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EFFECTS OF DELAY ON COST PERFORMANCE OF ROAD CONSTRUCTION PROJECT: CASE OF NIGER DELTA DEVELOPMENT COMMISSION PROJECTS IN NIGERIA

Scholastica F. Ekanem[1], A. Opawole[2] and Timothy O. Adewuyi[3]

[1]Department of Quantity Surveying, School of Environmental Studies, AKS Polytechnic, Ikot Osurua, Nigeria

[2]Department of Quantity Surveying, Faculty of Environmental Design and Management, Obafemi Awolowo University, Ile-Ife, Nigeria

[3]Department of Building, Faculty of Environmental Studies, University of Uyo, Uyo, Nigeria

ABSTRACT

Purpose: The reduced cost performance of the Niger Delta Development Commission (NDDC) road construction projects was caused by construction delay. It makes it essential to evaluate the effects of road construction delay on cost performance and developed a model for predicting the cost performance of road projects in the Niger Delta region, Nigeria.

Design/methodology/approach: Both primary and secondary data were used for the study and were analysed using a descriptive method, multiple regression analysis, and Kruskal Wallis H test for the hypothesis. Secondary data were obtained from initial and final costs and durations of 136 road projects procured between 2008 and 2018.

Findings: Based on the 138 copies of questionnaires retrieved involving registered professionals in the six selected States, the results showed that the significant effects of delay on cost performance are: inflation of currency/exchange rates, corruption, total abandonment, under-development, and dispute and claims/bad reputation. However, the test revealed a significant variation between Delta and Cross River States and between Edo and Cross River States. The source of variation might be attributed to frequent patronage of the same contractors and consultants, high rate inflation and fraudulent/corrupt practices in the procurement and execution of the projects.

Research limitation/implications: The squared coefficient of correlation (R^2) value of the relationship between delay and cost performance is 0.237, revealing that 23.7% of the variation in the cost performance of road projects can be explained by the delay. It explained the percentage of delays in the completion of the road project executed by NDDC.

Practical implication: The studied variables that contributed significantly to the effect of delay on the cost performance of road projects procured by NDDC in the study area are nonspecific. Dereliction of such factors can rob both the client and beneficiaries of the economic benefits of such development and may aggravate the recurrent agitations and militancy in the region.

[1]king13dan2013@gmail.com

Originality/value: The identified challenges by this study and their effects could be reduced through the application of the developed model in the execution of road projects in the region by the professionals and stakeholders employed by the commission. Participants in the construction industry in the region, and the world at large, can as well benefit from the application of the model for road projects with similar attributes, thus improving cost performance of projects delivery.

Keywords: Cost performance; delay; effect; NDDC, Niger Delta region; road construction project.

1. INTRODUCTION

The construction industry is a medium through which a society achieves its goals of rural and urban development (Alhomidan, 2013). Construction is one of the sectors that provide essential ingredients for the development of an economy, especially road infrastructures, as it enhances any kind of investment, movement of goods, services, and equally harnessing economic potential. A road construction project is a complex process and involved activities of professionals in the construction industry for its execution at every given time. Mulla and Waghmare (2015) observed that managing these activities to complete a project within budgeted cost and to client's satisfaction is difficult due to delay, despite the inventions and highly developed technologies. Delays in terms of value sometimes become freighting and disturbing, thus, demanding a more programmatic investigation. Shahid et al. (2015) established that delays are the primary cause of disputes confronting the construction industry. As such, road construction delay has assumed a grave concern to the parties in the construction industry.

Delay in construction remains a significant object of dissatisfaction among the stakeholders in the construction industry. An attempt to tackle the effects of delay on cost performance of road projects delivery becomes abortive, mostly in the developing countries. Documented findings revealed that new skill and improved expertise have not been able to prevent delay occurrences in civil engineering construction projects, including road projects procured by the Niger Delta Development Commission (Ekanem, 2019). The Federal Government of Nigeria assigned huge budgetary allocation for the construction of road projects through the NDDC since the year 2000. However, construction and delivery effects in terms of cost and time performance are poor as most of the road projects had either not commenced, partially completed, or in some cases, were abandoned (Isidiho & Sabran, 2015). Ekanem (2019) explained further that this scenario could be due to embezzlement, agitation, militancy, corruption, political interference, and insincerity among the stakeholders, which is very common in the Niger Delta region.

Though cost overrun remained a significant characteristic of road construction projects in the area, empirical studies on the effect of delays on cost performance of NDDC road projects delivery seems scarce. Thus, the scarcity of local literature has made it complicated to ascertain the impact and extent of delay in the cost performance of road projects procured by NDDC in the region. Mahamid (2011) examined the similarity between the estimated and actual cost of 100 road projects secured in the West Bank in Palestine. Deviations occurred on the value of execution of earthworks, asphalting, and furniture works to the extent of 15.7%, 18.5%, and 36.4%, respectively. However, the drivers resulting in these deviations remained uncaptured. According to Gebrehiwet and Luo (2017), construction projects experienced 70% of the time overruns

attributing 76% to contractors and 56% to consultants, given an overall average time overrun of 10 to 30% from the original period that causes 50% cost overrun.

Cost and time performances become the principal concerns in the construction sector, due to late completion of projects, thus exposing the stakeholders, especially the clients and contractors, to severe economic and financial risks such as loss of income, profit, bad reputation, and a lot more. Ghana's Statistical Services (2019) observed that, between 1997 and 2010, materials prices and labour costs increased by 1,229% in Africa. Construction projects, especially road projects, experience inflation, and fluctuation that affect cost and time performances as a result of claims and extension of time. Because of this, some previous studies developed cost-time relationship models for building projects to minimise the frequent occurrence of cost overrun in the construction industry, such as Bromilo (1974), Choudhury and Rajan (2003), Ogunsemi and Jagboro (2006) and Hoffman et al. (2007). Nevertheless, Kaka and Price (1991) and Tawiah (2014) developed similar models for road construction projects in the United Kingdom and Ghana, respectively. However, the foregoing studies did not focus on the evaluation of the delay effect on the cost performance of regional intervention projects. But this present study specifically focused on road construction projects with similar socio-political, environmental, and economic climates, which could pose significant delays on road construction projects in the Niger Delta region. This research investigated the effect of delay on the cost performance of road construction projects executed by the NDDC in the Niger Delta region, giving attention to the peculiar economic, environmental, and socio-political characteristics of the region.

This study sought solutions to two questions: (a) How does delay impact on cost performance of road project delivery in the study area? (b) How can the effect be modelled to predict the cost performance of such road projects? This study sought answers to these research question to help achieve aim and objectives. Therefore, the objectives of the study are: (1) to evaluate the effect of delay on the cost performance of road construction projects procured by NDDC in the Niger Delta region. (2) to determine the relationship between delay and the cost performance of road projects in the study area. Two hypotheses derived from the objectives of this study include: (i) There is no significant variation in the effect of delay on the cost performance of road projects procured by NDDC among the six selected States in the study area. (ii) There is no significant relationship between delay and cost performance of road projects procured by NDDC in the Niger Delta region.

1.1. The study area

The South-South of Nigeria comprises of Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and the River States selected from the nine States and is geographical located within the Niger Delta region, Nigeria. The study focused on this area due to familiarity with the environment for the sake of data collection and also due to numerous on-going road construction. Niger Delta region is rich in oil and gas, it remains the primary source of income for the country, accounting for about 97% of the total export item generating revenues (Agbu, 2005 and Jike 2005). They further explained that, this mineral became well-known in the region in 1958, and since then, the resources accruing from the exploration of crude oil has dominated the country's economy. The indigenes of the area depend on their land, water, and forest as farmers, fishermen, and hunters, for their survival before the discovery of mineral resources. These economic activities were

devastated as a result of the operation of exploration by oil companies. As a result of the exploration activities, the region becomes unproductive and undeveloped for survival, thus necessitating the establishment of NDDC to implement developmental projects as a means of compensating the inhabitants of the area. The lack of completed desired and impacting development demands this study.

2. REVIEW OF RELATED LITERATURE

Although construction delay is an occurrence that is common to construction projects but the level of effect and what led to cost overrun differ from project to project and from region to region (Kasima & Abubakar, 2012). Ashwini and Rahul (2014) defined cost overruns as the distinction between the estimated cost of projects and actual project cost at the completion time of the work; that is, the amount by which real value surpasses the approved cost or an increase in a completed price higher than what was estimated. While Benon and Milton (2012) termed time overruns as the degree by which the proportion of the finishing time of a project closes up to the initial commencement duration, that is, the extent by which the percentage of final finishing duration differs from the initial completion time. Furthermore, time overruns point out the gap between the final and initial completion time prescribed at the commencement of work.

Shahsavand et al. (2018) defined delay as the extra time incurred either beyond completion date specified or beyond the date that was agreed and signed upon by the parties in the contract document for delivery of a project. Client described delay as a loss of income through lack of production facilities and rentable space or a dependence on present facilities. While to a contractor, delay means higher overhead costs due to additional task leading to extension project duration, higher material costs through inflation, and as a result of labor cost increases. However, to complete projects on schedule is an index of efficiency, but the processes involved in the construction project is subject to countless variables and unpredictable factors, which may result from many sources. It is necessary that a detailed assessment and investigation is carried out and analysed the effects resulting from delays on the stakeholders in the projects with time required for the extension of projects time whenever the project is delayed. Kikwasi (2012) opined that delays occur in road construction projects as a result of the parties involved regarding the road project merely as linear and straight-line projects with no adequate planning attached at the inception. Construction delays were reported to be a common phenomenon in civil engineering projects in Egypt, where road construction projects were not excluded (Aziz et al., 2016). Therefore, it is essential to study and analyse the causes of road construction delay. Asish and Pratheeba (2015) enunciated that delay or cost overrun occurs due to ineffective and thorough investigations, planning, and scheduling. The preparation of valuation and payment, ineffective managerial technique, lack of incentive, delay in approving design documents, poor communication network among working teams, lack of teamwork among the workers on-site, and change order by clients due to errors were included among the cases of overrun. Enshassi, Mohamed and Madi (2005) attributed project location, fluctuation in material prices, interference by political leaders, and poor financial status of the client as the significant factors influencing cost overrun in road construction projects in Gaza. Ramabodu and Verster (2010) discovered critical factors causing cost overruns of road construction projects as incomplete design at tender stage, claims, inadequate planning and supervisions, delays in scope, which led to variations and change-orders by clients. EnasFaith and Pandey (2013) affirmed that changes in the client's requirement ordered by the consultant could contribute significantly to delay and cost overruns, especially during

the construction phases. Patil et al. (2013) established sixty-four causes of construction delays in transportation infrastructure projects in India, which were grouped into five related-causes. These included land acquisition, lack of environmental impact assessment; financial instability; change orders by the client, ineffective project monitoring, and supervision by the site engineers.

Larsen et al. (2016) analysed twenty-six factors that project managers experience as having the most significant effect on time, cost, and quality, and to determine whether the impact of these factors are significantly different from each other. The result revealed that the most influential factor for time is unsettled or lack of project funding; for cost, errors or omissions in consultant material; and for quality, inaccuracies, or omissions in construction work. The results derived by Jhawar and Bajpai (2014) revealed the top three significant causes of cost overrun. The factors included delayed payment of compensation, lateness in approvals of the plan, as well as bureaucracy and organizational gaps. These identified factors ultimately affect the delay in land acquisition and environment, especially in the case of a road construction project. Towhid and Amiruddin (2012) identified causes of cost overrun as underestimation of materials and quantities, the discrepancy in design, changes in the project schedule, change in the scope of the projects, inclement weather conditions, increase in material and labour cost and unforeseen events. Olawale and Sun (2010) itemised sixteen (16) variables that could cause cost overruns. These include risk and uncertainty associated with projects, imprecise project cost, program ambiguity, lack of coordination among parties, discrepancies in design bill of quantities, fluctuation in prices, lack of incentive, inexperienced professionals, dependency on imported materials, low skilled human resources, unpredictable weather condition, lack of software, unstable profit, inflation of currency/exchange rate, project fraud and corruption, and unstable policies based on a change in government. According to Mahamid and Bruland (2012), most road construction projects in the West Bank during 2004-2008 suffered an increased cost of up to 132% due to underestimation and fluctuation in material prices.

Additionally, an examination of the effects of delay in road construction projects revealed negative implications on the project objectives. Haseeb et al. (2011) studied the impact of delay in the construction industry of Pakistan. They pinpointed them to include disputes, negotiation, lawsuit, total desertion, litigation, inconsistent growth of the construction sector, and abandonment. While Haseeb et al. (2011) postulated that, the effects of delays relative to location and parties are the forfeiture of wealth, capacity, and time, Aboubaker et al. (2018) findings showed that the most important effects were cost overrun, and obstruction of economic and country development in Tripoli, Libya. Ekanem (2019) study revealed cost overrun, dispute, arbitration, litigation, and total abandonment as the most dominant effects of delay affecting road construction projects in Nigeria. Umoren (2014) asserted that the consequences in the delay of road construction might hinder the fruitful process and trigger the reduction of economic expansion. Therefore, Aysha et al. (2015) established that delays are major disputes confronting the construction industry and that the degree and how the delay factors influence cost performance concerning the estimated budget and specified quality is becoming frightening and disturbing, thus demanding a pragmatic evaluation.

3. RESEARCH METHODOLOGY

The study adopted a quantitative approach for data collection with the sample drawn from the client, consulting, and contracting firms engaged by NDDC in the region. Both primary and secondary data were used for the study. The study used a questionnaire to

measure the perceptions of respondents on an ordinal scale. The study adopted a total enumeration procedure with a population size of 153 professionals comprising Civil/Structural Engineers and Quantity Surveyors. The first part of the questionnaire captured information concerning the respondents such as gender, age, academic and professional experiences to ascertain the reliability of the data. At the same time, the second part factors affecting the cost performance of road construction projects exceuted by NDDC were considered. The second part considered the factors that affect the cost performance of road construction projects executed by NDDC. Five-point Likert scale ratings of 1 to 5 were assigned to the options of very low, low, moderate, high, and very high respectively to obtain the level of the respondent's ratings of the variables. The questionnaire was validated with an internal consistency reliability test to measure the Cronbach's alpha coefficient (which ranges from 0.886 to 0.969) among the factors affecting the cost performance of road construction projects. The study evaluated the effect of delay on the cost performance of road projects procured by NDDC with descriptive analysis (mean score). Kruskal Wallis H-test was employed to test hypothesis one, and the Bonferroni Dunnett test was used for the post-hoc test.

The data mean score (MS) was employed to analyse the data collected through the questionnaire for the objective one, using the expression in Equation 1 which was adopted from Kazaz, et al., (2008) with 1 representing the lowest level of effect and 5 representing the highest level.

$$MS = \frac{\sum_{j=1}^{5} W_i X_i}{\sum_{j=1}^{5} X_i}, \qquad (1 \leq MS \leq 5) \qquad \text{Equation 1}$$

where:

Wi is the rating given to each factor by the respondents ranging from 1 to 5, with 1 representing 'not significant' and 5 representing 'extremely significant';

Xi is the level of scoring, and

i is the order number of respondents.

The mean score was used by Kometa *et al*. (1996) and Awodele *et al.* (2012) in construction management studies, to measure the level of significance of variables. The cut-off points of the mean score (MS) computed were determined by summing the nominal values and dividing it by the total number of scaling items: (1+2+3+4+5)/5 = 3. Thus, events that have a mean greater than 3.0 and above are significant; those equal to 3 are moderately significant, while those below 3 are of insignificant. Ekanem (2019), as well as similar studies by Mojekeh and Eze (2011), Imonikebe (2013), and Ujene (2014), adopted this approach. The expectation that the use of 3.0 as a reference score can adequately cover only essential variables in terms of the substantial effect of delay on cost performance in road construction projects delivery.

The development of the model in this study used multiple linear regression analysis. Thus, the model explains the relationship between delay and cost performance of the road projects procured by NDDC in the Niger Delta region of Nigeria. The second objective of this study was realised with the information sourced through secondary data collection were the numbers of completed road construction projects, as procured by NDDC from 2009 to 2019 in the study area. Data collected from a total of 136 highway projects in the six States selected for this study, including Akwa Ibom, Bayelsa, Cross River, Edo, Delta, and the Rivers States, expressed the distribution as 27, 22, 18, 20, 23 and 26 respectively. The evaluations of the model originated from Pallant (2007) assumptions in the first stage of

exploration analysis. These include the correlation between dependent and independent variables, and the corresponding value of R, which is the correlation coefficient. The values of R ranging from 0.10 to 0.29 represent low correlation, 0.30 to 0.49 as the mean correlation, while 0.50 to 1.0 becomes the most relevant to the analysis. Secondly, the preliminary step of the analysis was done to ensure that there is no violation of the rules of normality, linearity, and homoscedasticity, and outliers.

A statistical significance test using the F-statistic determined whether or not the model, with its independent variable, is a significant predictor of the dependent variable (that is, significant test for R^2). The R^2 value is statistically significant or different from zero if the computed F-statistic is higher than the F-critical value for the defined probability level. For this study, the p-value used was at 0.05 level of significance, therefore, for the output interpretation, if obtained significance level (p-value) associated with the F-statistic is less than 0.05 (95% confidence), then R^2 is statistically significant. The level of significance in the regression analysis offered an explanation for or realisation of hypothesis two such that if the p-value is less than 0.05, the relationship is significant and vice versa.

4. Data Analysis, Results and Discussion of Findings

A total of 153 questionnaires were administered, only 138 usable questionnaires were collected and analysed for the research. The respondents with HND educational qualification were about 15.40%, while approximately 47.90% obtained B.Sc. and 36.80% had MBA/M.Sc. The result portrayed that all the respondents were literate enough to understand the subject matter of the study in the course of completing the questionnaires. Engineers were 73.50%, while 24.80% obtained Quantity Surveying degree indicating the respondents' relevance in the construction industry, showing that the data collected were viable and suitable for the study. 35.04% of the respondents reported having worked in the construction sectors between 1-10 years, while 43.59% of respondents had 11-20 years of experience revealing that the majority of the respondents possess considerable knowledge and could give reliable information required for the study. In respondent designation, about 38.50% of the respondents were either project managers or site managers, and 68.30% served as a consultant (quantity surveyors or engineers). The result revealed that all respondents participated actively in the construction of road projects and the encouragement of the stakeholders, especially those within the Niger Delta, portraying the purpose of establishing NDDC for the development of the region.

4.1. Presentation of findings

The effect of delay on cost performance of road project delivery was sourced through a structured questionnaire survey and analysed using the mean score (MS). The second objective involves the collection of archival data on initial and final costs together with the initial and final durations of the road projects procured by NDDC, which were obtained from the States' offices of NDDC in the six selected States for the study. Multiple linear regression was employed for the analyses. This study identified 14 effects of delay on cost performance, and the mean score (MS) was used to rate the variables in their order of significance as it affects the cost performance of road construction projects delivery. The result is presented in Table 1. The significant factors were determined by the cut-off score of 3.0, as earlier stated in the methodology. Table 1 showed both the significant and

insignificant effects of delay on cost performance in the study area. Based on the overall rating, inflation of currency/exchange rate ranked first as the most significant effect on the cost performance with a mean score of 3.70. This effect brought about an increase in market prices of materials and labour, thereby altering the established estimated budget of the road construction project creating a negative impact on the project performance in terms of time and cost. This effect generally concerns the ability to manage the contract within time and budgeted limits to avoid fluctuation in market prices as a result of inflation and exchange rate.

Table 1: Effect of Delay on Cost Performance of Road Projects

	AKS		BYS		CRS		DTS		EDO		RVS		Overall
Effects	**MS**	**R**	**MS**	**R**	**MS**	**R**	**MS**	**R**	**MS**	**R**	**MS**	**R**	**MS**	**R**
Inflation of currency/ exchange rate	3.63	3	2.68	12	3.46	1	4.13	4	4.25	3	4.15	2	3.70	1
High rate of fraud and corruption	3.56	5	2.37	15	2.92	5	4.7	1	5.00	1	3.89	4	3.69	2
Total abandonment	3.78	2	3.53	5	2.38	13	4.26	3	4.75	2	3.33	7	3.60	3
Under-development	3.59	4	3.32	6	2.38	13	4.00	5	4.25	3	3.37	5	3.50	4
Disputes and claims	3.41	7	3.74	4	3.38	2	3.87	7	2.5	13	2.93	9	3.40	5
Bad reputation	3.37	8	3.00	8	2.38	13	3.48	12	3.5	8	3.96	3	3.40	5
High cost of living	3.19	10	2.68	12	3.23	3	3.96	6	3.75	7	3.37	5	3.38	7
Materials waste	3.19	10	3.95	2	3.00	4	3.61	10	3.25	10	2.93	9	3.35	8
Unemployment	3.56	5	3.00	8	2.92	5	3.78	9	3.50	8	2.89	11	3.33	9
Renegotiation	3.22	9	3.95	2	2.77	10	3.52	11	3.25	10	2.85	12	3.30	10
Impede movement	2.89	12	3.00	8	2.85	8	3.83	8	4.00	6	3.07	8	3.26	11
Arbitration	2.67	14	3.26	7	2.69	11	2.78	14	2.00	14	2.70	13	2.80	12
High accident rate	2.26	15	2.68	12	2.85	8	3.04	13	3.00	12	2.48	15	2.77	13
Litigation	2.81	13	2.74	11	2.46	12	2.74	15	2.00	14	2.52	14	2.65	14

AKS =Akwa Ibom, BYS = Bayelsa, CRS = Cross River, DTS= Delta, EDS =Edo, RVS = River States, MS = Mean Score; R = Rank

Procurement of specified required materials without delay and prompt payment to workers encourage timely completion, and it is among the robust parameters to achieve cost performance in construction projects. A similar study by Al-Hazrm and Abusalem (2015) revealed material price fluctuation as the significant effect of cost overruns in road construction projects in Jordan. More so, Adam et al. (2012) reported that Yamuna road construction witnessed a four-fold materials labour fluctuation since inception owing to farmer's protest for compensation leading to a negative effect on the cost performance of the construction project. Mohammed and Isah (2012) study revealed a shortage of construction materials supply due to inflation, and the exchange rate was ranked fifth with a mean score of 3.60 in the Nigerian construction site as another effect of cost performance. The high rate of fraud and corruption ranked second with a mean score of 3.69. The result may be a reflection of current practices in the present situation in almost all the sections of the economy, especially in the study area. Corrupt practices may significantly affect the performance of infrastructural projects, not only road construction procured by the Commission, thus increasing the unsatisfactory performance of developmental projects in the region. The political insensitivity and agitations of resident communities contribute significantly to delay as a result of constant change in bureaucracy, communal crises, policy formation, high rate of inflation, and similar or associated issues. Project delay may result

from the client's alteration of the scope of the work, thereby affecting the construction cost performance.

The study also ranked the total abandonment in the third position with a mean score of 3.64. A similar result was obtained in Sudan by Khair et al. (2016). Project abandonment hinders the free movement of economic activities that mostly depend on the road network as the only mean of transportation, thus preventing growth and development in the region. The findings of Rawat and Sharmai (2016) explained that road network is a prime index of development, a marker of economic growth of an area as it provides access road, the necessary infrastructure for any kind of investment, and harnessing the commercial potentials. Therefore, the effect of abandonment of road construction networks deprived the area of investment opportunities, growth, and development in the region. Construction project abandonment has a significant impact on project performance as supported by the findings of Desai and Desale's (2013), which ranked total abandonment fifth position in the survey of road projects executed in Nasik City, India. Abisuga et al. (2014) rated complete abandonment fourth position with a mean value of 3.72 based on indigenous construction firms' perceptions in Sudan. This result explains how greatly the abandonment of projects, especially road projects, can affect an economy not only in Nigeria but in other countries in the world.

Under-development with a mean score of 3.49 ranked fourth in this study. This factor becomes the fourth most significant one affecting the cost performance of road projects procured by NDDC in the Niger Delta region. The cut-off point in this study identified other noteworthy factors to include disputes and claims, bad reputation, high cost of living, material waste, unemployment, renegotiation, and impede movement. In contrast, this study showed that litigation, high accident rate, and arbitration have less effect on the cost performance of road projects executed by NDDC in the Niger Delta region. In conclusion, based on the ranking, the identified results known to have a significant influence on the cost performance of road construction projects in any nation or community. Therefore, NDDC road projects in the Niger Delta region suffered a similar experience.

For the comparison of the effect of delay on cost among the States, the non-parametric equivalent of analysis of variance (ANOVA), Kruskal-Wallis H test was used because of the ordinal nature of the data collected and the result is as shown in Table 2 to clarify hypothesis one (H01).

Table 2: Test of Variation among the Selected States using Kruskal-Wallis test

	Mean Rank	Chi-Square	Df	Asymp. Sig.	Decision
Akwa Ibom	45.07	18.370	5	0.003	Reject
Bayelsa	40.97				
Cross River	25.40				
Delta	63.40				
Edo	54.77				
River	43.40				

Table 2 showed that there is a significant variation in the mean responses from different States. The result led to the rejection of hypothesis one, and the study concluded that there are significant variations in the mean responses obtained on the factors affecting delay concerning cost. The considerable differences among the selected States imply that there is a location effect of delay on cost.

4.2. Post-Hoc test using Bonferroni and Dunnett test for comparison

In contrast, the Post-Hoc test using the Bonferroni and Dunnett test was carried out to substantiate the source of variation in hypothesis one (H01), and the result is presented in Table 3. The result of the test revealed that there is a significant variation between Delta and Cross River States and between Edo and Cross River States as revealed by the $p < 0.05$ (with asterisk signs in Table 3) in the post hoc test, showing the source of variation among the selected States.

Table 3: Post-Hoc test using Bonferroni and Dunnett test for comparison

Type of Test	(I) Fac	(J) Fac	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Bonferroni	Akwa Ibom	Bayelsa	0.067	0.218	1.000	-0.594	0.727
		Cross River	0.431	0.218	0.775	-0.229	1.092
		Delta	-0.463	0.218	0.557	-1.123	0.198
		Edo	-0.279	0.218	1.000	-0.940	0.381
		River	0.009	0.218	1.000	-0.651	0.670
	Bayelsa	Akwa Ibom	-0.067	0.218	1.000	-0.727	0.594
		Cross River	0.365	0.218	1.000	-0.296	1.025
		Delta	-0.529	0.218	0.263	-1.190	0.131
		Edo	-0.346	0.218	1.000	-1.006	0.314
		River	-0.057	0.218	1.000	-0.718	0.603
	Cross River	Akwa Ibom	-0.431	0.218	0.775	-1.092	0.229
		Bayelsa	-0.365	0.218	1.000	-1.025	0.296
		Delta	-0.894*	0.218	0.001*	-1.554	-0.234
		Edo	-0.711*	0.218	0.025*	-1.371	-0.051
		River	-0.422	0.218	0.852	-1.082	0.238
	Delta	Akwa Ibom	0.463	0.218	0.557	-0.198	1.123
		Bayelsa	0.529	0.218	0.263*	-0.131	1.190
		Cross River	-0.894*	0.218	0.001	0.234	1.554
		Edo	0.183	0.218	1.000	-0.477	0.844
		River	0.472	0.218	0.504	-0.188	1.132
	Edo	Akwa Ibom	0.279	0.218	1.000	-0.381	0.940
		Bayelsa	0.346	0.218	1.000	-0.314	1.006
		Cross River	-0.711*	0.218	0.025*	0.051	1.371
		Delta	-0.183	0.218	1.000	-0.844	0.477
		River	0.289	0.218	1.000	-0.372	0.949
	River	Akwa Ibom	-0.009	0.218	1.000	-0.670	0.651
		Bayelsa	0.057	0.218	1.000	-0.603	0.718
		Cross River	0.422	0.218	0.852	-0.238	1.082
		Delta	-0.472	0.218	0.504	-1.132	0.188
		Edo	-0.289	0.218	1.000	-0.949	0.372
Dunnett t (2-sided)[a]	Akwa Ibom	River	0.009	0.218	1.000	-0.550	0.569
	Bayelsa	River	-0.057	0.218	0.999	-0.617	0.502
	Cross River	River	-0.422	0.218	0.203	-0.982	0.138
	Delta	River	0.472	0.218	0.127	-0.088	1.032
	Edo	River	0.289	0.218	0.547	-0.271	0.848

*. The mean difference is significant at the 0.05 level.

a. Dunnett t-tests treat one group as a control and compare all other groups against it.

Ekanem (2019) stated that such variation might be attributed to the high rate of inflation of currency and exchange rate, fraudulent and corrupt practices in the procurement process, and as a result of frequent patronage of the same consultants and contractors in the

procurement and execution of the projects. It can, therefore, be concluded that the studied variables that contributed significantly to the effect of delay on the cost performance of road projects procured by NDDC in the study area are nonspecific. However, there is no significant variation in the effect of delay in terms of cost between Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and River States. Similarly, there is no significant variation between Bayelsa, Akwa Ibom, Cross River, Delta, Edo, and the Rivers States, among others.

Table 4: Delay and Cost Performance of Road Projects Procured by NDDC

S/N	CR (Million)	CR-log	DL	DL-log	S/N	CR (Million)	CR-log	DL	DL-log	S/N	CR (Million)	CR-log	DL	DL-log
											0			
1	0	0	0	0	47	0	0	44	1.64	93		0	11	1.04
2	0	0	21	1.32	48	0	0	48	1.68	94	0	0	12	1.08
3	0	0	25	1.4	49	0	0	57	1.76	95	11	7.04	12	1.08
4	100	8	0	0	50	100	7	14	1.15	96	20	8.3	83	1.92
5	0	0	0	0	51	0	0	24	1.38	97	66	7.82	114	2.06
6	700	7.85	30	1.48	52	22.7	6.36	60	1.78	98	53	7.72	63	1.8
7	0	0	27	1.43	53	200	7.3	12	1.08	99	50	7.7	44	1.64
8	0	0	0	0	54	0	0	12	1.08	100	0	0	27	1.43
9	0	0	40	1.6	55	0	0	0	0	101	0	0	61	1.79
10	100.2	7	32	1.51	56	0	0	4	0.6	102	0	0	55	1.74
11	839	8.92	27	1.43	57	208.69	9.32	65	1.81	103	0	0	54	1.73
12	100.00	8	24	1.38	58	416	8.62	78	1.89	104	0	0	14	1.15
13	0	0	39	1.59	59	0	0	6	0.78	105	1.02	6.01	42	1.62
14	0	0	-2	0	60	0	0	72	1.86	106	0	0	70	1.85
15	0	0	36	1.56	61	0	0	60	1.78	107	0	0	20	1.3
16	700.00	8.85	48	1.68	62	0	0	-2	0	108	0	0	17	1.23
17	0	0	32	1.51	63	150	7.18	6	0.78	109	12	7.08	19	1.28
18	0	0	11	1.04	64	300000	5.48	19	1.28	110	0	0	31	1.49
19	800.00	8.9	12	1.08	65	0	0	0	0	111	20	7.3	16	1.2
20	0	0	84	1.92	66	0	0	15	1.18	112	20	7.3	20	1.3
21	0	0	108	2.03	67	0	0	17	1.23	113	0	0	25	1.4
22	0	0	88	1.94	68	0	0	0	0	114	0	0	10	1
23	3000	9.48	94	1.97	69	30	6.48	17	1.23	115	20	7.3	40	1.6
24	1300	9.11	82	1.91	70	0	0	13	1.11	116	166	8.22	32	1.51
25	0	0	0	0	71	1054	9.02	54	1.73	117	400	8.6	98	1.99
26	40	7.6	10	1	72	0	0	8	0.9	118	0	0	25	1.4
27	20	5.3	12	1.08	73	109	8.04	70	1.85	119	8	6.9	70	1.85
28	18	5.26	13	1.11	74	0	0	62	1.79	120	0	0	44	1.64
29	0	0	31	1.49	75	0	0	15	1.18	121	0	0	0	0
30	0	0	42	1.62	76	0	0	43	1.63	122	0	0	44	1.64
31	0	0	14	1.15	77	1000	9	19	1.28	123	24	7.38	52	1.72
32	200	8.3	30	1.48	78	0	0	35	1.54	124	60	7.78	21	1.32
33	4	6.6	60	1.78	79	1100	9.04	148	2.17	125	0	0	28	1.45
34	0	0	41	1.61	80	900	8.95	83	1.92	126	10	7	26	1.41
35	0	0	1	0	81	520	8.72	90	1.95	127	0	0	14	1.15
36	44	7.64	71	1.85	82	0	0	62	1.79	128	0	0	43	1.63
37	0	0	2	0.3	83	32	7.51	32	1.51	129	0	0	12	1.08
38	100000	5	-12	0	84	0	0	57	1.76	130	0	0	26	1.41
39	50	7.7	13	1.11	85	100	7.85	36	1.56	131	0	0	21	1.32
40	30	7.48	9	0.95	86	100	7	0	0	132	60	7.78	34	1.53
41	0	0	0	0	87	180	7.26	74	1.87	133	400.18	8.6	132	2.12
42	200	8.3	84	1.92	88	0	0	21	1.32	134	30	7.48	25	1.4
43	902	8.96	117	2.07	89	200	7.3	30	1.48	135	23	7.36	32	1.51
44	29	7.46	12	1.08	90	0	0	22	1.34	136	20	7.3	16	1.2
45	0	0	31	1.49	91	0	0	12	1.08					
46	2300	9.36	45	1.65	92	6	6.78	24	1.38					

Cost = Overrun_log, Delay = Del_log

4.3. Relationship between delay and cost performance

The study used multiple regression analysis to establish the quantitative relationship between delay and cost performance of road projects. The secondary data set for 136 road construction projects were used for the analysis. In this study, the dependent variable (cost overrun) and independent variable (duration overrun) were measured on a continuous scale. The extracted data for the calculated delay (the difference between the initial and final project duration, which were also in continuous scale) were equally transformed. The project cost overruns and the computed delay, with their respective transformed version, are presented in Table 4. The data sets were converted to logarithm to base 10 of the data set to ensure homogeneity among the data set and for the better predictive ability of the proposed relationship (that is, the construction costs and delays overruns of selected projects for this study). The transformation also reduces the effect of the standard error in the model, as indicated by previous studies (Otali & Adewuyi, 2015). Table 4 shows the construction costs and delays the overruns of selected projects for this study.

Cost performance was the cost overrun of the projects and regarded as the dependent variable. At the same time, the delay was the time overrun and viewed as the independent variable in this study, while the necessary parameters of the model revealing the relationship are presented in Table 5. It is clear from Table 5 that the model resulting from the regression analysis is significant with a p-value of 0.001. Equation 2 captures the quantitative relationship, and the R^2 is 0.237, indicating that about 23.7% of the variation occurring in the cost overrun of road projects procured by NDDC is explained by the delay in the completion of the project. The balances of 76.3% of the variation are explained by other effects not captured by this relationship.

Table 5: Parameters of Relationship between Delay and Cost Performance

	Estimates	Std. Error	Beta	T	R^2	MSE	F	Sig.
(Constant)	5.545	0.525				13.710	17.972	
Del_log	1.415	0.334	.486	4.239	0.237	0.763		0.001

$$C = 5.545 + 1.415\ D \quad \text{------} \quad \text{Equation 2}$$

where: C = Cost
D = Delay
R^2 = Variation

5. CONCLUSION AND RECOMMENDATIONS

The socio-economic effects of road projects to the development of a nation, the improvement upon the conditions of living of the populace, and the enhancement of economic activities cannot be over-emphasised. The necessity and relevance of such development in the Niger Delta region of Nigeria prompted a study of this kind. The critical effects obtained from descriptive analysis and subsequent comparison of the effect of delay revealed the precarious elements prone to an increase in the cost of completion of road construction projects in the study area. The findings showed that 11 were significant out of 14 effects identified by this study, represent about 78.57% and can adequately define the effect of delay on road construction projects in the Niger Delta region, Nigeria. Furthermore, the tested first hypothesis was rejected as there was a significant variation in the mean responses from different states. The post hoc test result affirmed the presence of

significant variation and revealed the source of variation between Delta and Cross River States and Edo and Cross River States among the selected States. It concluded that significant variation does exist among the selected States in the effect of delay in terms of cost. Submissions were made, as reflected in the developed model, that 23.7% of the variation in the cost performance of road projects can be explained by the delay. Therefore, it was concluded that such cost performance, if derelicted, can rob both the client and beneficiaries of the economic benefits of such development and can aggravate the recurrent agitations and militancy in the region. Therefore, it was recommended that professionals and stakeholders employed by the commission and Niger Delta region in construction industries should pay adequate attention to the identified significant effects to improve upon the cost performance of road projects. The adoption of the model developed by this study is canvased for the successful delivery of road construction projects within budgeted cost, most notably the intervention projects with similar geographical peculiarities.

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