

Influence of Project Plans on the Outcome of Construction Projects Procured by Design-Build (DB) in Nigeria

Godwin Iroroakpo Idoro

Abstract: This study evaluates the influence of project plans on the outcome of design-build projects. The purpose is to ascertain whether the level of use of project plans can be utilised to improve the outcome of projects procured by the design-build method. To achieve this purpose, a field survey of 42 projects procured by the design-build method and selected by stratified random sampling was conducted. Data were collected with the aid of structured questionnaires and analysed using percentage, mean and the Spearman correlation test. The results of the study indicate that the level of use of project plans has significant influence on some parameters of the design-build projects' outcome. The results also indicate that the inception, design, tendering and construction plans are not prepared in many of the projects sampled. The study concludes that the level of use of project plans can be used to reduce the high time and cost overruns recorded in design-build projects and that there is room for stakeholders to increase the level of use of project plans in design-build projects. The study suggests that stakeholders should ensure that the required project plans are prepared when projects are procured by design-build.

Keywords: Nigeria, Procurement method, Project planning, Project outcome

INTRODUCTION

Procurement methods have become an important issue in the construction industry because every project must be procured by a method. The importance and concern given to procurement methods in the industry are based on two reasons. First, the procurement of construction projects involves a series of processes that are interrelated and sequential. The effectiveness and the efficiency of the processes have considerable impact on the success or failure of projects. Naoum (1991), Mohsini and Davidson (1992), Bennett, Potheary and Robinson (1996), Sanvido and Konchar (1998), Molenaar and Songer (1998), Ojo, Adeyemi and Ikpo (2000), Chan, Ho and Tam (2001), Ibbs et al. (2003), Ling et al. (2004) and Idoro (2006; 2007) maintain that the outcome of projects is the gauge for evaluating the performance of procurement options. Second, several procurement methods are available for a developer to adopt in procuring a project. Accordingly, the project developer faces a major challenge in selecting one method out of many. Alhazini and McCaffer (2000) maintain that each project has its own characteristics and requirements, and for a project to be successful, the procurement method must address the technical features of the project alongside the clients' and contractors' needs.

One of the available options for procuring construction projects is using the Design-Build (DB) method. Although Chan (2000) describes DB as a recent arrangement that was conceived as a solution to the numerous shortcomings in the traditional contract method, Tenah (2000) maintains that the DB approach predated the Design-Bid-Build (DBB) approach and that the Renaissance era marked the split between the design and the construction functions. Tenah (2000)

Department of Building, University of Lagos, Akoka, Yaba, Lagos, NIGERIA
Corresponding author: iroroidoro@yahoo.com

traces the practice of combining the design, engineering and construction functions, which is now regarded as DB, to ancient times when the construction was overseen by a master builder appointed by the king or ruler to execute both the design and the construction. He maintains that most of history's great engineering feats, such as the Pyramids at Giza, the Great Wall of China and the Taj Mahal in India, were DB jobs. Since its inception, the DB method has gained wide acceptance and has become one of the most popular options for procuring construction projects in most developed and developing economies. In the United Kingdom (UK), Ling, Kee and Lim (2000) argue that the DB arrangement has been practised since the 1960s. Franks (1990) finds that 15%–20% of building projects in the UK were procured by DB in the early 1990s. By the mid-1990s, Holt, Olomolaiye and Harris (1996) put the percentage of all construction projects that were procured by DB at 20%, while Bennett, Potheary and Robinson (1996) put the percentage of the market for new buildings constructed by DB at 23%. In 1991, Bennett, Potheary and Robinson (1996) maintain that approximately 5% of all construction in the United States (US) was procured by DB, while Yates (1995) reports that in the mid-1990s, the DB approach was used in more than one-third of construction projects procured in the US.

In developing countries, the use of the DB approach began much later. The Building and Construction Authority (2002) reports that the public sector in Singapore began adopting the approach for construction works in 1992. In a study of the procurement options used in the Finnish construction industry, Oyegoke (2004) notes that DB is one of the three prominent procurement options. He finds that the option accounts for 13%–28% of the annual number of construction contracts and an average of 15.6% of the total value of new projects procured in Finland between 1989 and 2001. He states further that the option accounts for 8%–12%, with an average of 12%, of the total number of projects procured in Finland within the same time period. In the Nigerian construction industry, although the adoption of DB is a recent development, it has also gained wide acceptance. Ogunsanmi and Bamisile (1997) and Odusami (1999) find that the DB method is now widely used for the procurement of construction projects. In a survey of construction projects, Idoro (2006) finds that many of the projects sampled were procured by the design-build method. The study indicates that design-build is gradually gaining wide acceptance in the Nigerian construction industry.

In recent times, research efforts on the procurement option have been mostly directed towards assessing performance, with little concern about how to improve it. Rowlinson and Newcombe (1986) assess the performance of the DB and the DBB options and discover that while the cost-overruns in projects procured using the two options are the same, the time-overrun in projects procured by DBB is considerably higher than that of projects procured by DB. The duo discovers that the cost-overrun in DBB and DB projects is 4%, while their time-overruns are 70% and 40%, respectively. In another study, Konchar and Snavido (1998) discover that DB options solve many problems inherent in the DBB method and that DB projects experience 5.2% fewer changes than DBB projects, which experience 11.4% more changes in their schedule. In another study, Pocock et al. (1996) discover that projects procured by the design-build method were better than the traditional contract method in cost and schedule growth, the number of contract modifications per millions of dollars and the percentage of changes due to design inefficiency. In Nigeria, there is concern about the method's performance. In a

study that compares the performance of traditional contract and design-build methods, Idoro (2006) discovers that the difference between the percentage of the time-overrun to the initial contract period and the cost-overrun to the initial contract sum of the projects procured by the two methods is insignificant. The results of the study show that the Nigerian construction industry has yet to derive the numerous advantages, in particular the time advantage, in procuring projects by the design-build method.

The background above shows that the problem with using the DB method in Nigeria involves the long delay and the high cost-overrun recorded in projects procured by the option. The challenge faced by researchers and stakeholders in the Nigerian construction industry involves reducing the high overrun in the delivery time and the cost of projects procured by the method. One of the ways to achieve this goal is to ensure that effective and efficient planning is executed when projects are procured by the option. Research studies agree that planning has a considerable effect on the outcome of projects. Faniran, Oluwoye, and Lenard (1998) argue that the objective of project planning is to complete a project within a fixed time, at a previously estimated cost and to a specified standard of quality. This assertion implies that the effectiveness of project planning is measured by the project performance. Naoum (1991), Ling and Chan (2002) and Thomas et al. (2002) also regard project performance as the basis of evaluating the effectiveness of project planning. Naoum, Fong and Walker (2004) describe planning as one of the key tools that stakeholders use to ensure that construction projects are successful. Idoro (2009) argues that the measures of the effectiveness of project planning and the measures of project performance are the same. The implication of these assertions is that the level of planning for the delivery of a project has a considerable effect on how successful the project will eventually be. A completed project is the end product of every procurement process, and the success or failure of the project remains the gauge for determining the success or failure of the procurement option adopted. Accordingly, the parameters of the project success serve as the parameters of the success of the procurement methods. As the project outcome is an indicator of the performance of the procurement methods, it follows that one of the tools that can be used to improve the performance of the procurement methods is planning. Two aspects of planning can contribute to project success: (1) the preparation in terms of the level of planning (number of plans prepared), or whether the required plans are prepared, and the quality of planning (quality of plans prepared), or whether the plans are well prepared and (2) the implementation in terms of the effective implementation of the plans and the achievement of their targets, deadlines and standards. As in other procurement methods, the level and quality of planning and their effective implementation contribute significantly to the success or failure of the projects procured by DB. Project planning and project performance are two complementary issues in project management. The basis of project success or failure is defined in the project planning; without planning, stakeholders have no bases for measuring progress and determining whether a project procured by design-build or any other method is a success or failure.

To find ways of improving the performance of projects procured by DB, this study evaluates the influence of the use of project plans on the outcome of projects procured by the DB method. The objectives are to evaluate the levels of

use of each of the selected project plans in the project delivery in terms of the proportion of projects for which a plan is prepared, the levels of planning executed at the inception, design, tendering and construction stages in terms of the proportion of plans actually prepared among the plans expected to be prepared in each stage and the overall level of use of project plans in projects procured by the DB option and their influence on the project outcome. The achievement of these objectives is significant in several ways. First, the evaluation of the levels of use of the important project plans, the levels of use of project plans at the four stages and the overall level of use of project plans will assist stakeholders to determine the level and adequacy of the efforts they devote to the planning of projects procured by the method. Second, the evaluation of the influence of the levels of use of project plans at the inception, design, tendering and construction stages and the overall level of use of project plans on the outcome of projects procured by the DB method will assist stakeholders to evaluate the effectiveness of their planning efforts. Third, the results will assist stakeholders reduce overruns in the delivery time and the cost of projects procured by the method through planning, thereby improving the performance of the procurement option.

Conceptual Framework for the Study

The variables used in the study are classified into two categories: project plans and project outcome. Twenty-one important project plans are used as the indicators of project planning in the study. The plans were classified into four project delivery stages: inception, design, tendering and construction. The plans selected for the project inception stage are the life-cycle chart, the survey plan, the value analysis report, the clients' cash-flow chart and the feasibility and viability report. The plans selected for the project design stage are the project specifications, the quality management plan, the bill of quantities, the Occupational Health and Safety (OHS) management plan, structural drawings, the buildability report, architectural, electrical and mechanical drawings and the Environmental Impact Analysis (EIA) report. The plans used in the tendering stage are the method statement and the project budget. The plans selected for the construction stage are the programme of work, the material, labour and plant schedules.

The parameters selected as the indicators of project outcome are classified into two categories: subjective and objective indicators of project outcome. Three parameters, clients' assessment of project duration, cost and quality, used in the study are the subjective indicators of the project outcome. Two parameters, the percentage of the time-overrun to the initial contract period and the percentage of the cost-overrun to the initial contract sum, are the objective indicators of the project outcome.

Research studies show that there is a relationship between the two categories of variables used in the study. The variables of project planning are known to likely influence the variables of the project outcome. The conceptual framework adopted in the study is based on this relationship. The framework is presented in Figure 1.

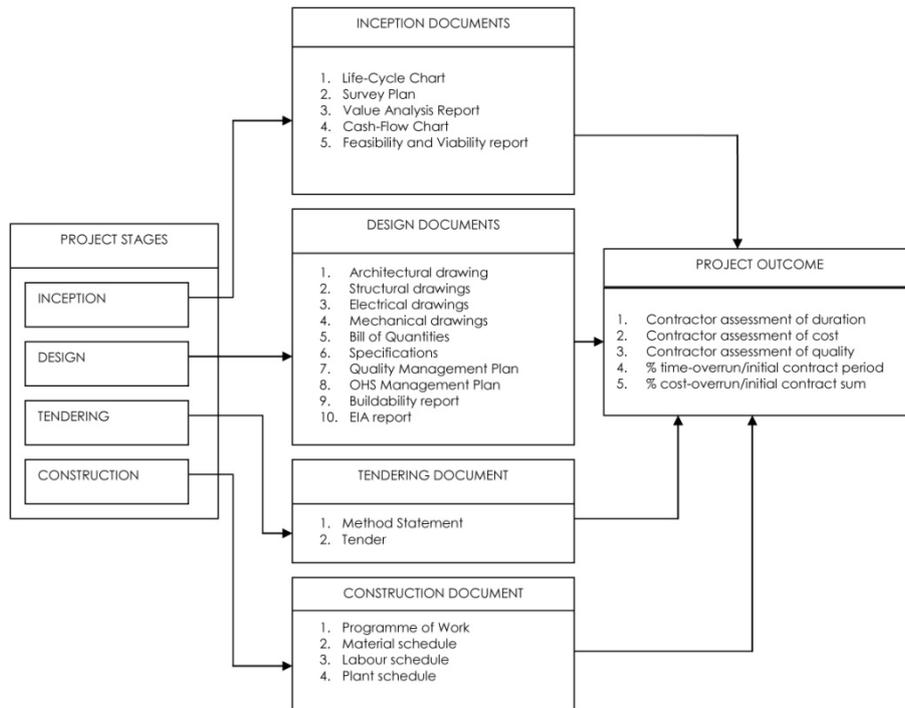


Figure 1. The Conceptual Framework for Evaluating the Relationship between Project Documents and the Project Outcome

Hypothesis of the Study

To evaluate the influence of the level of use of project plans on the project outcome, a research hypothesis is postulated. The hypothesis is as follows:

The levels of use of project plans at the inception, design, tendering and construction stages and the overall level of use of project plans in projects procured by the design-build method have no significant correlation on the outcome of the projects.

Procurement Methods

Unlike other products that the customer can buy directly from the market, construction projects are usually procured by a chain of processes, which is known as the procurement method. Franks (1992) describes the construction procurement method as the arrangement and the activities to be undertaken by a client to realise a project. Sanvido and Konchar (1998) describe this method as a set of relationships, roles and responsibilities of project team members and the sequence of activities required for the deployment of capital projects. Idoro and Iyagba (2008) describe the method as the responsibilities and/or contractual obligations of the parties required to perform the numerous activities involved in delivering a project to the owner and observe that variations in project

participants and/or their obligations account for the differences in procurement methods. Chan (2000) and Yakowenko (2004) maintain that several options exist whereby a project can be procured and that no single option is appropriate for all projects. The Construction Industry Institute (2001) identifies 12 different project delivery methods available to a client. Some of the options are direct labour (DL), traditional contracting or DBB, DB, labour-only (LO), project management, construction management, management contracting and several public-private partnership arrangements. This study focuses on DB. This option is selected for the study because Ojo, Adeyemi and Ikpo (2000) and Idoro (2007) find that the method is a prominent procurement option in the Nigerian construction industry.

The most notable feature in procuring a project by the DB option is that the design and construction phases are integrated and performed by a single party and under the same contract. Researchers describe DB as an arrangement whereby a developer contracts a single party or entity to perform both the design and construction of a facility or project under a single DB contract (Bennett, 1992; Hovet, 1996). Tenah (2000) notes that the DB method combines the fragmented responsibilities associated with the traditional contract method into a single entity that provides both the design and construction services of a project. He maintains that this method is favoured because of the growing need to involve the contractor from a project's inception. Despite the general acceptance that the main feature of the method is the integration of the design and construction stages, Akintoye (1994) and Turner (1997) observe that the method has variants. In an earlier study, Rowlinson and Newcombe (1986) use the relationship between the design and construction parties as the basis for the variants in the method in the UK. The duo identifies three variants: (1) pure DB, where both the design and the construction teams belong to the same organisation, (2) partial integrated design-build, where the majority of the design and construction teams belong to the same organisation, but some design functions are performed by external consultants and (3) disparate DB, where the design functions are sub-contracted to outside consultants, but the builder or design-build contractor performs the construction of the project. Bennett (1992) also identifies three variants: (1) direct DB, which involves a designer/contractor being appointed after some appraisal but without competition, (2) competitive design-build, which involves the preparation of project documents such as briefs and performance specifications by consultants to enable several contractors to offer designs and competitive prices and (3) the develop and construct method, which involves appointing consultants to design a project to a particular stage, after which a contractor completes and guarantees the design either using the client's consultants or his own designers. In all variants, several project documents used for the execution of the projects are prepared. These documents, which are also known as project plans, are the focus of the first objective of this study.

Project Planning

Project planning is one of the most important project management functions. Hore et al. (1997) and Faniran, Love and Smith (2000) describe project planning as the optimal systematic arrangement of project resources to achieve project objectives. Project planning requires that project objectives be defined first; thereafter, the strategies to achieve them are formulated. Project planning can

be described as the process of defining project objectives, determining the framework, methods, strategies, tactics, targets and deadlines to achieve the objectives and communicating them to project stakeholders. The process of project planning requires that the client's expectations or requirements and the available resources be defined first, then matched to set project objectives, available options identified and evaluated and the most appropriate frameworks, strategies and tactics to achieve the objectives selected. Project planning also involves communicating the objectives and the frameworks, methods, strategies, targets and deadlines to achieve them to the persons, parties and organisations concerned with their implementation, monitoring and control. The process involves preparing numerous project plans, each representing defined strategies to achieve defined project objective(s). Faniran, Oluwoye and Lenard (1998) describe project planning as the process of determining the appropriate strategies for the achievement of predefined project objectives. The above studies indicate that a project plan is a document that specifies one or more project objectives and how to achieve them. Several plans are required for the effective delivery of a project. While a plan may comprise two or more objectives, two or more plans may concern the same objective. Planning is a continuous process that commences as soon as the decision on the investment is taken and does not end until the project is delivered. Accordingly, Dvir, Raz and Shenhar (2003) identify three levels of project planning: (1) the end-user level, where the planning focuses mainly on the functional characteristics of the project end product; (2) the technical level, which focuses on the technical specifications of the project deliverables that are needed to support the functional requirements and (3) the project management level, which focuses on planning the activities and processes that need to be performed to ensure that the technical work proceeds effectively. These three levels of planning can otherwise be regarded as project conception planning, project design planning and construction planning. These levels (conception, design and construction) are the project delivery stages. Therefore, the studies reviewed above tend to imply that several project documents are prepared at all stages of the project delivery. The various documents (drawings, programmes, bills, charts and schedules) are regarded as project plans. The second objective of the study is to investigate these levels of project planning.

Project Performance

Throughout the world, project performance remains a prominent issue in project delivery because projects involve defined objectives that must be achieved and numerous resources that must be efficiently utilised. Robinson et al. (2005) emphasise the need for participants involved in construction project delivery to develop and use tools for performance measurement. Josephson and Lindstrom (2007) identify 250 parameters used for measuring project performance. From reviewing previous research studies on project performance parameters, Ling (2004) identifies 70 potential factors for measuring project performance. These and other parameters that have been used in research studies can be classified into two broad categories: subjective and objective parameters. Ling (2004) states that the performance of a project is multifaceted and may include unit cost, construction and delivery speeds and the level of the clients' satisfaction. Pinto

and Slevin (1998) classify project performance parameters into (1) internal factors, which are the project variables: schedule, cost and quality, and (2) external factors, which are concerned with stakeholders' satisfaction with the performance of a project and the perceived impact on the organisation's effectiveness. Schedule, time, cost and quality are quantifiable, measurable and controllable and do not vary in assessment; therefore, internal factors are regarded as objective performance parameters. However, there are many project stakeholders, and their satisfaction often varies. Therefore, external factors are regarded as subjective performance parameters. Ling et al. (2004) also identify two categories of the indicators of project success: product success, which consists of the measures of the achievement of quality standards, and process success, which is composed of variables that measure the achievement of time and cost targets. Subjective parameters refer to stakeholders' satisfaction with the end product, while objective parameters refer to project variables, such as the schedule, cost and quality, that are used for establishing and defining the project objectives and for establishing targets and deadlines for project delivery.

Stakeholders' satisfaction has become prominent in the modern approach to performance measurement, and clients remain the most important stakeholder when considering project performance. Kotler (2000) maintains that satisfaction can be understood as a person's satisfaction or disappointment resulting from the performance of a product as compared to the person's expectations. Products are generally all about the customers' expectations, and their performance should also be about the customers' feelings. Clients are the customers in construction projects. Their requirements are the focus of projects, and project objectives are derived from clients. Thus, it follows that project performance should be about the clients' feelings and satisfaction. Neto et al. (2007) state that matching or exceeding the client's expectations results in a satisfied client. They argue that meeting client's expectations can reflect how loyal a client becomes to a provider or a brand and can result in higher sales, lower levels of sensitivity to price and positive comments about the provider and the brand. Idoro (2008) maintains that the clients' satisfaction can be measured from several perspectives. However, three parameters, time, cost and quality, remain the most prominent in research studies. Josephson and Lindstrom (2007) argue that the project goal, which considers the clients' goals, is measured from several perspectives, but the main aim is to prompt clients to identify and clearly present their goals and to motivate all managers involved to inform and remind all individuals of the project goals. Hatush and Skitmore (1997) maintain that the success of a project is generally operationalised into time, cost and quality. Michell et al. (2007) note that clients' primary concern is the completion of the project within the budget and deadline and at the required level of quality. Based on the above assertions, this study selected three parameters, the project time, cost and quality, that are described as the variables for measuring clients' satisfaction.

The objective parameters of project performance are usually derived from the parameters used earlier to define the project objectives and establish targets and deadlines for project delivery. The same parameters are used for the monitoring, evaluation and control of a project. Although there are many parameters, two of them, schedule and cost, are common among research studies. The reasons for time and cost as the most common objective parameters of project performance are understandable. Michell et al. (2007) state that the

timely completion of construction projects is frequently regarded as being a major criterion of project success by clients, contractors and consultants alike. They also argue that cost-overruns are identified as one of the principal factors that lead to the high cost of construction. The third parameter (quality) is commonly used when defining project objectives and setting targets and deadlines and is not a common objective parameter in research studies because, as Vincent and Joel (1995) note, stakeholders consider the goal of quality management to be customer satisfaction. From the perspective of previous studies, two parameters, the time-overrun and the cost-overrun, remain the prominent indicators of the objective measurement of the project outcome. Based on this understanding, this study selected two parameters, the percentage of time-overrun to the initial contract period and the percentage of cost-overrun for the initial contract sum, as the variables for the objective measurement of the project outcome.

RESEARCH METHODS

A field survey was conducted to collect the data used for the study. For the field survey, a list of 211 organisations composed of federal government ministries and parastatals, selected state and local governments and organised private firms was first prepared to serve as the population frame for the study. From this population, a sample of 42 organisations was selected by purposive sampling to cover the six geo-political zones (north-west, north-central, north-east, south-west, south-east and south-south) in Nigeria. The purpose of the sampling technique is to limit the study sample to organisations that adopted the design-build option to procure projects in recent years. A project with the highest value among the projects procured by the design-build method by each of the sampled organisations was selected for the study by the same sampling technique.

The instrument used for the survey was a structured questionnaire. The instrument was given to project leaders who were either the project manager, the architect or the project officer in charge of the projects. Data were collected on the levels of use of the 21 project documents that represented the different forms of planning. The documents stated in the variables of the study were classified into four project stages: inception, design, tendering and construction. The respondents were requested to indicate whether each of the plans was prepared or not prepared during the delivery of the projects. The responses were weighted as follows: prepared = 1; not prepared = 0. Data were also collected on both the subjective and the objective parameters of the project outcome. The data collected on the objective parameters of the project outcome included the scheduled delivery time, the initial budget, the actual delivery time and the final cost of the projects used for the study. The subjective parameters of the project outcome were measured using five ranks: poor, low, moderate, high and very high. These ranks were weighted as follows: poor = 1, low = 2, moderate = 3, high = 4 and very high = 5. The respondents were requested to indicate their assessment of the duration, cost and quality of their projects based on the ranks indicated in the questionnaire. In the analysis, the level of use of each plan was evaluated as the percentage of the number of projects in which the plan was prepared to the number of projects sampled. The levels of project inception, design, tendering and construction planning were calculated as the number of plans prepared divided

by the number of plans selected in each project stage, while the level of overall planning was calculated as the total number of plans prepared in the three project stages divided by the total number of plans (21) selected. The mean was used to rank the levels of use of the selected project plans in each project stage and to establish the levels of inception, design, tendering, construction and overall planning and the outcome of the projects sampled. The Spearman correlation test was used to find a correlation between the levels of conception, design, tendering, construction and overall planning executed in the projects procured by the method and their outcome.

RESULTS OF THE STUDY

The data collected were analysed to achieve the objectives of the study. The results are presented as follows.

Characteristics of Construction Projects Procured by the Design-Build Method

The characteristics of the construction projects procured by the DB method in Nigeria were first investigated. For this investigation, six parameters, the construction type, the client type, the procurement management method, the building rise, the initial contract period and the initial contract sum, were used. The construction type consists of new construction and redevelopment/renovation; the client type consists of public and private clients. The building rise refers to the number of floors in a building and is classified into three categories: low-rise (1–3 floors), medium-rise (4–7 floors) and high-rise (above 7 floors). The initial contract period refers to the number of weeks proposed for the construction of a project and is classified into three categories: short duration (1–26 weeks), average duration (27–52 weeks) and long duration (more than 52 weeks). The proposed cost or budget for the construction of a project is classified into five categories: N1–N25 million, N26–N50 million, N51–N75 million, N76–N100 million and above N100 million, where N is Naira (the official Nigerian currency). The percentages of the types of construction and clients, the procurement management methods and categories of the building rise, the initial contract period and the sum of the projects used in the study were analysed. The results are presented in Table 1.

The results in Table 1 indicate that the majority of the projects used for the study are new projects, while redevelopment or renovation works are a minority. Regarding the client type, Table 1 shows that most of the projects used for the study are owned by private clients, while only a few projects are owned by public clients. Regarding the building rise, Table 1 shows that the majority of the projects used for the study are high-rise buildings, and medium and low-rise buildings are in the minority. Regarding the initial contract period, Table 1 shows that the majority of the projects used for the study are of long duration, while projects of short and medium durations constitute a minority. Regarding the contract sum, Table 1 shows that the initial sum of half of the projects used for the study is of the highest value, while most of the remaining projects are between N51–N75 million. This result implies that the projects used for the study are of medium and high complexity.

Table 1. Descriptive Result of the Characteristics of Projects Procured by Design-Build Method in Nigeria

Project Characteristic	N	%	Project Characteristics	N	%
Construction type			Building rise		
New construction	28	66.7	High (above 7 floors)	20	60.6
Redevelopment/renovation	14	33.3	Low (1–3 floors)	11	33.3
Total	42	100	Medium (3–7 floors)	2	6.1
			Total	33	100
Client type			Initial contract period		
Private clients	38	90.5	Above 52 weeks	30	71.4
Public clients	4	9.5	1–26 weeks	10	23.8
Total	42	100	17–52 weeks	2	4.8
			Total	42	100
Initial contract sum					
Above N100 million	12	50.0			
N51–N75 million	10	41.7			
N1–N25 million	2	8.3			
N26–N50 million	0	0.0			
N76–N100 million	0	0.0			
Total	24	100			

N = Number of respondents

Table 2. Descriptive Result of the Characteristics of Contractors Who Executed the Projects Used for the Study

Contractor Characteristic	N	%	Project Characteristics	N	%
Contractor type			Contractor size		
Indigenous	26	61.9	Small	22	52.4
Expatriate	16	38.1	Medium	16	38.1
Total	42	100	Large	4	9.5
			Total	42	100
Registration category					
D	42	100			
Total	42	100			

N = Number of respondents

Characteristics of the Construction Projects Procured by the Design-Build Method

The characteristics of the contractors who executed the projects used for the study were also investigated. Accordingly, three parameters, the contractors' type, size and registration category, were used. The contractors' type is classified as either indigenous or expatriate. The contractors' size is classified as small (contractors who employ one to 10 permanent workers), medium (contractors who employ 11–50 permanent workers) and large (contractors who employ above 50 permanent workers). The contractors' registration category is classified as A, B, C or D based on the categorisation of the construction contractors by the

Federal Ministry of Works. Contractors registered in category D are qualified to execute projects of the highest value. The results of the percentages of the contractors who executed the projects used for the study in each of the sub-variables of the three parameters are presented in Table 2.

Levels of Use of the Selected Project Plans in Projects Procured by the Design-Build Method

The levels of use of the 21 project plans in projects procured by the DB method were investigated. The plans described in the variables of the study consist of five inception stage plans, 10 design stage plans, two tendering stage plans and four construction stage plans. The purpose of the investigation is to determine the priority accorded to the plans when a project is procured by the DB method. To achieve this purpose, the level of use of each plan was evaluated as the percentage of the number of projects in which the plan was prepared. The mean levels of use of the plans were analysed. The results are presented in Table 3.

Regarding the levels of use of the inception stage plans, the results in Table 3 reveal that the survey plan, which is prepared in the majority of the projects sampled, is the most used inception plan. Therefore, this plan is accorded the highest priority among the project inception stage plans. The project life-cycle chart is accorded the second highest priority and is therefore the second most used plan. The feasibility and viability report is the third most used inception stage plan, while the clients' cash-flow chart is the fourth most used inception stage plan. The value analysis report is the least used project inception stage plan.

Regarding the levels of use of the design stage plans, Table 3 shows that structural drawings, which are prepared in almost all of the projects sampled, are the most used project design stage plan and are therefore accorded the highest priority among the design stage plans when projects are procured by the design-build method. The project specifications, bill of quantities, architectural drawings and quality management plan are the second most used plans, and the electrical drawings are the sixth most used design plans. The mechanical drawings and buildability report are the seventh most used design stage plans, and the occupational health and safety management plans are the ninth most used design plans. The environmental impact analysis report is the least used design stage plan.

Regarding the levels of use of the tendering stage plans, Table 3 shows that tender is submitted in majority of the projects sampled and it is more commonly used than method statement.

Regarding the levels of use of construction stage plans, Table 3 shows that the labour schedule, which was prepared in almost all the projects sampled, is the most used construction stage plan and is therefore accorded the highest priority when projects are procured by the design-build method. The material schedule is the second most prepared construction stage plan, while the programme of work and the plant schedule are the least used among the construction stage plans when projects are procured by the design-build method.

Table 3. Levels of Use of Selected Project Plans in Projects Procured by Design-Build Method

Project Plan	S	N	%	Project Plan	R	N	%
Inception stage				Design stage			
Survey plan	42	40	95.2	Structural drawings	42	40	95.2
Feasibility & viability report	42	36	85.7	Project specifications	42	38	90.5
Value analysis report	42	26	61.9	Quality management plan	42	38	90.5
Life-cycle chart	42	22	52.4	Bill of quantities	42	38	90.5
Clients' cash-flow chart	42	22	52.4	Architectural drawings	42	34	80.6
				Electrical drawings	42	30	71.4
				Mechanical drawings	42	30	71.4
				Buildability report	42	26	61.9
				OHS management plan	42	22	52.4
				EIA report			
Tendering							
Tender	42	28	66.7				
Method statement	42	22	52.4				
Construction							
Labour schedule	42	38	90.5				
Material schedule	42	34	81.0				
Programme of work	42	32	76.2				
Plant schedule	42	32	76.2				

S = Sample size, N = Number of projects in which project plan was prepared

Levels of Use of the Project Stage Plans and the Overall Level of Use of Project Plans in Projects Procured by the Design-Build Method

Having evaluated the levels of use of each of the project plans above, the study further investigates the level of use of project plans in each of the four project delivery stages and the overall level of use of project plans in the projects sampled. Accordingly, the level of use of the project plans in each project stage is calculated as the percentage of the number of the plans prepared in each project stage (5 for the inception stage, 10 for the design stage, 2 for the tendering stage and 4 for the construction stage). The overall level of use of project plans for each project is evaluated as the percentage of the number of plans prepared at the inception, design, tendering and construction stages. The mean levels of use of each project stage plans and the overall level of use of project plans for the projects used for the study are analysed. The results are presented in Table 4.

The results in Table 4 indicate that approximately 71% of the inception plans used for the study is prepared in the projects sampled and imply that less than four of the five inception stage plans are prepared in projects procured by the design-build method. Table 4 also shows that approximately 80% of the inception plans used for the study is prepared in the projects sampled. The results in Table 4 show that an average of one tendering stage plan, which is most likely to be tender, is prepared in the projects sampled. Table 4 also reveals that

approximately two of the four construction stage plans and approximately 18 of the 21 project plans used for the study were prepared in the projects sampled.

Table 4. Levels of Project Inception, Design, Tendering, Construction and Overall Planning in Projects Procured by Design-Build Method

Project Stage	R	Mean
Level of inception stage planning	42	71.43
Level of design stage planning	42	79.05
Level of tendering stage planning	42	59.52
Level of construction stage planning	42	58.33
Level of overall planning	42	74.29

R = Number of respondents

Outcome of the Projects Procured by the Design-Build Method

The project outcome is regarded as the gauge for determining the effectiveness of project plans. Based on this understanding, the study evaluates the outcome of the projects sampled. For this investigation, seven indicators of the project outcome described in the variables of the study are used. The clients' assessment of the project delivery time, cost and quality are measured using the five ranks described in the methods of the study. The time and cost overruns and the percentages of the time-overrun to the initial contract period and the cost-overrun to the initial contract sum are evaluated from the initial and actual contract periods and the sums of the projects sampled. The mean outcome of the projects is analysed. The results are presented in Table 5.

The results in Table 5 indicate that the level of satisfaction of the owners regarding the duration, cost and quality of the projects is slightly above moderate and that the projects overrun their delivery time schedule by approximately 30% and their initial contract sum by approximately 30%.

Table 5. Mean Outcome of Projects Procured by Design-Build Method

Project Outcome Indicator	R	Mean
Clients' satisfaction with project duration	42	3.62*
Clients' satisfaction with project cost	42	3.86*
Clients' satisfaction with project quality	42	3.62*
% time-overrun/initial contract period	32	29.79
% cost-overrun/initial contract sum	24	29.78

R = Number of respondents, N = Naira (Nigerian official currency), m = million, * = Mean rank (total weight / 5 × number of respondents)

Correlation between the Levels of Use of the Project Stage Plans and the Overall Level of Use of Project Plans and the Outcome of the Projects Procured by the Design-Build Method

The results of the study establish the level of use of project plans in the projects sampled and their outcome. The study further attempts to determine whether there is a relationship between the results of the levels of use of project plans and

the outcome of the projects. This evaluation is performed to ascertain whether the levels of use of the project plans do influence the outcome of the construction projects procured by the design-build method. To achieve these objectives, the hypothesis of the study is postulated. The hypothesis states that the levels of use of project plans at the inception, design, tendering and construction stages and the overall level of use of project plans in projects procured by the design-build method has no significant correlation with the outcome of the projects. The hypothesis is tested using the Spearman correlation test with $p \leq 0.05$. The rule for the acceptance or rejection of the hypothesis is that when the p -value > 0.05 , the hypothesis is accepted, but when the p -value ≤ 0.05 , the hypothesis is rejected. The results of the test are presented in Table 6.

Regarding the influence of the level of use of the project inception stage plans on the project outcome, the results in Table 6 show that the level of preparation of the inception stage plans has no significant correlation with the clients' satisfaction with the quality and the percentages of the time-overrun to the initial contract period and the cost-overrun to the initial contract sum of the projects sampled. However, the level of preparation of the inception stage plans has a significant correlation with the clients' assessment of the project delivery time and cost of the projects sampled.

Regarding the influence of the level of use of the design stage plans on the project outcome, Table 6 reveals that the level of use of the design stage plans has no significant correlation with the clients' assessments of the delivery cost and the quality of the projects sampled. However, the results in Table 6 reveal that the level of use of the project plans prepared at the design stage has a significant correlation with clients' assessments of the duration and percentages of overruns for the initial contract period and the sum of the projects sampled.

Regarding the influence of the level of use of the tendering stage plans on the project outcome, Table 6 reveals that the preparation of the method statement and the tender has no significant correlation with the clients' assessment of the cost and quality, the percentage of the time-overrun to the initial contract period and the percentage of the cost-overrun to the initial contract sum of the projects sampled. However, the preparation of the method statement and the tender has a significant correlation with the clients' assessments of the duration of the projects.

Regarding the influence of the level of use of the construction stage plans on the project outcome, Table 6 reveals that the preparation of the programme of the work and the resources' schedules of the projects sampled has no significant correlation with the clients' assessments of the duration, cost and quality of the projects and the percentage of the time-overrun to their initial contract period. However, the preparation of the programme of the work and the resources' schedules has a significant correlation with the percentage of the cost-overrun to the initial contract sum of the projects sampled.

Regarding the influence of the overall level of use of project plans on the project outcome, Table 6 reveals that the preparation of the inception, design, tendering and construction plans has no significant correlation with the clients' assessments of the cost and quality of the projects sampled and their percentages of the time-overrun to the initial contract period and the cost-overrun to the initial contract sum. However, the preparation of the inception, design, tendering and

construction plans has a significant correlation with the clients' assessments of the duration of the projects sampled.

Table 6. Results of Spearman Test for Correlation between the Level of Use of Project Plans and the Outcome of Projects Procured by Design-Build Method

Variables Correlated	N	R	p-value	Decision
Level of use of inception stage plans				
Respondents' assessment of project duration	42	0.400	0.009	Reject
Respondents' assessment of project cost	42	0.381	0.013	Reject
Respondents' assessment of project quality	42	-0.132	0.403	Accept
% time-overrun/initial contract period	26	-0.042	0.877	Accept
% cost-overrun/initial contract sum	22	-0.261	0.412	Accept
Level of use of design stage plans				
Respondents' assessment of project duration	42	0.407	0.007	Reject
Respondents' assessment of project cost	42	0.189	0.231	Accept
Respondents' assessment of project quality	42	0.101	0.526	Accept
% time-overrun/initial contract period	26	0.861	0.001	Reject
% cost-overrun/initial contract sum	22	0.621	0.031	Reject
Level of use of tendering stage plans				
Respondents' assessment of project duration	42	0.427	0.005	Reject
Respondents' assessment of project cost	42	0.044	0.781	Accept
Respondents' assessment of project quality	42	-0.202	0.200	Accept
% time-overrun/initial contract period	26	-0.058	0.832	Accept
% cost-overrun/initial contract sum	22	-0.261	0.412	Accept
Level of use of construction stage plans				
Respondents' assessment of project duration	42	0.207	0.188	Accept
Respondents' assessment of project cost	42	0.053	0.739	Accept
Respondents' assessment of project quality	42	-0.281	0.071	Accept
% time-overrun/initial contract period	26	-0.367	0.162	Accept
% cost-overrun/initial contract sum	22	-0.621	0.031	Reject
Level of use of project plans				
Respondents' assessment of project duration	42	0.513	0.001	Reject
Respondents' assessment of project cost	42	0.150	0.344	Accept
Respondents' assessment of project quality	42	-0.182	0.247	Accept
% time-overrun/initial/contract period	26	0.469	0.067	Accept
% cost-overrun/initial contract sum	22	0.164	0.610	Accept

N = Number of respondents, *R* = Correlation value

DISCUSSION OF FINDINGS

The results of the analysis of the characteristics of the projects used for the study show that the majority of the projects used for the study are new projects sponsored by private clients, high-rise buildings with an initial contract period above 52 weeks and an initial contract sum above N100 million. These results

indicate that the majority of the projects used for the study are complex projects that are sponsored by private organisations.

The study results reveal that the level of use of the inception stage plans is 71.43%. That is, three of the five inception stage plans are prepared when projects are procured by the DB method. A cursory examination of the level of use of the five inception stage plans shows that the survey plan, the feasibility and viability report and the value analysis report are prepared in the majority of the projects and are more used than the life-cycle chart and the clients' cash-flow chart. These results indicate that the survey plan, the feasibility and viability report and the value analysis report are likely to be the plans that are prepared at the project inception stage when construction projects are procured by the DB method. There is a need to increase the levels of use of all the five plans to increase the level of use of the inception stage plans because none of the plans is prepared in all projects. However, more concern should be given to the life-cycle chart and the clients' cash-flow chart.

The study also finds that the level of use of the design stage plans is 79.05%. This finding implies that approximately eight of the 10 design stage plans are prepared when the projects are procured by the DB method. The results of the evaluation of the levels of use of the plans reveal that the OHS management plan and the EIA report are the least used design stage plans. This result indicates that the OHS management plan and the EIA report are the least likely to be prepared when projects are procured by the DB method.

The study also finds that the level of use of the tendering stage plans is 59.5%. This result implies that approximately one of the two tendering stage plans is prepared when projects are procured by the design-build method. The levels of use of the two plans show that the rate of submission of tender is higher than the rate of preparation of the method statement. This result tends to imply that tender is more likely to be the plan that is prepared when projects are procured by the DB method.

The study finds that the level of construction stage plans is 58.33%. This result indicates that approximately two of the four construction stage plans are prepared when projects are procured by the DB method. The levels of use of the four plans show that the labour and material schedules are used more than the programme of work and plant schedule. These results tend to imply that the plans prepared are more likely to be labour and material schedules than the programme of work and plant schedule. The overall level of use of project plans is found to be 74.29%. This result indicates that an average of 15 of the 21 plans is prepared in all 4 of the project delivery stages when projects are procured by the DB method.

The performance of a project is usually the gauge for measuring the effectiveness of the level of planning executed during the delivery of projects. The results of the performance of the projects sampled indicate that the satisfaction of the clients with the delivery time, cost and quality of the projects is essentially average, while the percentage by which the actual delivery time and the cost of the projects exceed their scheduled delivery time and cost is discovered to be approximately 30%. These results imply that clients derive moderate satisfaction from projects they procure by the method and that the overruns the client should expect in the scheduled delivery time and cost of such projects are approximately 30%. When these performances are compared with those of projects procured by

other methods, it is clear that the percentage of time-overrun to the initial contract period of projects procured by the DBB method and that of projects procured by the DL method, which Idoro (2007) discovered to be 18.47% and 16.66%, respectively, are equally less than that of the projects procured by the DB method (29.79%), while the percentage of the cost-overrun to the initial contract sum of projects procured by the DBB method, which Idoro (2007) discovered to be (13.47%), and that of projects procured by the DL method, which Ojo, Adeyemi and Ikpo (2000) discovered to be 24% and Idoro (2007) discovered to be 22.5%, are equally less than that of projects procured by DB method (29.78%). The implication of these results is that Nigerian clients do not derive time and cost benefits from the process of engaging one party to execute the design and construction of projects. The question arising from these results is "Can the level of use of project plans be used to improve the performance of the projects procured by the method?". The results of the test of the research hypothesis of the study attempt to provide an answer to this question. The results indicate that the levels of use of project plans in the four project delivery stages are ineffective in some project performance parameters but effective in others.

The finding that the level of use of the inception stage plans has no correlation with the clients' satisfaction with project quality and the percentages of the time-overrun to the initial contract period and the cost-overrun to the initial contract sum indicates that the level of preparation of the inception stage plans does not influence these four project performance parameters. However, the finding that the level of use of the inception stage plans has a significant correlation with the clients' satisfaction with the project delivery time and cost and the overrun in the delivery time of the projects procured by the option indicates that the level of use of the inception stage plans influences these three parameters of project performance. In other words, an increase in the level of use or the number of the inception plans can make Nigerian clients more satisfied with the delivery time and cost of projects and can reduce the overrun experienced in the delivery time of projects procured by the method.

The finding that the level of use of the design stage plans has no correlation with the clients' satisfaction with the project cost and quality of the projects sampled indicates that the level of use of the design stage plans does not influence these two project performance parameters. However, the finding that the level of use of the design stage plans has a significant correlation with the clients' satisfaction with the project delivery time and the percentages of the time-overrun to the initial contract period and the cost-overrun to the initial contract sum indicates that the level of use of the design stage plans has a significant influence on these four parameters of project performance. This finding implies that an increase in the level of use of the design stage plans will make Nigerian clients more satisfied with the delivery time of projects and reduce the time and cost overruns recorded in the projects procured by the option. This finding shows that the claim in research studies conducted by Faniran, Oluwoye and Lenard (1998), Ling and Chan (2002), Thomas et al. (2002) and Naoum, Fong and Walker (2004) about project planning having a considerable effect on the project outcome is applicable to projects procured by the design-build method.

The results of this study show that the level of use of tendering stage plans has no correlation with the clients' satisfaction with the project cost and quality and the percentages of the time-overrun to the initial contract period and the

cost-overflow to the initial contract sum of the projects sampled indicate that the preparation of the tender and the method statement does not influence these five project performance parameters. However, the significant correlation between the level of use of the tendering stage plans and the clients' satisfaction with the project delivery time indicates that the preparation of the two tendering stage plans has a significant influence on the clients' satisfaction with the project performance. This finding implies that the preparation of the method statement and the tender of a project contribute to the satisfaction of Nigerian clients with respect to the delivery time of design-build projects.

The results of the study indicate that the level of use of construction stage plans has no influence on the project duration, the cost and quality, the time and cost overruns and the percentage of time-overflow to the initial contract period. However, the level of use of the construction stage plans has a significant correlation with the percentage of the cost-overflow to the initial contract sum of the projects sampled, indicating that the level of use of the construction stage plans has a significant influence on the project cost performance. This finding implies that the preparation of the programme of work and the required resource schedules contribute to the reduction in the percentage of the cost-overflow to the initial contract sum of the projects procured by the DB method.

CONCLUSION

The study has revealed important findings about the level of use of project plans at the four project stages that can provide solutions to some of the problems encountered in procuring projects by the DB method. First, the use of the design-build option is known to save time because the time spent on design and tendering is saved when a single party is contracted to execute the design and construction of a project. Despite this phenomenon, the study discovers that the percentages of the time-overflow to the initial contract period and the cost-overflow to the initial contract sum are higher in projects procured by the DB method than in projects procured by DL and traditional contract methods, which are the main procurement options in Nigeria. Through these findings, the study established that although clients may save time in the design and tendering of the projects procured by design-build, they should expect higher overflow in the execution time of such projects. The study also established that the use of the procurement option has no cost advantage. Acknowledging the existence of these problems, the study discovered that the level of preparation of project plans plays a major role in solving these problems. The results have shown that the levels of the inception, design and tendering stage plans do influence the respondents' satisfaction with project duration while the level of use of inception stage plans has influence on respondents' satisfaction with the project cost. Similarly, the level of use of the design stage plan has an influence on the project time-overflow, while the levels of use of the design stage and construction stage plans have an influence on the project cost-overflow. These results specifically show that the use of the design and construction plans can help to reduce the delay and cost-overruns recorded, while the use of the inception, design and tendering plans can help increase the stakeholders' satisfaction with the delivery time and the cost of projects procured by the option.

However, despite the significant influence that the level of use of project plans has on the time and cost overruns experienced and the satisfaction derived by clients, the study has discovered that some project plans are not prepared when projects are procured by the option. Indeed, this scenario cannot reduce the problems of time and cost overruns, which are the bane of construction project delivery in Nigeria. The study has established that the level of use of project plans in projects procured by design-build is still open to improvement and that when improvement in project plans is achieved, the problems of time and cost overruns will reduce. This finding indicates the need for project stakeholders to improve the level of use of project plans when projects are procured by design-build. Clients, consultants and contractors must ensure that the required project plans are prepared when projects are procured by design-build to minimise the overruns that will be recorded in the delivery time and cost of such projects.

Furthermore, the study has also established that the level of use of project plans has no influence on some parameters, in particular the project quality, of the project outcome. This finding should be a concern to project stakeholders and researchers because it shows that project plans are ineffective with regard to some parameters of the project outcome. This finding indicates that the preparation of project plans is not sufficient for their effectiveness and that the quality of the plans is equally important. Project stakeholders and researchers are challenged to improve the quality of project plans prepared when projects are procured by the design-build method.

SUGGESTION FOR FURTHER STUDIES

The study has established that the parameters of the project outcome are influenced by the preparation of different types of project plans. However, it is also known that the quality and the extent of the implementation of project plans contribute to the influence of project planning on the project outcome. The study could not address these two aspects of project planning. Therefore, further studies on the influence of the quality and extent of the implementation of project plans on the project outcome are suggested to complement the findings of the study.

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