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Stakeholders Opinion on Selected Effects of Road Construction Delay in the Niger Delta Region of Nigeria

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Abstract: Many variables are involved in the construction of road projects. These variables changes with project types and sizes, thus challenging management of these projects to uncertainties. The resulting effects of schedule overrun may be reduced but cannot be completely depleted or eliminated. At these times of scarce and competing resources, critical effects of construction delay are prompted for effective resource deployment in making investment decisions. Eleven important effects of construction delay of road projects awarded by the Niger Delta Development Commission (NDDC) derived from literature and desk file review were identified. These factors which can be linked with stakeholders in the NDDC's road construction industry i.e., client, contractor, consultant and estate valuer were evaluated by utilising quantitative analysis to get the stakeholder's opinions on the critical effects from the selected array. Analysis of the questionnaire was also done to assess its statistical significance. To achieve this objectives, exploratory factor analysis (EFA) which includes; Cronbach Alpha Coefficient (CAC) calculation, reliability analysis, multivariate and inferential statistics were employed. The most critical effects of construction delay of road projects awarded by NDDC in the Niger Delta Region of Nigeria are: time overrun, cost overrun, litigation and Disruption to traffic movement. The next critical effects are obstruction of economical and urban movement, total abandonment, dispute, delay of other projects related to the main one, and breach of contract.

Keywords: Stakeholders, Construction Delay, Schedule Overrun, Exploratory Factor Analysis, Effects of Construction Delay, Niger Delta Development Commission, Niger Delta Region

1. Introduction

Construction delay is a global phenomenon which has been imposing immense costs on the construction industry. Despite many scientific tools supporting construction and project management, delays on construction continue to occur. Infrastructural projects are considered successful when delivered within scheduled duration, allocated budget, and specified quality [1]. While schedule control is the main key to a successful project, the project that cannot be managed to completion, thus terminated is classed as a failed project [2, 3]. Time overruns give negative impacts on the project and all the involved construction parties. When this happens, the overall project performance will decrease and competency of involved workers and professionals will be doubtful [4]. Many variables are involved in the construction of road projects, and in a developing country like Nigeria, the construction industry is experiencing some technical challenges resulting in construction delays.

Some that significantly influence the efficiency and effectiveness of road construction are site location, quantity and quality of personnel, construction materials, machinery and payment procedures among others [5-8]. In particular, the critical factors causing construction delay of road projects awarded by NDDC in the Niger Delta Region from client's perspective were determined to include: mistakes and discrepancies (due to errors and omissions) in design documents, inadequate procurement planning of material,

shortage of construction materials in market (bitumen, cement and steel), no budgetary provision/removal from budgets, inadequate planning/scheduling of works, and difficulties in financing project by contractors [9, 10]. Omatsuli observed that construction delays, time overruns and cost overruns have plagued NDDC's road projects since inception in year 2000 due to lack of proper understanding of designs and specifications by project teams, lack of modern construction equipment, deficient designs resulting from patronage of unqualified, inexperienced and incompetent consultants and contractors by government agencies as well as delayed payment of compensation on encumbered properties along the project's Right-of-Way [11]. These variables changes with project types and sizes, thus challenging management of these projects to uncertainties whose effects can be reduced by use of scientific methods and tools.

In this study, stakeholder's opinions on the rating of eleven selected effects plaguing road projects awarded by NDDC were examined. This will enable the identification of critical effects with a view to deploying available limited resources for road construction and delay mitigation initiatives. Thus this study will be useful to all parties involved in road construction industry in Nigeria, particularly in the Niger Delta Region of the Country. The findings from this investigation shall ensure that managers of road construction projects are given their rightful place throughout the project life cycle. This knowledge will further enable pre-emptive measures to be taken to reduce, mitigate or eliminate the impact of the critical effects of construction delay of NDDC road projects as suggested by the evaluated stakeholders inclusive of client, contractor, consultant and estate valuers. The study will further help NDDC Management in corporate strategic planning. Furthermore, this effort is initiated towards adding value to NDDC's road projects delivery portfolio.

The stakeholders evaluated in this study are the Client or Promoter, the Engineer or Consultant, and the Contractor. Osara referred to them as The Trinity of Project Management [12]. However, Estate Valuers were also included in the study because they execute the right-of-way costing of the Commission's road projects: The terms client, consultant and contractor used in this research work are defined below:

Client: NDDC represented by the project managers and directors. The client pays the other parties in the tripod and want value for the money being put into the project.

Consultant: The consultant is Engineering Consulting Firm commissioned by the client for the engineering responsibilities of the project which normally include feasibility studies, design, supervision and maintenance.

Contractor: The contractor is the Engineering Construction Firm selected to execute the construction of the project. The Contractor is in business to make profit. This does not however prevent the Contractor from timely delivery of the project to specified quality. This was represented by the contractor's project manager or site agent.

2. Literature Review

2.1. Types of Construction Delay

Alaghbari categorize construction delay into four types: Excusable non-compensable delays, Non-excusable delays, Excusable compensable delays, Concurrent delays [13]. Khan also classify construction delay into four basic groups of Critical or non-critical delays, Excusable or non-excusable delays, Concurrent or non-concurrent delays, and Compensable or non-compensable delays [2]. However, Dinakar categorized delay into three types: Critical and noncritical, Excusable and Non-excusable, Compensable and non-compensable while Hamzah categorized delay types into two types: non-excusable delays and excusable delays [14, 15]. Alaghbari defined the above mentioned types of delays as follows: excusable non-compensable delays are those, which are beyond the control of both the owner and the contractor; excusable compensable delays are delays caused by the project owner (client); non-excusable delays are those that are the responsibility of the contractor; while concurrent delays are those caused by both the owner and the contractor [16]. Figure 1 shows a classification of delay with respect to origin, timing, and compensability.

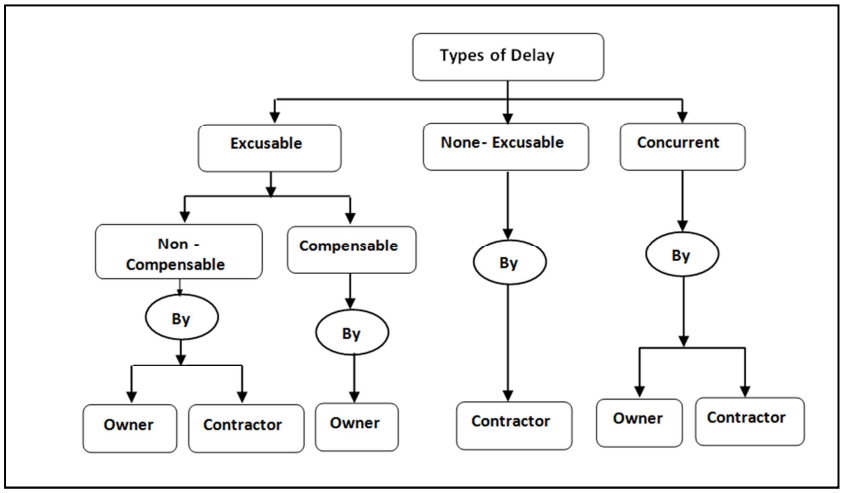

Figure 1. *Classification of Construction Delays [13, 15].*

2.2. Studies on Effects of Construction Delay

Effects of construction delays are the consequences that will occur when the causes of delays are not identified and addressed effectively and on time. Construction delay in Nigeria has been a subject of investigation by many researchers [8, 17-21]. They studied the effects of delays in project delivery in the Nigerian construction industry and discovered that six effects of construction delay included time overrun, cost overrun, dispute, arbitration, litigation and total abandonment. Memon assert that delay is one of the numerous challenges of construction worldwide [22]. The others include cost overrun, construction waste, poor safety, poor quality, excessive resource consumption and threat to environment. Delay in construction is a major problem often faced in the course of executing projects and the problem can easily create negative impact on the outcome of project execution. Delay is common in the traditional type of Contract in which the contract is awarded to the lowest bidder. Mohamed opined that this procurement method is mostly practiced in developing countries [23]. Many authors outside Nigeria also identified time and cost overruns as effect of construction delay [5, 24-26]. In a study of Malaysia construction industry, Abedi generated a fish-bone diagram of the effects of construction delays as shown in Figure 2 [27].

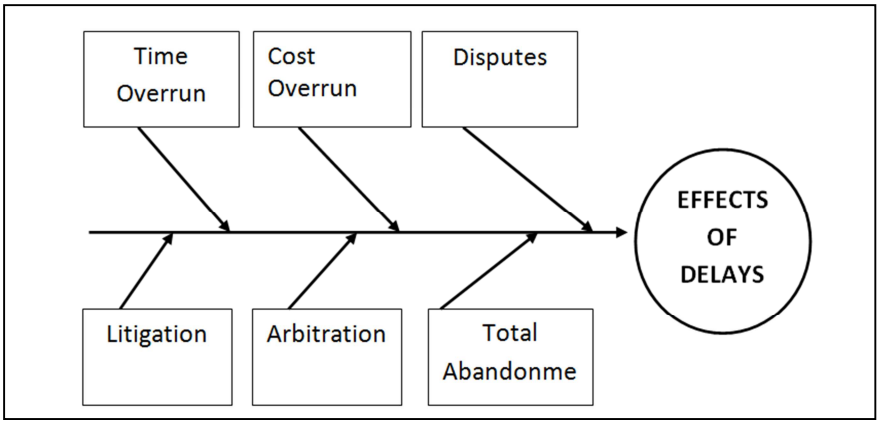

Figure 2. *Fish-Bone Diagram of Effect of Construction Delays [27].*

In a study conducted in Tanzania, Kikwasi identified fourteen effects of construction delays to include time overrun, cost overrun, negative social impact, idling resources, disputes, arbitration, delay by the client to return the loans, poor quality of work due to hurrying the process, delay in getting profit by clients, bankruptcy, litigations, stress on contractors, total abandonment, and acceleration loses [5]. Similar findings were made by Salunkhe and Patil in India, and Sunjka & Jacob in Nigeria [6, 7]. However, Osara identified four effects of project abandonment to include social cost, opportunity cost of sunk fund, deterioration of completed works in uncompleted projects and vandalization of completed works in uncompleted projects [12].

3. Research Methodology

3.1. Description of the Study Area

The study area of this research are the Nigerian Niger Delta Regional states of Abia, Akwa-Ibom, Cross River, Delta, Edo, Imo, Ondo and Rivers in line with the NDDC Act 2000 [28]. The region is situated in the Southern part of Nigeria and bordered to the south by the Atlantic Ocean and to the East by Cameroon and lies between the geographical coordinates of latitudes 03”00’N to 06”00’N and longitudes: 0”005’E to 08”00’E. The surface area is about 112,110Km, representing about 12% of Nigeria’s total surface area. The Niger Delta Basin is a major geological feature of significant petroleum exploration and production in Nigeria making the Region to generate above eighty percent (80%) of the Nation’s foreign exchange revenue. Figure 3 shows the Niger Delta Regional Constituents States, while Table 1 shows their landmass and population projections.

3.2. Research Methods

Researches generally follows the traditional scientific development process of problem identification, research methodology, hypothesis settings, experimental design, data collection and, analysis. The study was carried out in three main stages, namely: data and information sourcing, data analysis, and discussion of results. The questionnaires were administered to four categories of stakeholders inclusive of client – represented by project managers and directors in NDDC, consultants, contractors and estate valuers. In addition, the survey was framed in such a way that the personal views of the experts involved in the different categories evaluated in this study were collected and analyzed. The questionnaire covered road construction performance ratings by respondents on effects of construction delays of road projects awarded by NDDC in the Niger Delta Region of Nigeria. The selected effects for this study derived from desk review of document and comprehensive literature review are shown in Figure 4.

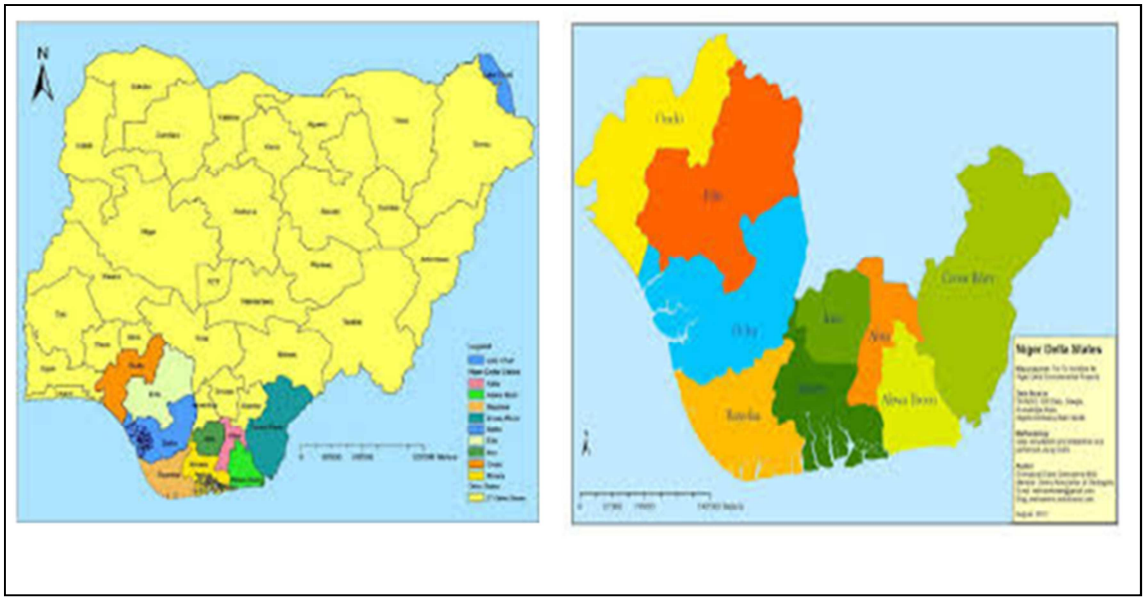

Figure 3. *Niger Delta Development Commission Component States in Nigeria (NDRDP [29]).*

Table 1. *Land Area, Oil Production Quota and Population of the Nine States of the Niger Delta Region.*

States	Land Area (Sq. Km)	Percent of Oil Production (%)	Estimated Population	
			Projected to 2005	Projected to 2020
Abia	4,877	1.3	3,230,000	5,106,000
Akwa Ibom	6,806	21.9	3,343,000	5,285,000
Bayelsa	11,007	19.8	1,710,000	2,703,000
Cross River	21,930	-	2,736,000	4,325,000
Delta	17,163	30.3	3,594,000	5,681,000
Edo	19,698	3.3	3,018,000	4,871,000
Imo	5,165	1.9	3,342,000	5,283,000
Ondo	15,086	2.6	3,025,000	4,732,000
Rivers	10,378	18.9	4,858,000	7,679,000
TOTAL	112,110	100	28,856,000	45,715,000

Source: NDRDMP [29], National Population Commission (NPC) [30], & Revenue Allocation Among NDDC States [31].

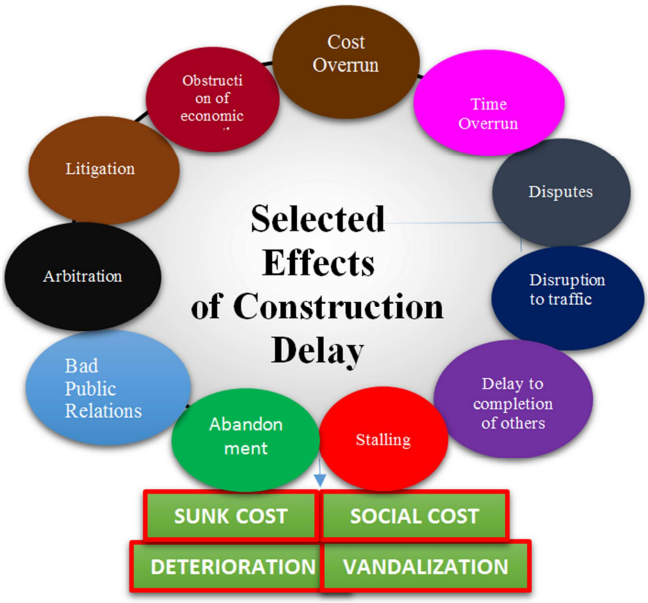

Figure 4. *Mixed diagram of effect of delay in construction delay from literatures and desk file reviews.*

Questionnaire on a Likert rating scale from 1 (never impacted) to 5 (always impacted) was used to rate the effect

of road construction delays by respondents. The questionnaires were collected from the respondents after a period of 1-6 months. This approach removed any undue pressure from the respondents and gave them the freedom to fill in the questionnaires as truthfully as possible. The level of impact used to describe the effects of road construction delays are presented in Table 2. The questionnaire also passed the pilot study test which resulted in the refinement of the questionnaire by a select group of professional experts.

Table 2. *Levels of Impact used to Describe Effects of Road Construction.*

Category of Effects	Explanation
Never	0% impact
Seldom	Less than 35% impact
Sometimes	35% - 60% impact
Mostly	60% – 75% impact
Always	More than 75% impact

Slovin's formula as given by Simon and Clinton gives a sample size of three hundred and eighty-five (385) respondents [32]. However, seven hundred and fifty (750) questionnaires were administered to respondents across the nine States of the Niger Delta Region. The target population was stratified into 10 categories for purpose of ensuring adequate representation from the Nine State Operating Offices and the Headquarters in Port Harcourt, Nigeria and ensuring that the collected data reflects the variability of the study population [33]. 50 questionnaires each were distributed in the 5 *small* states of Abia, Cross River, Edo, Imo and Ondo while the 4 four *big* states of Akwa-Ibom, Bayelsa, Delta, Rivers and the Commission's Headquarter Office got 100 each. Big or small is relative to the crude oil production quota of the component states because this criterion determines the number of road projects awarded in the nine states. They were further distributed in the ratio of 350 (47%): 200 (27%): 150 (20%): 50 (6%) respectively for contactors, client representatives, consultants, and estate valuers. The minimum valid questionnaires returned by respondents was four hundred and twenty-five (425) which is higher than the target population of 385 and indicative of 57% rate of return. While Akintoye posited that the general most prevailing acceptable response rate for academic surveys was 50 percent, Fellows and Liu suggested that a response rate of 25% – 35% as acceptable [34, 35].

4. Analysis of Result

Analysis of the questionnaire was done to assess its statistical significance of the questionnaire and to determine the opinion of the client, consultant, contractor and Estate Valuer on the effects of road construction delays. To achieve this objectives, exploratory factor analysis (EFA) which includes; Cronbach Alpha Coefficient (CAC) calculation, reliability analysis, multivariate and inferential statistics were employed. Exploratory factor analysis is a statistical technique that is used to reduce data to a smaller set of summary variables and to explore the underlining theoretical structure of the phenomena. It is used to identify the structure of the relationship between the variable and the respondent. The detail of the analysis is presented as follows.

4.1. Test of Statistical Significance of Questionnaire

The first phase of EFA was to test the statistical significance of the questionnaire used for data collection. The most widely used method for reliability testing is the Cronbach alpha [36]. The Cronbach Alpha Coefficient (CAC) which is a measure of the inner consistency of the data collected was calculated and results obtained is presented in Table 3.

Table 3. *Computed value of CAC on the Effects of Road Construction Delay.*

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.702	0.722	5

For statistically significant questionnaire, the Cronbach Alpha Coefficient (CAC) is expected to range from 0.65 to 0.90. Calculated CAC of 0.702 as observed in Table 3 was employed to conclude that the questionnaire used for data collection is statistically significant.

4.2. Variation of Opinion of Stakeholders

On whether the data used to assess the variation in the opinions of the four respondents (Clients, Consultants, Contractors; and Estate Valuers) is adequate and reliable, adequacy test using intraclass correlation coefficient and reliability analysis using one-way analysis of variance was employed. Reliability analysis of the data was done to ascertain the fitness of the data for the selected analysis. Descriptive analysis of reliability based on the data scale (measured in terms of weight and order of distribution) was done to compute the data means, variance, covariance and correlations using the intraclass correlation coefficient presented in Table 4.

Table 4. *Result of summary statistics.*

Summary Item Statistics							
	Mean	Min.	Max.	Range	Max/Min.	Variance	N of Items
Item Means	20.884	12.814	31.093	18.279	2.426	57.988	5
Item Variances	651.248	231.869	879.658	647.788	3.794	8.164E4	5
Inter-Item Covariance's	208.365	-177.55	603.404	780.955	-3.398	4.978E4	5
Inter-Item Correlations	0.342	-0.213	0.741	0.954	-3.479	0.096	5

Table 5. *Computed intraclass correlation coefficients.*

Intraclass Correlation Coefficient							
	Intraclass Correlation[a]	95% Confidence Interval		F Test with True Value			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	0.320[a]	0.186	0.481	3.352	42	168	0.000
Average Measures	0.702[c]	0.533	0.822	3.352	42	168	0.000

The high inter-item covariance value of 208.365 against the low inter-item correlation value of 0.342 as observed in Table 4 shows the variation in the opinions of the four respondents on the effect of construction delay. To test the validity of the calculated inter-item correlation value, the intraclass correlation coefficient was calculated and presented in Table 5.

The single and average measure intraclass correlation of 0.320 and 0.702 as observed in Table 6 shows that the values are relatively weak which indicate the absence of multicollinearity. The intraclass correlation value is synonymous to the variance inflation factor (VIF). Ideal VIF ranges from 0.1 to 1.0 while VIF above 10 is cause for alarm showing the presence of multicollinearity. The absence of multicollinearity as defined by the weak single and average measure intraclass correlation confirms the adequacy of the data.

4.3. Reliability of Data

To ascertain the reliability of the data, two-way mixed model having a confidence interval of 95% (p-value=0.05) and initial test value of 0 was employed. The null hypothesis of reliability was formulated as follows: H0: Data are reliable; H1: Data are not reliable. Using the Fisher's probability test (F-test), the analysis was conducted and result obtained is presented in Table 6.

Table 6. *Analysis of Variance.*

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig
Between People		62357.693	42	1484.707		
	Between Items	9973.953	4	2493.488	5.630	0.000
Within People	Residual	74404.447	168	442.884		
	Total	84378.400	172	490.572		
Total		146736.093	214	685.683		

At 0.05 df, and with a computed p-value of 0.000 as observed in Table 6, the null hypothesis was accepted and it was further concluded that the data are good and can be employed for further analysis.

4.4. Statistical Variation of Opinions of Respondents

To assess the statistical variation in the opinions of the four respondents, multivariate analysis of variance (MANOVA) was employed. To justify the potential of MANOVA for this task, multivariate alliance was first calculated. Multivariate alliance is usually calculated through a measure known as the Mahalanobis constant. If the maximum calculated value of the Mahalanobis constant is less than the critical value, then the assumption of multivariate outliers has not been violated. Then we can investigate the concept of variability using multivariate analysis of variance (MANOVA) otherwise, we must think of another statistical concept to track the presence of variability. Results of the calculated Mahalanobis constant using regression analysis is presented in Table 7. With (df=10) the critical value of Mahalanobis constant was 29.59. Since 2.411534 < 29.590, it was concluded that the assumptions of multivariate outliers have not been violated hence the use of multivariate analysis of variance to study the variability in the opinions of the four respondents is justified.

Table 7. *Calculated values of Mahalanobis constants on the Effects of Construction Delay.*

Effects of construction delay	Assigned Values	Calculated Mahalanobis Constant	Df	Critical value
Time overrun	1	2.411534	2	13.82
Cost overrun	2	2.055471	3	16.27
Litigation	3	0.692416	4	18.47
Dispute	4	2.069843	5	20.52
Arbitration	5	1.941402	6	22.46
Total abandonment	6	1.167505	7	24.32
Disruption of traffic movement	7	0.619531	8	26.13
Delay of other projects related to the main one	8	0.846774	9	27.88
Obstruction of economical and urban movement	9	0.512516	10	29.59
Discredit the commission among the people and in the press	10	1.028248	For df=n-1=10, critical value=29.59	
Breach of contract	11	1.507319		

4.5. Box Test or Covariance Matrix Among Categories of Respondents

In multivariate analysis of variance, we set out to test the null hypothesis that observed covariance matrix of all the dependent variables (views of the different respondents; never, seldom, sometimes, mostly and always) are the same across categories (clients, consultants, contractors and estate valuers). That is there is no variation in the views of the different categories of respondents. If the calculated p-value is less than 0.05 ($p<0.05$) for all the dependent variables, we reject the null hypothesis and conclude that the assumption of same covariance matrices across categories have not been satisfied; an indication that variability exists between the views of the different respondents. Different statistical method for computing the F-value for multivariate analysis of variance exits in literature. One of them is the Roy's largest root which is probably the most acceptable and also the most susceptible to deviation in the covariance matrix. The next is the Pillai's Trace followed by Wilk's Lambda. Pillai's Trace is the least sensitive to the violation of the assumption of covariance matrix hence it was selected for this study. Result of multivariate test statistics computed to study the variation in the opinions of the different respondents is presented in Table 8.

Table 8. *Multivariate Statistical Table.*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	.989	6.519E2[a]	5.000	36.000	.000	.989	3259.649	1.000
	Wilks' Lambda	.011	6.519E2[a]	5.000	36.000	.000	.989	3259.649	1.000
	Hotelling's Trace	90.546	6.519E2[a]	5.000	36.000	.000	.989	3259.649	1.000
	Roy's Largest Root	90.546	6.519E2[a]	5.000	36.000	.000	.989	3259.649	1.000
CATEGORY	Pillai's Trace	1.063	4.174	15.000	114.000	.000	.354	62.606	1.000
	Wilks' Lambda	.015	23.705	15.000	99.782	.000	.753	303.616	1.000
	Hotelling's Trace	59.924	138.491	15.000	104.000	.000	.952	2077.361	1.000
	Roy's Largest Root	58.838	4.548E2[c]	5.000	38.000	.000	.984	2273.862	1.000

a. Exact statistic
b. Computed using alpha=.05
c. Design: Intercept + Season

From the result of Table 8, it was observed that the computed significant value (p-value) based on Roy's largest root, Wilk's Lambda, Hoteling's Trace and the Pillai's Trace were less than 0.05 ($p=0.00$) hence, the null hypothesis that the views of the different respondents are the same for the four categories (clients, consultants, contractors and estate surveyor/valuers) was rejected and it was concluded that there is a level of variation in the views of the different respondents. To calculate the percent variability that exist between the different respondents, the partial Eta squared value of the Pillai's trace was employed. From the result of Table 8 the calculated partial Eta squared of the Pillai's trace based on category was observed to be 0.354 which indicates 35.40% variability among the dependent variables occasioned by change in the category of respondents. In addition, when the null hypothesis of equal variance assumption is rejected, then the observed power function based on Pillai's trace must be between 0.9-1.00. From the result of Table 8, it was observed that the calculated power function based on Pillai's trace is 1.00 for both intercept and category. This validates the initial claim that a certain level of 35.40% variability exists between the views of the different categories of respondents.

4.6. Inferential Statistics on the Effects of Construction Delay

The selected effects of construction delay were used as the independent variable while the respondent views were used as the dependent variable. The null and alternate hypothesis of inferential statistics was formulated as:

H0: No significant difference in the selected effect of construction delay according to client's, consultant's, contractor's and estate valuers.

H1: Significant difference exists in. the selected effect of construction delay according to client's, consultant's, contractor's and estate surveyors/valuers.

Table 9. *Levene test statistics.*

	Levene Statistics	df1	df2	Significance Level
Client	1.045	10	44	0.424
Consultant	1.395	10	44	0.214
Contractor	1.236	10	44	0.296
Estate Valuers	0.690	10	44	0.728

The analysis was performed at 95% confidence interval, which represent 0.05 degrees of freedom that is $p=0.05$. For $P < 0.05$, the null hypothesis was accepted and the alternate hypothesis was rejected and it will be concluded that no significant difference exists among the selected effect of construction delay according to the view of the four

categories of respondents. For P > 0.05, the null hypothesis was rejected and the alternate hypothesis accepted and it will be concluded that significant difference exists among the selected effect of construction delay according to the view of the four categories of respondents. The Levene test statistics is shown in Table 9.

With all p-values > 0.05 (i.e., 0.424 for client, 0.214 for consultant, 0.296 for contractor and 0.728 for estate valuers), the null hypothesis was rejected and it was concluded that significant difference exists among the selected effect of construction delay based on categories of respondent's views. On whether to finally accept or reject the null hypothesis, analysis of variance (ANOVA) table was generated and presented in Table 10.

Table 10. *Summary of Analysis of Variance.*

		Sum of Squares	Df	Mean Square	F	Level of Significance
Client	Between Groups	42.400	10	4.240	0.330	1.000
	Within Groups	5580.800	44	126.836		
	Total	5623.200	54			
Consultant	Between Groups	773.782	10	77.378	0.571	0.828
	Within Groups	5958.400	44	135.418		
	Total	6732.182	54			
Contractor	Between Groups	299.636	10	29.964	0.019	1.000
	Within Groups	70670.000	44	1606.136		
	Total	70968.636	54			
Estate Values	Between Groups	4.109	10	0.211	0.004	1.000
	Within Groups	2594.000	44	58.955		
	Total	2598.109	54			

From the result of the analysis of variance, it was observed that all the p-values is > 0.05 (p=1.000 for client, contractor and Estate Valuer, and 0.828 for consultant). For P > 0.05, the null hypothesis was again rejected and the alternate hypothesis was accepted and it was concluded that significant difference exists among the selected effect of construction delay according to the view of the four categories of respondents.

4.7. Rating of Effects of Construction Delay

To select the critical effect of construction delay according to the view point of the client, consultant, contractor and estate valuer, the mean plot of performance was generated and presented in Figures 5-8.

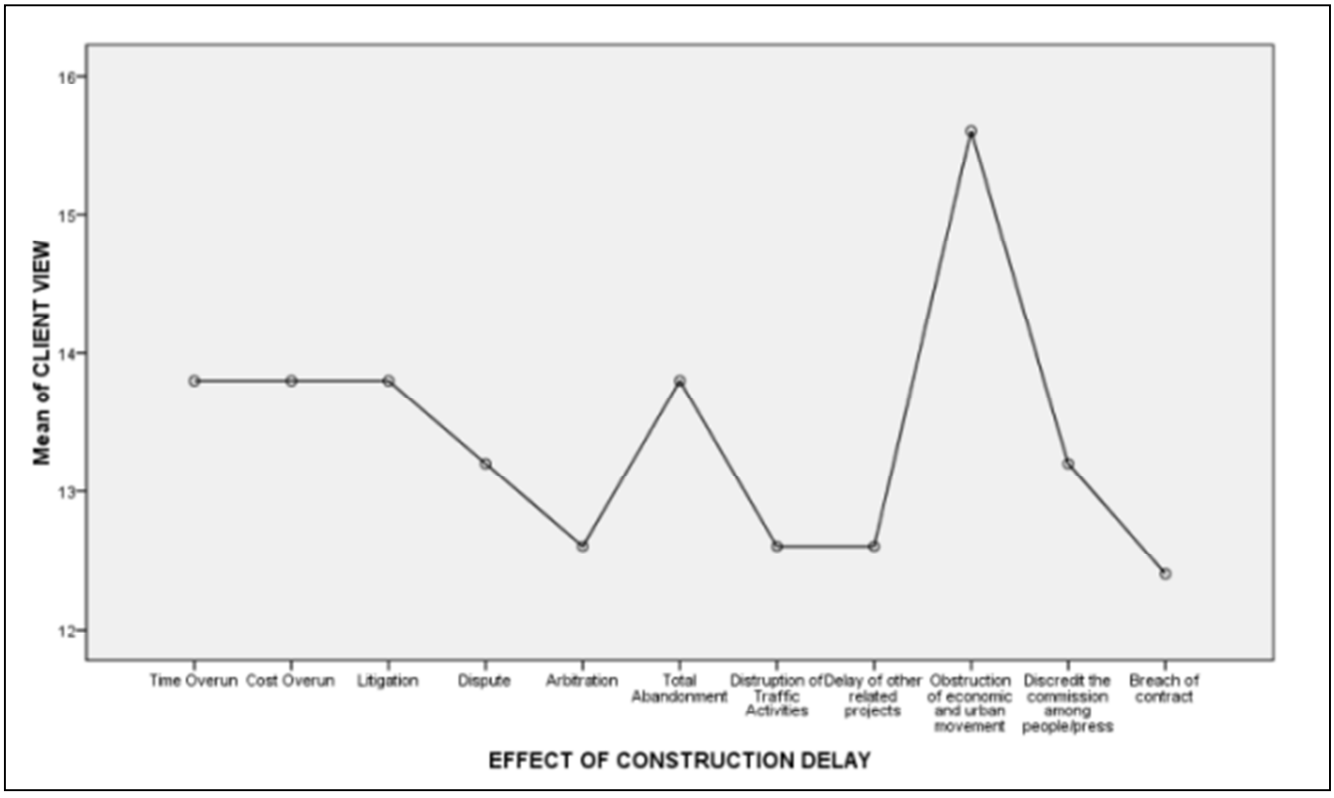

Figure 5. *Most important effect of construction delay according to Client.*

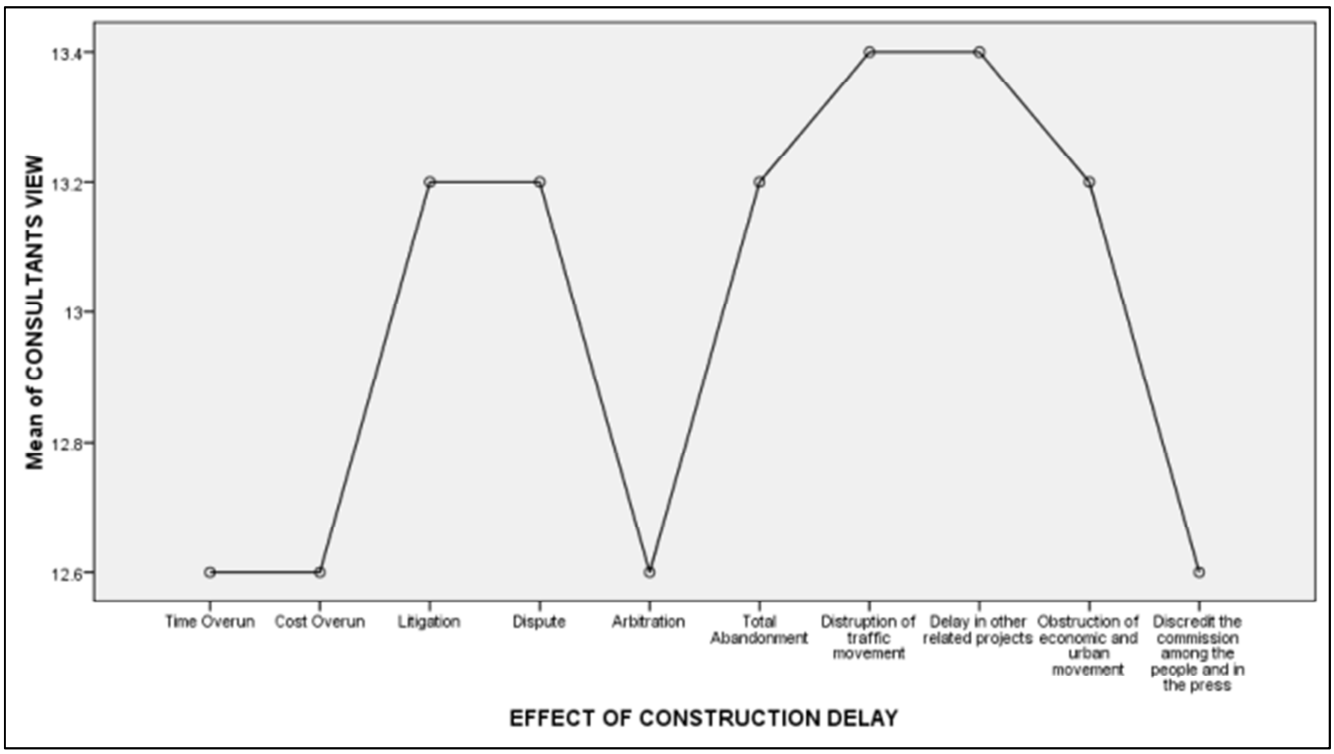

Figure 6. *Most important effect of construction delay to Consultants.*

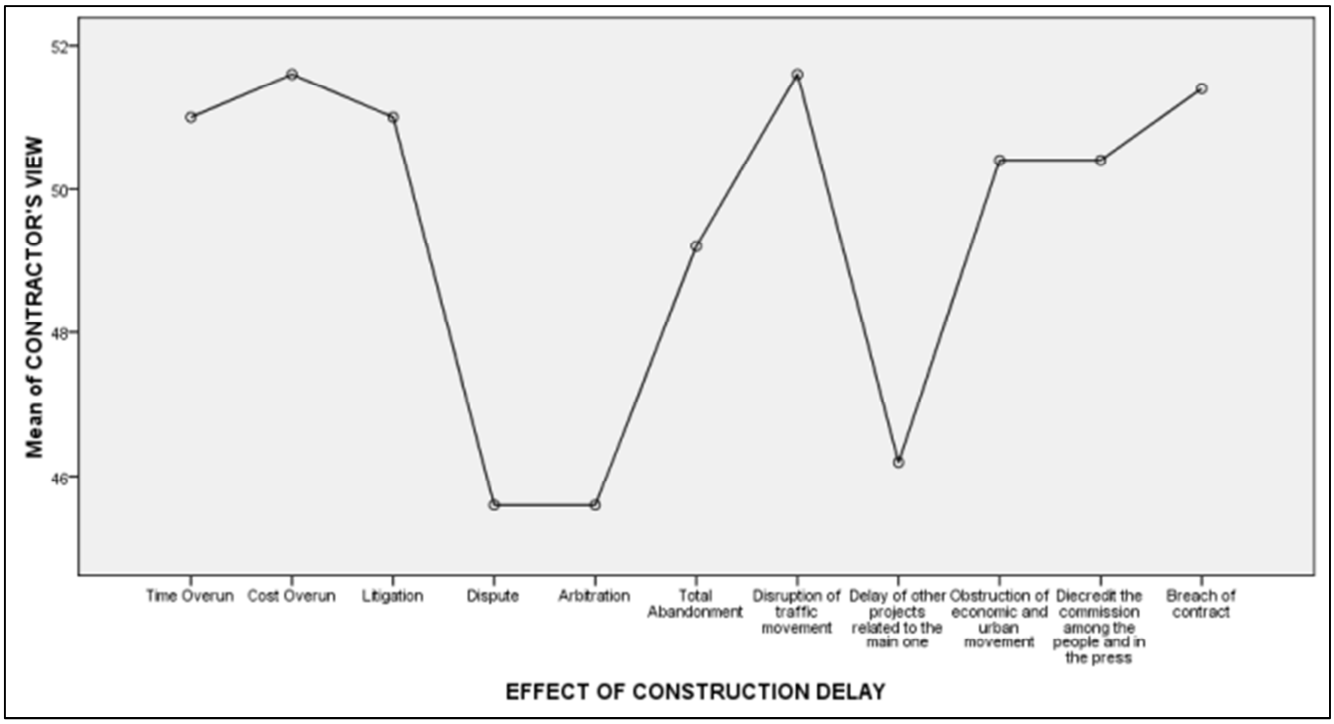

Figure 7. *Most important effect of construction delay according to Contractors.*

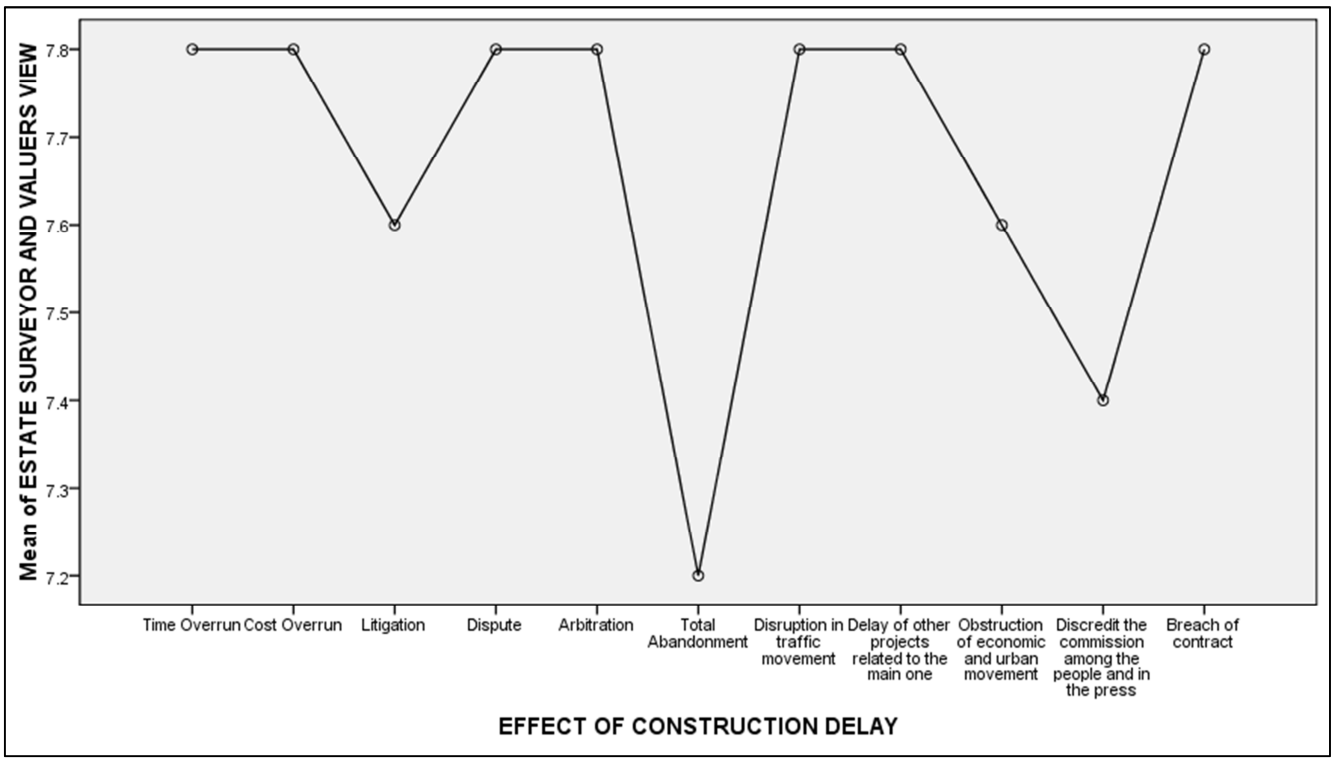

Figure 8. *Most important effect of construction delay according to Estate Valuers.*

4.8. Inferences from the Mean Plots of Performances

4.8.1. Clients Opinion on Effects of Construction Delay

From the client view point as observed in Figure 5, obstruction of economic and urban movement remains the most important effect of construction delay. To identify the other effect of construction delay that are strongly and positively correlated with obstruction of economic and urban movement, post-hoc test using the least significant difference (LSD) was done and presented in Table 11.

Table 11. *Post-Hoc Analysis using LSD of client's view on the Effects of Construction Delay.*

Obstruction of economic and urban movement	Time Overrun	1.800	7.123	.802	-12.56	16.16
	Cost Overrun	1.800	7.123	.802	-12.56	16.16
	Litigation	1.800	7.123	.802	-12.56	16.16
	Dispute	2.400	7.123	.738	-11.96	16.76
	Arbitration	3.000	7.123	.676	-11.36	17.36
	Total Abandonment	1.800	7.123	.802	-12.56	16.16
	Disruption of Traffic Activities	3.000	7.123	.676	-11.36	17.36
	Delay of other related projects	3.000	7.123	.676	-11.36	17.36
	Discredit the commission among people/press	2.400	7.123	.738	-11.96	16.76
	Breach of contract	3.200	7.123	.655	-11.16	17.56

From the post-hoc analysis presented in Table 11, the other effect of road construction delay that are strongly and positively correlated with obstruction of economic and urban movement include; time overrun, (p=0.802), cost overrun (p=0.802), litigation (p=0.802) and total abandonment (p=0.802) with the least positively correlated effect being breach of contract (p=0.655).

4.8.2. Consultants Opinion on Effects of Construction Delay

From the consultant's view point as observed in Figure 6, disruption in traffic movement and delay of other projects related to the main one is the most important effect of construction delay. To identify the other effect of construction delay that are strongly and positively correlated with disruption in traffic movement and delay of other projects related to the main one, post-hoc test using the least significant difference (LSD) was done and presented in Table 12. From the post-hoc analysis presented in Table 12, it was observed that; with the exception of breach of contract, all other effects of construction delay, i.e., time overrun (P=0.914), cost overrun (P=0.914), litigation (P=0.978), dispute (P=0.978), arbitration (P=0.914), total abandonment (P=0.978), obstruction of economical and urban movement (P=0.978), discredit the commission among the people and in the press (P=0.914) are strongly and positively correlated

with disruption in traffic movement and delay of other projects related to the main one.

Table 12. *Post-Hoc Analysis using LSD of consultant's view on the Effects of Construction Delay.*

Distruption of traffic movement	Time Overrun	.800	7.360	.914	-14.03	15.63
	Cost Overrun	.800	7.360	.914	-14.03	15.63
	Litigation	.200	7.360	.978	-14.63	15.03
	Dispute	.200	7.360	.978	-14.63	15.03
	Arbitration	.800	7.360	.914	-14.03	15.63
	Total Abandonment	.200	7.360	.978	-14.63	15.03
	Delay in other related projects	.000	7.360	1.000	-16.83	14.83
	Obstruction of economic and urban movement	.200	7.360	.978	-14.63	15.03
	Discredit the commission among the people and in the press	.800	7.360	.914	-14.03	15.63
	Breach of contract	13.400	7.360	.075	-1.43	28.23
Delay in other related projects	Time Overrun	.800	7.360	.914	-14.03	15.63
	Cost Overrun	.800	7.360	.914	-14.03	15.63
	Litigation	.200	7.360	.978	-14.63	15.03
	Dispute	.200	7.360	.978	-14.63	15.03
	Arbitration	.800	7.360	.914	-14.03	15.63
	Total Abandonment	.200	7.360	.978	-14.63	15.03
	Distruption of traffic movement	.000.	7.360	1.000	-16.83	14.83
	Obstruction of economic and urban movement	.200	7.360	.978	-14.63	15.03
	Discredit the commission among the people and in the press	.800	7.360	.914	-14.03	15.63
	Breach of contract	13.400	7.360	.075	-1.43	28.23

Table 13. *Post-Hoc Analysis using LSD of contractor's view on the Effects of Construction Delay.*

Cost Overrun	Time Overrun	.800	25.347	.981	-50.68	51.68
	Litigation	.600	25.347	.981	-50.48	51.68
	Dispute	6.000	25.347	.814	-45.08	57.08
	Arbitration	6.000	25.347	.814	-45.08	57.08
	Total Abandonment	2.400	25.347	.925	--48.68	53.48
	Disruption of Traffic movement	.000	25.347	1.000	-51.08	51.08
	Delay of other related projects related to the main one	5.400	25.347	.832	-45.68	56.48
	Obstruction of economic and urban movement	1.200	25.347	.962	-49.88	52.28
	Discredit the commission among the people and in the press	1.200	25.347	.962	-49.88	52.28
	Breach of contract	.200	25.347	.994	-50.88	51.28

Table 14. *Post-Hoc Analysis using LSD of ESV's view on the Effects of Construction Delay.*

ESTATE SURVAYOR AND VALUER VIEW					**99% Confidence Interval**	
EFFECTS OF CONSTRUCTION DELAY		**Mean Difference (I-J)**	**Std Error**	**Sig.**	**Lower Bound**	**Upper Bound**
Time Overrun	Cost Overrun	.000	4.858	1.000	-9.79	9.79
	Litigation	.200	4.858	.967	-9.59	9.99
	Dispute	.000	4.858	1.000	-9.79	9.79
	Arbitration	.000	4.858	1.000	-9.79	9.79
	Total Abandonment	.600	4.858	.902	-9.19	10.39
	Disruption of Traffic movement	.000	4.858	1.000	-9.79	9.79
	Delay of other related projects related to the main one	.000	4.858	1.000	-9.79	9.79
	Obstruction of economic and urban movement	.200	4.858	.967	-9.59	9.79
	Discredit the commission among the people and in the press	.400	4.858	.935	-9.39	10.19
	Breach of contract	.000	4.858	1.000	-9.79	9.79

4.8.3. Contractors Opinion on Effects of Construction Delay

From the contractor's view point as observed in Figure 7 cost overrun and disruption in traffic movement are the most important effect of construction delay. To identify the other effect of construction delay that are strongly and positively correlated with cost overrun and disruption in traffic movement, post-hoc test using the least significant difference (LSD) was done and presented in Table 13.

From the post-hoc analysis presented in Table 14, it was observed that; time overrun (P=0.981), litigation (P=0.981), total abandonment (P=0.925), obstruction of economical and urban movement (P=0.962), discredit the commission among the people and in the press (P=0.962) and breach of contract (p=0.994) are strongly and positively correlated with cost overrun and disruption in traffic movement.

4.8.4. Estate Valuers Opinion on Effects of Construction Delay

From estate surveyor and valuers view point as observed in Figure 8, time overrun, cost overrun, dispute, arbitration, disruption of traffic movement, delay of other projects related to the main one and Breach of contract are the most important effect of construction delay. The other effect of

construction delay that are strongly and positively correlated. Post-hoc test using the least significant difference (LSD) was done and presented Table 14.

From the post-hoc analysis, it was observed that; litigation (P=0.967) and obstruction of economic and urban movement (p=0.967) are strongly and positively correlated with time overrun, cost overrun, dispute, arbitration, disruption of traffic movement, delay of other projects related to the main one and Breach of contract.

4.9. Summary of Rating of Effects of Construction Delay

The summary rating of effects of road construction delay is shown in Table 15.

Table 15. *Summary of rating of Effects of Construction Delay.*

Rating	Client	Consultant	Contractor	Estate Valuer
1	Obstruction of economical and urban movement	Delay of other projects related to the main one	Cost overrun	Time overrun
2	Time overrun	Disruption of traffic movement	Disruption of traffic movement	Cost overrun
3	Cost overrun	Litigation	Breach of contract	Dispute
4	Litigation	Dispute	Time overrun	Arbitration
5	Total abandonment	Total abandonment	Litigation	Disruption of traffic movement
6	Dispute	Obstruction of economical and urban movement	Obstruction of economical and urban movement	Delay of other projects related to the main one
7	Discredit the commission among the people and in the press	Time overrun	Discredit the commission among the people and in the press	Breach of contract
8	Arbitration	Cost overrun	Total abandonment	Litigation
9	Disruption of traffic movement	Arbitration	Delay of other projects related to the main one	Obstruction of economical and urban movement
10	Delay of other projects related to the main one	Discredit the commission among the people and in the press	Dispute	Discredit the commission among the people and in the press
11	Breach of contract	Breach of contract	Arbitration	Total abandonment

5. Most Important Effects of Construction Delay

Since the eleven selected latent factors of road construction delays were not supported by indicators or descriptive factors, the critical effects cannot be determined by use of structural equation modelling. Thus, in this work, a rational approach of capturing all factorial effects on a scale of five (5) out of eleven (11) was adopted as most important. In the process, all factors classified as principal in the opinion of the different categories of respondents also formed the most important mass. From Table15, the most important effects of construction delays in the opinion of the different categories of respondents are: *Client*: obstruction of economical and urban movement, time overrun, cost overrun, litigation and total abandonment; *Consultant*: delay of other projects related to the main one, disruption of traffic movement, litigation, dispute, total abandonment, and obstruction of economical and urban movement; *Contactor*: cost overrun, disruption of traffic movement, breach of contract, time overrun and litigation; *Estate Valuer*: time overrun, cost overrun, dispute, arbitration, disruption of traffic movement, delay of other projects related to the main one, and breach of contract. This observed differences in the views of the four categories of respondents is validated by the earlier deductions in section 4.6 that a certain level of 35.4% variability exists in their views.

Table 16. *Critical Effects of Road Construction Delay.*

Critical Effects	Agreement among 2 categories of respondents	Agreement among 3 categories of respondents	Agreement among all categories of respondents
Obstruction of economical and urban movement	■		
Time overrun	■	■	
Cost overrun	■	■	
Litigation	■	■	
Total abandonment	■		
Dispute	■		Nil
Discredit the commission among the people and in the press			
Arbitration			
Disruption of traffic movement	■	■	
Delay of other projects related to the main one	■		
Breach of contract	■		

6. Critical Effects of Construction Delay

The critical effects of construction delay of road projects awarded by NDDC in the Niger Delta Region of Nigeria are made up of most important effects chosen by at least two (2) or three (3) categories of respondents. While nine (9) factors were agreed upon as critical by two (2) categories of respondents, only four (4) factors were jointly chosen by three (3) categories of respondents. No factor was chosen by all four (4) categories of respondents. These views are shown in Table 16.

7. Conclusion

From Table 16, the most critical effects of construction delay of road projects awarded by NDDC are time overrun, cost overrun, litigation and Disruption to traffic movement. The next critical effects are obstruction of economical and urban movement, total abandonment, dispute, delay of other projects related to the main one, and breach of contract. Only arbitration and discredit of the commission among the people and in the press are not jointly considered as critical by the evaluated stakeholders.

The impact of these critical effects can be controlled, reduced or mitigated by appropriate mitigation strategies. An earlier study had identified six critical mitigation measures for construction delay of road projects awarded by NDDC [37]. They are: use of competent consultant to supervise and monitor project, enforcing liquidated damage clauses, adequate contingency allowance, up-to-date technology utilization (best practice) in project management, proper project planning and scheduling, and frequent progress site meeting. Although, this research did not classify arbitration as a critical effect, legal dispute, litigation and breach of contract were so identified. In reality, the spate of law suits being filed against the Commission by unsatisfied stakeholders is on the increase. This has resulted in an exponential upward surge in the Commission's litigation portfolio with attendant costs implication on the resources of the Commission. Thus, the constitution of an Intra-Commission Litigation and Arbitration Committee is recommended to help mitigate and/or resolve many law suits out of courts.

These findings and suggestions have the potentials of assisting the Commission in deploying scarce resources in the construction and management of road projects.

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