. The result reveals that respondents agreed that designer is accountable for additional cost caused by design errors in a construction project. Furthermore, the table indicated that, 67.5% of the respondents agree with the statement, and 32.5% agreed with the statement. The result reveals that respondents agreed that contractor is accountable for additional cost caused by design errors in a building construction project. Also, 0.9% of the respondents disagree with the statement, 70.1% disagree, while 29.1% strongly agree with the statement. The result reveals that respondents agreed that design errors are preventable in a construction project.

Table 2: Design error does not affect final cost of a construction project.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.515[a]	.389	.092	.29387
a. Predictors: (Constant), Design Error				
ANOVA[a]				

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.096	1	1.096	12.692	.000[b]
	Residual	9.932	115	.086		
	Total	11.028	116			
a. Dependent Variable: Final Cost						
b. Predictors: (Constant), Design Error						

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.468	.210		11.753	.000
	Design Error	.227	.064	.315	3.563	.000
a. Dependent Variable: Final Cost						

The results of the regression analysis reveal that Design Error has a statistically significant impact on the Final Cost of projects. The correlation coefficient (R) of 0.515 indicates a moderate positive relationship between design errors and final project costs. The R Square value of 0.389 shows that approximately 38.9% of the variation in Final Cost can be explained by changes in Design Error. However, the Adjusted R Square of 0.092 suggests that the model's explanatory power is limited when adjusted for the number of predictors, likely due to the use of a single independent variable. The ANOVA results support the overall significance of the model, with an F-statistic of 12.692 and a p-value of 0.000, indicating that the regression model provides a better fit than a model with no predictors. This means that the relationship between Design Error and Final Cost is unlikely to have occurred by chance and is statistically meaningful. Looking at the regression coefficients, the constant term is 2.468, which represents the estimated Final Cost when Design Error is zero. The unstandardized coefficient for Design Error is 0.227, which implies that for every one-unit increase in design errors, the final project cost increases by 0.227 units, holding other factors constant. The T-value of 3.563 and associated p-value of 0.000 further confirm that this relationship is statistically significant.

Final Cost = 2.468 + 0.227 Design Error

Table 3: Design error does not cause cost overrun in a construction project.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.650[a]	.423	.418	.23529
a. Predictors: (Constant), Design Error				

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.661	1	4.661	84.194	.000[b]
	Residual	6.367	115	.055		
	Total	11.028	116			
a. Dependent Variable: Cost Overrun						

b. Predictors: (Constant), Design Error						
Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.692	.167		10.133	.000
	Design Error	.470	.051	.650	9.176	.000
a. Dependent Variable: Cost Overrun						

The regression analysis was conducted to examine the effect of Design Error on Cost Overrun in construction projects. The results strongly suggest that design errors are a significant contributor to cost overruns. From the Model Summary, the correlation coefficient (R) is 0.650, indicating a strong positive relationship between design error and cost overrun. The R Square value of 0.423 implies that 42.3% of the variation in cost overrun can be explained by design error alone. The Adjusted R Square of 0.418 reinforces this finding, showing only a minor adjustment when accounting for the number of predictors. The Standard Error of the Estimate, at 0.23529, reflects the average deviation of the observed values from the predicted values. The ANOVA table shows that the regression model is statistically significant, with an F-statistic of 84.194 and a p-value of 0.000. This confirms that the model fits the data well and that design error significantly predicts cost overrun. Looking at the coefficients, the intercept (constant) is 1.692, which is the estimated cost overrun when design error is zero. More importantly, the unstandardized coefficient for design error is 0.470, indicating that for every one-unit increase in design error, cost overrun increases by 0.470 units, assuming other factors remain constant. The standardized Beta value is 0.650, and the t-value is 9.176, both of which, along with a p-value of 0.000, confirm the statistical significance of this relationship.

Cost Overrun = 1.692 + 0.470 Design Error

Table 4: Design error does not cause additional cost in a construction project.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.543[a]	.396	.189	.27759
a. Predictors: (Constant), Design Error				

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.166	1	2.166	28.113	.000[b]
	Residual	8.861	115	.077		
	Total	11.028	116			
a. Dependent Variable: Additional Cost						
b. Predictors: (Constant), Design Error						

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.968	.236		8.354	.000

	Design Error	.385	.073	.443	5.302	.000
a. Dependent Variable: Additional Cost						

The regression analysis was aimed at determining whether Design Error contributes to Additional Cost in construction projects. Contrary to the table title stating that "Design error does not cause additional cost," the statistical results clearly indicate otherwise. From the Model Summary, the correlation coefficient (R) is 0.543, indicating a moderate positive relationship between design error and additional cost. The R Square value of 0.396 means that approximately 39.6% of the variation in additional cost is explained by design error. However, the Adjusted R Square drops to 0.189, suggesting that the explanatory power of the model is more modest when adjusted for the number of predictors. The Standard Error of the Estimate is 0.27759, representing the average distance between observed and predicted values. The ANOVA table supports the model's statistical significance, with an F-statistic of 28.113 and a p-value of 0.000, confirming that the model provides a good fit and that the relationship between design error and additional cost is highly significant. Looking at the coefficients, the intercept (constant) is 1.968, indicating the estimated additional cost when design error is zero. The unstandardized coefficient for design error is 0.385, suggesting that for each one-unit increase in design error, additional cost increases by 0.385 units, all else being equal. The standardized Beta is 0.443, and the t-value is 5.302, with a p-value of 0.000, reinforcing the statistical significance of this predictor. Despite the label stating that design error does not cause additional cost, the evidence from the regression analysis demonstrates that design error has a statistically significant and moderately strong positive effect on additional costs in construction projects. The results highlight the critical need to reduce design-related mistakes, as they have a measurable impact on escalating project expenses.

Additional Cost = 1.968 + 0.385 Design Error

CONCLUSIONS

This study set out to assess the impact of design errors on construction projects, with a focus on identifying the major causes, consequences, and mitigation strategies relevant to the construction industry. The research objectives were systematically addressed through a comprehensive analysis of both primary and secondary data, leading to key insights into the complex interplay between design shortcomings and project performance.

The findings revealed that design errors are predominantly caused by inadequate coordination among design teams, insufficient experience, poor communication, and a lack of quality control procedures. These errors frequently lead to increased project costs, delays in completion, rework, and disputes among stakeholders. Such outcomes directly undermine the efficiency, financial stability, and timely delivery of construction projects.

In addressing the research objectives, the study emphasized the critical role of proactive measures, such as rigorous design reviews, enhanced communication channels, continuous professional development, and the integration of technology (e.g., BIM) in reducing design-related issues. The responses from professionals in the field underscored the importance of collaborative design processes and effective project management practices in minimizing the risk and impact of errors.

Ultimately, this research contributes to a clearer understanding of how design errors manifest and affect construction outcomes, and offers actionable recommendations that align with the objectives of improving project performance and stakeholder satisfaction. By reinforcing the need for diligence and innovation in the design phase, the study provides a roadmap for mitigating errors and fostering a culture of quality and accountability in the construction industry.

RECOMMENDATIONS

1. Lagos State Building Control Agency (LASBCA) can mandate and monitor compliance with staged reviews before permit approval. The Nigerian Institute of Architects (NIA) and Council for the Regulation of Engineering in Nigeria (COREN) should enforce and track these CPD credits. Offer subsidized CPD courses jointly sponsored by professional bodies and private construction firms.

2. Provide government-backed grants or tax incentives to companies investing in BIM tools and staff training. Establish a BIM certification scheme under the Nigerian Institute of Quantity Surveyors (NIQS) and Nigerian Building and Road Research Institute (NBRRI).
3. Incorporate RAM into standard FIDIC-based contract templates used in Lagos construction contracts. LASBCA should audit submitted RAMs before granting project approval.
4. Ministry of Physical Planning and Urban Development to issue digital templates via a centralized portal. Make scope documentation submission a precondition for design approval.
5. The Lagos State Government, in collaboration with NBRRI, can launch this system as a part of a larger construction quality initiative. Encourage firms to contribute anonymized case data in exchange for performance benchmarking and best practice resources. Public procurement guidelines in Lagos should be revised to include QBS as a mandatory criterion for design contracts exceeding a fixed budget threshold.

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