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Cost and time performance of traditional-, direct labour- and management-procured public projects in Ondo State, Nigeria

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Abstract: Procurement method over time has proven to have significant influence on the successful delivery of construction projects. Making the right decision in the selection of a procurement option to adopt is therefore crucial if a project is to succeed. This study therefore assessed the cost and time performance of selected public building projects procured using traditional, direct labour and management procurement options in Ondo State, Nigeria. A pro forma was used to gather cost and time data from government procuring entities in the state. In addition, a structured questionnaire was used to obtain information from construction professionals in these procuring entities, in order to ascertain the factors influencing the choice of procurement options adopted. The cost and time data gathered were analyzed using percentages and the paired-samples *t*-test, while those gathered on the factors influencing the choice of procurement options were analyzed using mean item scores and analysis of variance (ANOVA). The results revealed that although there is no significant difference between the initial and final costs of the assessed projects, some measure of cost overrun still exists. In addition, a considerable amount of time overrun was experienced on projects executed using the three different procurement options. The most significant factors influencing the choice of a procurement option are price competition, speed, time certainty and complexity of the project. It is believed that the findings of this study will provide public procuring entities with insight on the cost and time capability of these procurement methods and aid them in selecting

the procurement option that will help in delivering public building projects within the budget and on schedule.

Keywords: cost, direct labour, management procurement, project success, public building projects, time, traditional procurement

1 Introduction

The choice of a procurement option in the delivery of construction projects is an important factor, if value for money is to be achieved. Considering the economic situation in most developing countries, where adequate finances for projects seem to be a major problem, the adoption of prudent methods in procuring construction projects within the meagre budget of clients is necessary. “Procurement” in construction has been described as the organizational structure needed to design and build construction projects for a specific client (Masterman 1996). Love et al. (1998) noted that the procurement process determines the overall framework and structure of responsibilities, as well as authorities, for participants within the building process; thus, it is a key factor contributing to overall client satisfaction and project success.

The term “project success”, according to Chan (2001), is open to multiple interpretations in the construction industry. While most people consider time, cost and quality as the predominant targets, others suggest that it is something more complex. However, Ogunsemi (2015) opined that cost and time have proven to be the most important criteria for measuring the success of construction projects, and they are considered as being very critical because of their direct economic implications if they are unnecessarily exceeded. According to Memon et al. (2010), while cost is a crucial measure of project success throughout the project’s life cycle, a delay in completion of facilities is directly equal to financial losses resulting from lack of the revenue that such facilities would have been generating. Hence, completing a project within the

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specified budget and time is very important to stakeholders within the built environment (Aghimien et al. 2017). This recognition highlights the fact that selecting the right procurement method that will deliver the proposed construction project within the estimated cost and at the estimated time is crucial if a project is to be termed successful.

Studies have shown that most clients and their representatives have the tendency of selecting procurement systems by default, without making a deliberate choice or proper consideration of the procurement method that will best suit both their needs and those of the project. Others base their selection largely on their familiarity with a particular procurement method (Okunlola 2012; Ng et al. 2002). The implication of these types of selections is poor delivery of construction projects, and this has characterized the construction industry in most developing countries around the world, Nigeria being no exception (Akindoyeni 1989; Maizon et al. 2006; Ogunsemi and Jagboro 2006; Ogunsemi and Saka 2006; Oluwakiyesi 2011). Considering the harsh economic situation in Nigeria, coupled with the poor performance of its construction industry, “getting it right” from the very beginning, through the adoption of the right procurement system is necessary if projects are to be delivered within the client’s budget and schedule.

Based on this knowledge, this paper focusses on the cost and time performance of selected public building projects in Nigeria, procured using the traditional, direct labour and management procurement systems. The rationale for selecting these three procurement options is based on the premise that, while the traditional procurement is the oldest and the most common method of procurement within the country (Kadiri and Odusami 2003), the direct labour over time has gained popularity among government organizations in the country (Idoro et al. 2007). The performance of management procurement method, however, has failed to gain any form of recognition in academic discussions emanating from the country. Thus, this study was conducted with a view to showcasing the ability in terms of cost and time of these three procurement systems in the delivery of public building projects in Nigeria. The study also assessed the factors responsible for the selection of a procurement option by public procuring entities in the country.

2 Literature review

Procurement method is described as the relationships formed among clients, consultants and construction companies, to enable a building project to be completed (Sarah et al. 2007). Ashworth and Hogg (2007) further

described procurement as an organized method for clients to obtain construction products. This process is extensive and covers every aspect of the project delivery, planning for their contractual requirements, and this extensiveness creates a major problem and affects the performance of the construction industry (Inuwa et al. 2014). Traditionally, construction projects start with the client’s brief, on which designs are based. The design team advises on the design and cost implications of the design variables, after which the tender process that produces the contractor for the execution of the work will begin. On the award, the successful contractor executes the work as designed under the supervision of the consultants. This approach is known as the *Traditional Procurement* method. This method has dominated the Nigerian construction industry for years (Dada and Oladokun 2012). It separates the design, tendering process and construction processes, and this separation leads to a sequencing of activities in which the design is completed before construction commences. This is time consuming and it is not suitable for time-sensitive projects (Kadiri and Odusami 2003; Seeley 1997; Tunner 1990). These shortcomings of the traditional method have led to the development of other procurement options, such as the management procurement and direct labour options.

In the *Management Procurement* method, a contractor is involved in the provision of management services on a project. Larmour (2011) stated that the two main variants of this method are management contracting and construction management. Management contracting involves an arrangement whereby the client appoints designers and a management contractor separately and pays the contractor a fee for managing the construction works. The contractor provides management services to control and coordinate all site activities, sub-letting works to suitable contractors on a competitive basis. In construction management, the client enters into separate contracts with the construction manager, designers and trade contractors. The major difference between these two systems is that, in construction management, the construction manager acts solely as a manager and he/she is not in contract with the trade contractors, who undertake all of the work. He/she is appointed as a professional consultant with powers to inspect work on site and issue instructions (Babatunde et al. 2010; Brook 2004; El-Agha 2013; Oladinrin et al. 2013).

The *Direct Labour* approach is a method whereby the client designs and produces his/her project by himself with the aid of his/her in-house professionals (Idoro and Iyagba 2008). The system is void of the usage of contractors (Kadiri and Odusami 2003). This procurement system has undergone rapid growth and development with time,

and the government and its agencies are the major users of this procurement system in Nigeria (Idoro et al. (2007; Idoro and Iyagba 2008). This procurement system, according to Idoro and Iyagba (2008), saves time as there is no need for preparing tenders or negotiating with contractors, and it discourages economic waste on non-capital projects to contractors.

In selecting a procurement option to be adopted for specific projects, certain factors have the tendency of influencing the choice of procurement option. Ng et al. (2002) observed the need for speed and time certainty in construction as a major factor that may influence the choice of a procurement system. Speed refers to the need to complete a project more quickly than other projects of similar nature, complexity and size. Time certainty is the assurance that a project will be completed on or before an exact date and time, particularly for large or prestigious projects scheduled for a particular function or event. Price certainty was noted by Maizon et al. (2006). This can be related to the firm price for the total construction cost obtained at the commencement of the project. Often, clients like to have a firm price for their project before committing to it. This enables them to have an approximate estimate so that the project cost can be kept within the financial budget. A similar observation was made by Afriyie (2014), who discovered that the estimated value of the proposed project is a major factor influencing the choice of a procurement system in Ghana. Moreover, Cheung et al. (2001), Love et al. (1998) and Ratnasabapathy et al. (2006) have noted the issue of flexibility of the procurement methods, which has to do with the ability of a procurement method to accommodate variations such as design changes during the construction phase. Quality, which is the degree to which a set of inherent characteristics fulfil client's requirements, has also been noted as an important factor that influences the choice of a procurement option (Love et al. 1998; Maizon et al. 2006; Seng and Yusof 2006; Ng et al. 2002).

Other factors, such as complexity of work to be executed, responsibility (which is the knowledge of the degree of client's involvement), price competition (which covers the aspects of value for money), risk allocation, familiarity with the procurement system by the client/his (her) professionals and government policies, have been deemed as important in the selection of a procurement system (Chan 2007; Edmond et al. 2008; El-Agha 2013; Hibberd and Djebarni 1996; Love et al. 1998; Luu et al. 2005; Maizon et al. 2006; Ratnasabapathy et al. 2006; Ng et al. 2002). All these factors formed the basis for the assessment of the factors influencing the selection of procurement method in the delivery of public projects in this study.

3 Reserach methodology

This study set out to assess the cost and time performance of public projects procured through the traditional, direct labour and management procurement options in Nigeria. The study adopts a case study of selected public building projects procured by government-sponsored organizations (public procuring entities) in Ondo State. These organizations include three ministries (works, land-and-housing and education), three local governments (Akure South, Akoko North-East and Owo), seven government agencies and three tertiary institutions. In all, a total of 16 government-sponsored organizations were assessed. Data on cost and time of building projects executed in the previous 5 years were gathered from the archives of these procuring entities through the use of a pro forma. It was discovered that most of the projects executed within this period were procured via the traditional and direct labour routes. Only 12 projects procured using the management procurement option were accessible. Thus, for uniformity, only 12 projects were selected for each of the three procurement options.

The study also assessed the factors influencing the choice of a procurement option used in the delivery of public building projects. Data on this aspect were gathered through purposive sampling of construction professionals within these identified government organizations. The instrument for gathering these data was a structured questionnaire, which – according to Blaxter et al. (2001) – is among the most widely used social research techniques. The questionnaire was designed in two parts, and Part 1 dwelt on the background information of the respondents. Results from this part served as a quality check for the responses obtained from the other part of the questionnaire. Part 2 addressed the factors influencing the choice of a procurement option. Respondents were provided with possible factors that might influence the selection of a procurement method and were asked to rate these lists on a five-point Likert scale based on their level of significance. The Likert scale ranged from 1 (very low) to 5 (very high). Four questionnaires were sent to each of the 16 organizations, making a total of 64. However, only 46 were retrieved and considered fit for analyses, with the remaining 18 dropped due to missing vital details. These 46 returned questionnaires represent a 71% response rate, which is adequate for the study (Moser and Kalton, 1999).

Analyses of the cost and time data were done using percentages and the paired-samples *t*-test. Pallant (2005) stated that the paired-samples *t*-test is used in comparing the mean scores for the same group of people on two different occasions or when there are matched pairs. Thus, since the initial cost/time and final cost/time assessed were for each

particular procurement option, the paired-samples *t*-test was considered suitable. Data on the background information of the respondents were calculated using frequency and percentage, while the mean item score (MIS) was used in ranking the factors influencing the choice of procurement option as perceived by the different procuring entities in the state. Analysis of variance (ANOVA) test was also used to check for statistically significant differences in the mean values of the various factors across the different procuring entities. The ANOVA test was chosen, since it is a suitable method for comparing the mean values of more than two groups (Pallant 2005). The internal consistency of the questionnaire was also analyzed using Cronbach's alpha test. Cronbach's alpha gives a range of values between zero and one, and the higher the value, the higher is the degree of internal consistency. A Cronbach's alpha value of 0.835 was derived for the factors influencing the selection of a procurement option. This shows that the instrument is reliable since the degree of reliability of an instrument is more perfect as the value tends towards one (Moser and Kalton 1999).

4 Findings and discussion

4.1 Background information of respondents

Analysis of the background information of respondents shows that most of the respondents who responded to the questionnaire were from the government agencies (32.6%) and local governments (23.9%). The least response was obtained from the tertiary institutions (23.9%) and ministries (17.4%). Moreover, the major type of construction project procured by these procuring entities was building works (73%). The remaining 27% were civil engineering works. This implies that more focus is given to building works than civil engineering works within the study area. The most represented professionals were the quantity surveyors and civil engineers, with 37.1% and 34.7%, respectively. The least represented were architects and builders, with 17.4% and 10.9%, respectively. In terms of academic qualification, the majority of the respondents (76%) were bachelor degree and higher national diploma holders. Most of these respondents were members of their professional bodies, except three, which constituted a meagre fraction (6.5%) of the total population. The average years of working in the built environment was put at approximately 9 years. This implies that these respondents are well equipped both academically and professionally to give reasonable insight to the questions of this research.

4.2 Factors influencing the choice of procurement option in the delivery of public building projects

In determining the factors influencing the choice of procurement system used for public projects in Ondo State, some factors were identified from the literature, and respondents were asked to rate them based on their level of significance. The results in Table 1 show the rating of these factors by the different categories of respondents and their respective significant *p*-values derived from the ANOVA test carried out. A look at the last column of the table shows that all the assessed factors have their significant *p*-value to be >0.05 . This implies that at 95% confidence level, there is no statistically significant difference among the mean values of the various factors across the different procuring entities.

In terms of the overall mean value, the result shows that all the assessed factors have a mean value greater than 3.0 on an average. This implies that, to a considerable extent, all the assessed factors have the tendency of influencing the choice of a procurement option in the delivery of public building projects. However, the most significant factors influencing the choice of a procurement option are price competition (which has to do with the need to achieve value for money and public accountability), speed in the design and construction phases of the project, time certainty (which has to do with the ability of a procurement option to complete a project within schedule) and the complexity of the project. These four factors were ranked highest, with mean values of 3.98, 3.86, 3.79 and 3.77, respectively.

According to El-Agha (2013), factors relating to the cost of construction are crucial in the selection of procurement method for the delivery of construction projects in the Gaza strips. A similar observation was made by Afriyie (2014) in Ghana. Maizon et al. (2006) further observed that for public clients, cost can be an important factor, especially where the government procurement policy requires value for money. Mahon (2011) also mentioned that factors related to cost affect the selection of procurement method strongly. Thus, consideration of the need to achieve both value for money and public accountability when selecting a procurement method to adopt in the delivery of public projects is deemed important.

The finding of this study is also in line with the observations of Shiyamini et al. (2008) and El-Agha (2013) that project characteristics that include parameters such as the project type and complexity are important factors that influence the choice of procurement

system. A similar observation was made by Eyitope et al. (2012) in Nigeria. This result also further confirms the study of Davis et al. (2008), who stated that some procurement options such as the management procurement option is adopted for more complex constructions.

Furthermore, the need for speed during design and construction, coupled with the ability for a procurement system to deliver a project within the stipulated period, can be major factors that could influence the choice of a procurement method in the delivery of public building projects. This is so because most government projects have specified completion periods, especially when such project is to be executed towards the end of the tenure of an administration. These projects tend to be time sensitive as the government will want to complete and commission them before leaving the office. Ng et al. (2002) also recognized the importance of these factors in the selection of procurement options.

4.3 Cost and time performance of traditional, direct labour and management procurement options

Table 2 shows the analysis of cost and time data gathered for 12 public building projects procured using the traditional approach. The result shows that out of the 12 projects, six were completed within the estimated budget, while six were completed above budget, with a percentage deviation ranging between 9.3% and 56.5%. Overall, there was an average of 12.2% cost overrun in the assessed projects. In terms of time, only three projects were completed within the estimated period, while the remaining nine projects exceeded their initial estimated time, with an overrun of between 13.3% and 113.3%. Overall, an average of 31.1% time overrun was experienced on all assessed projects.

Tab. 1: Factors influencing the choice of procurement method used in public project delivery

Factors	Min.		Agen.		LG.		Tert.		Overall		ANOVA	
	MIS	Rk	MIS	Rk	MIS	Rk	MIS	Rk	MIS	Rk	F	Sig.
Price competition - need to achieve value for money and public accountability	4.27	1	3.75	4	3.40	2	4.27	1	3.98	1	1.622	0.199
Speed - in all phases of the project	4.13	2	3.50	10	3.60	1	4.00	2	3.86	2	0.654	0.585
Time certainty - ability to complete project within the agreed duration	4.07	4	3.86	3	3.10	7	4.00	2	3.79	3	1.869	0.151
Complexity of the project	4.13	2	3.63	7	3.20	6	3.91	4	3.77	4	2.071	0.119
Flexibility - ability to accommodate changes during design and construction phases	3.86	7	4.00	1	3.22	5	3.64	8	3.69	5	1.343	0.275
Quality - the need to fulfil client's expectation of essential project characteristics	3.93	6	3.71	6	3.10	7	3.73	6	3.64	6	1.809	0.162
Familiarity - based on previous experience	3.80	8	3.43	12	3.33	3	3.73	6	3.62	7	0.561	0.644
Simplicity - in terms of activities, process and procedure	4.07	4	3.57	9	3.10	7	3.36	12	3.58	8	2.430	0.080
Price certainty - the ability to keep expenditure within budgeted estimate	3.80	8	3.50	10	2.90	10	3.91	4	3.57	9	1.822	0.159
Government policy - on using a particular procurement route	3.60	10	3.63	7	2.90	10	3.64	8	3.45	10	1.366	0.267
Dispute resolution and arbitration	3.36	12	4.00	1	3.33	3	2.91	13	3.34	11	2.406	0.083
Responsibility - the need to be involved in and to be kept informed about the project through its life	3.40	11	3.75	5	2.80	13	3.40	11	3.33	12	1.105	0.359
Risk allocation - knowledge on how and to what degree uncertainties/risks have been passed to or shared among parties	3.33	13	3.14	13	2.90	10	3.44	10	3.22	13	0.906	0.448

Note: Min. = ministries; Agen. = agencies; LG. = local governments, Tert. = tertiary institutions; ANOVA = analysis of variance; Rk. = rank; Sig. = significance.

Tab. 2: Cost and time analysis for traditionally procured public projects

S/n	Project type	FC. (mill.)	IC. (mill.)	Dev.	% Dev.	FT. (weeks)	IT. (weeks)	Dev.	% Dev.
1	Educational building	45.0	39.0	6.0	15.4	45	30	15	50.0
2	Educational building	18.0	11.5	6.5	56.5	28	24	4	16.7
3	Social building	600.0	600.0	0.0	0.0	96	76	20	26.3
4	Residential	116.0	93.0	23.0	24.7	46	36	10	27.8
5	Residential	2.3	2.3	0.0	0.0	10	10	0	0.0
6	Residential	5.7	5.7	0.0	0.0	12	12	0	0.0
7	Residential	5.6	5.6	0.0	0.0	15	15	0	0.0
8	Offices	37.5	33.0	4.5	13.6	34	30	4	13.3
9	Educational building	501.3	395.5	105.7	26.7	48	35	13	37.1
10	Educational building	150.0	150.0	0.0	0.0	72	52	20	38.5
11	Residential	13.5	13.5	0.0	0.0	32	15	17	113.3
12	Offices	55.4	50.7	4.7	9.3	36	24	12	50.0
	Average			12.5	12.2			10	31.1

Note: FC. = final cost; IC. = initial cost; Dev. = deviation; FT. = final time; IT. = initial time; mill. = million; exchange rate: 1 Euro = 419.6 Naira (2017).

Tab. 3: Cost and time analysis for direct labour-procured public projects

S/n	Project type	FC. (mill.)	IC. (mill.)	Dev.	% Dev.	FT. (weeks)	IT. (weeks)	Dev.	% Dev.
1	Offices	56.0	46.0	10.0	21.7	32	24	8	33.3
2	Educational building	4.5	4.5	0.0	0.0	4	4	0	0.0
3	Social building (ren.)	1.5	1.0	0.5	50.0	4	4	0	0.0
4	Utility building	4.5	4.5	0.0	0.0	6	6	0	0.0
5	Health care centre	6.0	5.0	1.0	20.0	32	20	12	60.0
6	Health care centre	5.0	5.0	0.0	0.0	6	4	2	50.0
7	Educational building	7.1	7.1	0.0	0.0	5	4	1	25.0
8	Social building (ren.)	10.5	10.0	0.5	5.0	32	24	8	33.3
9	Offices	830.0	830.0	0.0	0.0	32	24	8	33.3
10	Social building (ren.)	10.0	8.5	1.5	17.6	28	24	4	16.7
11	Residential	28.2	30.0	-1.8	-6.0	17	18	-1	-5.6
12	Educational building	4.4	4.5	-0.1	-2.2	6	4	2	50.0
	Average			1.0	8.8			4	24.7

Note: FC. = final cost; IC. = initial cost; Dev. = deviation; FT. = final time; IT. = initial time; mill. = million; ren. = renovation; exchange rate: 1 Euro = 419.6 Naira (2017).

Table 3 shows the cost analysis of 12 public building projects procured via the direct labour route. The result reveals that while five of the assessed projects were procured within budget, four projects experienced budget overshoot, while two made savings of 6% and 2.2%. Overall, 8.8% cost overrun was experienced on all the assessed projects. In terms of time, three projects were completed within the expected period, eight experienced time overruns ranging from 16.5% to 60%, while only one was delivered before the expected completion time. Overall, an average of 24.7% time overrun was recorded for the building projects. This is slightly lower than what was experienced for projects executed through the traditional route.

For public building projects procured using the management method, the result in Table 4 shows that out

of the 12 assessed projects, six were completed within budget. However, the remaining six experienced a budget overshoot ranging from 0.1% to 70.6%. Overall, an average of 8.8% cost overrun was experienced on all the assessed projects. In terms of time, three projects were also delivered within schedule; however, the remaining nine experienced time overruns ranging from 7.5% to 119.2%, with an overall percentage deviation of 47.4%. This result shows that among the three assessed procurement options, projects executed through this method experienced more variation between their initially estimated time and their actual completion time.

In order to determine whether there exists a significant difference between the initial estimated cost and the final cost of construction of these public building projects

Tab. 4: Cost and time analysis for management-procured public projects

S/n	Project type	FC. (mill.)	IC. (mill.)	Dev.	% Dev.	FT. (weeks)	IT. (weeks)	Dev.	% Dev.
1	Educational building	67.0	63.0	4.0	6.3	72	67	5	7.5
2	Social building	3,213.0	1,883.0	1.3	70.6	6	6	0	0.0
3	Educational building	29.6	29.6	0.0	0.0	24	24	0	0.0
4	Educational building	110.0	110.0	0.0	0.0	32	20	12	60.0
5	Social building	69.4	69.4	0.0	0.0	53	30	23	76.7
6	Social building	121.1	121.1	0.0	0.0	30	21	9	42.9
7	Health centre	250.0	217.0	33.0	15.2	32	21	11	52.4
8	Health centre	172.7	160.2	12.4	7.8	32	24	8	33.3
9	Educational building	158.5	158.4	98.2	0.1	114	52	62	119.2
10	Social building	54.0	51.1	2.9	5.7	24	24	0	0.0
11	Residential	69.7	69.7	0.0	0.0	42	20	22	110.0
12	Residential	245.0	245.0	0.0	0.0	40	24	16	66.7
	Average			115.2	8.8			14	47.4

Note: FC. = final cost; IC. = initial cost; Dev. = deviation; FT. = final time; IT. = initial time; mill. = million; exchange rate: 1 Euro = 419.6 Naira (2017).

Tab. 5: Summary of the cost performance of public building projects, analyzed using the paired-samples *t*-test

Procurement type	Overall deviation (million)	Overall % deviation	Std. deviation	Std. error mean	<i>T</i>	Df	Sig. (two-tailed)
Traditional	12.5	12.2	30.1	8.7	1.44	11	0.177
Direct labour	1.0	8.8	2.9	0.9	1.13	11	0.281
Management procurement	115.2	8.8	382.6	110.5	1.04	11	0.319

Note: Std. = standard; Df = degrees-of-freedom; Sig. = significance; exchange rate: 1 Euro = 419.6 Naira (2017).

Tab. 6: Summary of the time performance of public building projects using the paired-samples *t*-test

Procurement type	Overall deviation	Overall % deviation	Std. deviation	Std. error mean	<i>T</i>	Df	Sig. (two-tailed)
Traditional	10	31.1	8	2	4.296	11	0.001**
Direct labour	4	24.7	4	1	2.974	11	0.013**
Management procurement	14	47.4	17	5	2.845	11	0.016**

Note: Std. = standard; Df = degrees-of-freedom; Sig. = significance; **significant at $p < 0.05$; exchange rate: 1 Euro = 419.6 Naira (2017).

procured using these different routes, the paired-samples *t*-test was conducted. The result in Table 5 shows that at 95% confidence level, there is no significant difference between the initially estimated cost and the final cost of construction of public building projects procured using the traditional, direct labour and management procurement systems. This is because a significant *p*-value of > 0.05 (0.177, 0.281 and 0.319) was derived for all three procurement options.

Further analysis to determine whether there is a significant difference between the initial estimated time and the actual completion time of the assessed public

building projects was also done using the paired-samples *t*-test. Table 6 shows that at 95% confidence level, there exists a significant difference between the initial estimated time and the actual completion time of the identified projects procured using the three different procurement options. A significant *p*-value of < 0.05 (0.001, 0.013 and 0.016) was derived for all three procurement options. This implies that irrespective of the procurement option being adopted, time overrun is a common occurrence, which must be given adequate attention, if the expected completion time for projects is to be met.

The implication of this result is that, although there is no significant difference between the initial and final costs of delivering these public building projects, as observed from the result of the *t*-test, more work still needs to be done to further close the variation margin of cost of procuring public projects. The results revealed an approximate deviation of 12% for traditionally procured projects and 9% each for those procured using direct labour and management contracting. Comparing this result to the findings of Omoregie and Radford (2006), which showed that the minimum average percentage escalation cost of public projects in Nigeria was 14%, it could be seen that there exists appreciable scope for improvement in cost performance of construction works in the Nigerian construction industry. Moreover, the result shows that the cost overruns in the direct labour- and management procurement-procured building projects are similar to those observed in a similar developing country such as Malaysia. Memon et al. (2012) found that construction projects face cost overruns between 5% and 10% in the country. However, the result from this study indicates that more work still needs to be done in terms of cost control in public projects in the construction industry, especially for projects being procured via the traditional route. The National Institute of Building Sciences (2013) gives the range of acceptable deviation for an initial cost estimate from the final cost of construction as 2%–3%. Considering the 12% and 9% cost overruns recorded for these procurement options, respectively, it can therefore be said that the delivery of building projects within the state can still be improved upon in order to further reduce the variability in cost.

The findings of this study agree with those of Adenuga (2013), which show that projects procured by the traditional method experience cost overruns more than those procured via the direct labour system. The reason for this according to Adenuga (2013) may be because of the fact that under the direct labour method, there is better control of services, better adjustment to workload fluctuation and security to the work done. The findings further corroborate the study of Odusami (2001), which showed that the traditional procurement system is more expensive in the delivery of projects. Judging from the result of this study, it can be said that investors seeking to achieve cost-effective projects will do well by adopting the direct labour or management approach with strict supervision, instead of the traditional method, which gives a wider margin of cost overrun.

Our findings also show that the three assessed procurement options have the tendency of having time overruns when used in procuring public projects. However,

the overrun appears to be higher in projects delivered through the management procurement option (47.4%) and lower in direct labour-procured projects (24.7%). Studies have shown that time overrun has become a frequent occurrence in the Nigerian construction industry. Odeyinka and Yusif (1997) submitted that the average time overrun experienced on construction projects in Nigeria is 70%. Omoregie and Radford (2006) observed a 188% overrun in their study on public construction projects. Aghimien and Awodele (2017) also discovered 130% time overrun in educational buildings. Although these studies assessed a wider range of construction projects as against those assessed in this study, the trend towards high time overrun can still be seen from the result. This implies that public building projects in the country need proper attention in terms of timely delivery, as this may disrupt the activities of the industry and reduce the confidence of clients and other stakeholders in the industry. This finding further confirms the assertion by Akindoyeni (1989) and Ogunsemi (2015) that in Nigeria, most construction projects are completed after duration, longer than initially planned. Moreover, it further confirms Adenuga's (2013) submission that the issue of time overrun is not synonymous with one particular procurement method, as most procurement options have the tendency of experiencing time overrun if not properly managed.

Adenuga (2013) submitted that the direct labour approach experiences time overrun more than the traditional contract method of procurement. This was attributed to the introduction of innovations and technology to work done in the traditional contract method and the use of special skills for the delivery of their projects. The findings of this study, however, contradict this assertion, as direct labour was noticed to have a more reduced percentage deviation relative to that of traditionally procured public projects. The reason for this disparity may be attributed to the difference in the number of projects assessed in both studies. However, a similarity exists between the finding of this study and that of Idoro et al. (2007), who discovered a delay of 25% in terms of time for projects procured using the direct labour system. Davis et al. (2008) stated that one of the major advantages derived from the use of a management procurement option is the fact that it has the potential for time savings as design and construction activities are overlapped. The findings of this study prove otherwise, as this procurement option was found to have the highest time overrun among the three procurement options assessed. Thus, the use of this procurement option within the construction industry in the country merits a second reflection.

5 Conclusion and recommendation

This study set out to assess the cost and time performance of public building projects procured using the traditional, direct labour and management procurement options in Nigeria. A study of some identified public building projects in Ondo State was carried out, and information was gathered from construction professionals in the various government-sponsored organizations responsible for these projects.

Based on the findings, it is therefore concluded that although there is no significant difference between the initial and final costs of public building projects procured using the different procurement options, there still exists some measure of cost overrun experienced on the identified projects. This needs to be checked, with all necessary measures put in place before and during the construction of public projects, so as to reduce the level of variability in cost of these projects. Furthermore, the direct labour and management procurement options are seen to provide lesser cost overrun when compared to the traditional method. Thus, investors who wish to procure construction projects with cost as a major factor can adopt any of these two systems with strict supervision. In terms of time, the study concludes that there is a significant difference between the initial and final times of construction of public building projects procured using the different procurement options. Although the management procurement option experienced higher time overrun, a considerable amount of overrun was experienced on projects executed using the three different routes. This implies that the issue of time overrun is not synonymous with one particular procurement option. Hence, adequate measures in ensuring the reduction in the delay in completion of public projects must be put in place irrespective of the procurement option being adopted. The study also revealed that the most significant factors influencing the choice of a procurement option in the delivery of public projects are price competition (which has to do with the need to achieve value for money and public accountability), speed in the design and construction phases of the project, time certainty (which has to do with the ability of a procurement option to complete a project within schedule) and the complexity of the project.

This study therefore recommends that since no particular procurement method can best satisfy the needs of a client in all situations, or that of different clients in the same situation, public procuring entities and professionals within the built environment should therefore apply strategic measures in choosing the right procurement option to adopt. This can be done through careful

analyses of the projects' characteristics, costs involved and the expected completion times for such projects. Furthermore, there is the need for proper monitoring and control of construction cost and time by the parties involved in the delivery of projects within the construction industry. This is to ensure that the selected procurement option performs to cost and time.

It is believed that the findings of this study will provide public procuring entities, and even private investors in the country, with insight on the cost and time capabilities of these different procurement methods. This will help in selecting the procurement option that will help in delivering building projects within budget and on schedule, bearing in mind the crucial factors to consider in the selection of a procurement option. While this study gives an insight into the performance of building projects procured through the three identified procurement options, the study was limited to Ondo State; hence, the result of the study may not be applicable in other parts of the country. Moreover, another limitation of this study is the few number of available projects for each of the procurement options assessed. Further study can therefore be conducted by expanding the scope of the research to other states or regions in the country, in order to get more projects procured using these different procurement routes and also compare results from other states or regions in the country.

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