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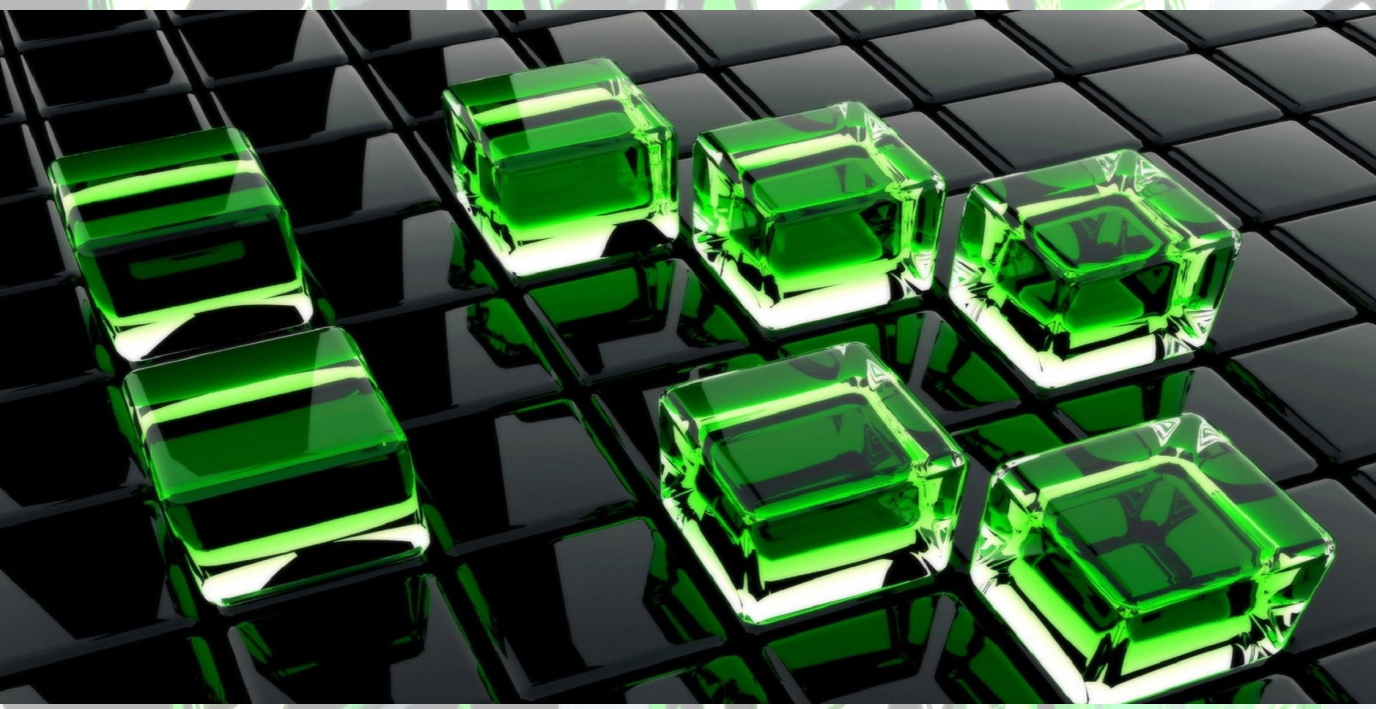

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IDENTIFICATION OF MAINTENANCE CULTURE APPROACH FOR CIVIL ENGINEERING STRUCTURES IN NIGERIA

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Abstract: The study investigated the maintenance culture approach adopted for monitoring civil engineering structures in Nigeria. Three research questions and hypotheses were formulated to guide the study. The researcher adopted survey research design for the study. The population of the study consists of all office personnel in the ministry of works from the selected states and geopolitical zones in Nigeria. The sample size comprised of 100 respondents. A structured questionnaire was used as an instrument for data collection. Mean and standard deviation were used to analyse data in order to answer the research questions, while the t-test was used to test the hypothesis. The analysis revealed that inspection of civil engineering structures was done based on reports of dilapidation of structures from the society. It also indicated poor inspecting practice in the country. Also, there was strong existence of tussle of interest among politicians on maintenance of the civil engineering structures. Again, the flow of information from bottom to the top of the managerial cycle was slow which resulted to delay of the overall system process. In addition, the maintenance work was neither supervised well nor done well. The implication was a case of poor maintenance culture and inadequate management of the sector. The study recommended that, workshops and seminars should be organised to sensitize the office personnel on the need for adequate and regular inspection of civil engineering structures. Emphasis should be laid on the use of renowned and efficient maintenance culture approach. There should be a benchmarking practice for monitoring of civil engineering structures in Nigeria to ensure sustainability of the structures in particular, and the society in general.

Keywords: *Civil engineering structures, Maintenance culture approach, Office personnel, Nigeria.*

1.0 Introduction

The maintenance of civil engineering structures in Nigeria cannot be over emphasized. This is because the maintenance of civil engineering structures in our environment can but only guarantee safety, reliability and cost-saving both to the government and it users. However, maintenance as being describe as a complex activity in the views of Vicente's (1999).

Several civil engineering structures such as large buildings, bridges, road, hydro power station and dams in Nigeria and many other third world country are experiencing aging issues, most of them have being built during the colonial era and in the first republic. There have being increasing need for major repair and renovations works on these structures. Either due to economical or environmental reasons, most of these structures have being left in perpetual disintegration and damage. This all bulged down towards the poor maintenafnce culture and practice on civil engineering structures and infrastructures at large in Nigeria (Udoka, 2013; Oyedele, 2012; Uma *et al.*, 2014).

In achieving enviable responsive maintenance culture, preventive maintenance, condition monitoring, planned outages, modifications and different kinds of fault repairs are paramount and a must to abide with. Preventive maintenance is aimed at avoiding faults, and to keep the structures and infrastructures functional (Geert and Liliane, 2002; Rosqvist et al., 2009). Hence this practice makes it possible to place the infrastructures such as civil engineering structures in optimal condition in order to guarantee functionality and effectiveness. Corrective maintenance is needed in fault situations and in situations where non-critical machinery outside the program of preventive maintenance fails. Modifications can be done in order to enhance serviceability of these structures and replace parts or elements of the structure that are too inefficient or too unreliable.

Over the years, maintenance culture which encompasses provision for adequate care of the hard earned infrastructure and civil engineering structures have not gained ground in the consciousness of resource managers in the Nigeria and most under developed country (Iwarereand Lawal, 2011), and consequently, government buildingsare seen at the verge of collapsing, factory buildings and infrastructures abandoned, dilapidated school buildings, pot-holes and chasms on the constructed highway roads, deserted vehicles with minor problems, moribund industries and a host of other property belonging to the country which have little or insignificant problem (Udoka,2013). These actions in myriad ways have resulted to a colossal waste of scarce resources. It is really one of the major problems, hitherto ravaging and undermining the developing countries, especially Nigeria (Lawal and Adeyemo, 2004; Uma et al., 2014).

In this paper, the approach being used in Nigeria for monitoring and maintaining civil engineering structures was investigated. The specific objectives were outlined namely; to identify the usual inspecting practice for monitoring civil engineering structures in Nigeria, to determine the prevailing bureaucratic practice for maintenance of civil engineering

structures in Nigeria, and to examine the attitude of office personnel towards maintenance of civil engineering structure in Nigeria. Also, null hypotheses were articulated to evaluate the significant difference in the opinion of the respondents on the maintenance culture approach in Nigeria.

2.0 Methodology

The study used the survey research design. Five out of the six geopolitical zones namely; North West, North East, North Central, South West, and South East were used as the area of study. The population of the study was the office personnel in the ministry of works. A simple random sampling technique was adopted to select 20 respondents from each of the geopolitical zones, making a total of 100 sample size. A structured questionnaire with 16 item statements was administered to the 100 respondents. The questionnaire accessed information from the respondents on the inspection practice used by the ministry for monitoring civil engineering structures, the bureaucratic practice for the inspection reports, and the attitude of office personnel towards maintenance of civil engineering structures. The Cronbach's alpha reliability coefficient of 0.804 was achieved from the research instrument.

The variables, namely; gender, age and status as disclosed in Table 1 were used to conduct the study. Table 1 showed the percentage distribution of the respondents that answered to the questionnaire. The following scale rating was adopted, namely: Strongly Agreed (SA) = 5, Agreed (A) = 4, Undecided (U) = 3, Disagree (D) = 2, Strongly Disagree (SD) = 1. The decision rule for the mean statistics was 3.0. A mean score value of 3.0 and above was accepted, while a mean score value below 3.0 was rejected. The statistical mean, standard deviation and t-test were applied for the data analysis. The relationship of the construct of the dependent variables was estimated through correlation analysis.

Table 1. General characteristics of the respondents

Variables	**Category**	**Person (%)**
General Characteristics gender	male	70(70.00)
	female	30(30.00)
	total	**100(100.0)**
Age	≥ 40 years	60(60.00)
	< 40 years	40(40.00)
	total	**100(100.0)**
Status	professional	55(55.00)
	Non-professional	45(45.00)
	total	**100(100)**

3.0 Results and Discussion

Tables 2, 3 and 4 showed the mean rating and standard deviations of the respondents on the identification of usual inspecting practice, determination of the prevailing bureaucratic practice, and the examination the attitude of office personnel towards maintenance of civil engineering structures respectively. It was observed from Table 2 that inspection of civil engineering structures was done based on reports of dilapidation of structures from the society. The respondents were of the opinion that there is poor inspecting practice in the country. The finding was in line with the submission of Adeleye (2009) and Sani et al (2011) that maintenance monitoring agents, economic agent and the users find it difficult to maintain these properties. They rather see public facilities as government property which does not belong to any body(Udoka,2013). Table 3 showed strong existence of tussle of interest among politicians on maintenance of the civil engineering structures. Again, the flow of information from bottom to the top of the managerial cycle was slow. This resulted to delay of the overall system process. Furthermore, Table 4 revealed that the maintenance work was neither supervised well nor done well. The implication was a case of poor maintenance culture and inadequate management of the sector.

Table 2. Mean rating and standard deviations of the respondents on usual inspecting practice for civil engineering structures.

S/N	Item Statements	$\bar{X}$	SD	Remarks
1	Initial visual inspection for new structures is done after every rainy season	2.28	1.21	Rejected
2	Periodic inspection is carried for old structures	2.97	1.08	Rejected
3	Inspection is done based on report of dilapidation	3.68	0.92	Accepted
4	Inspection is conducted at the discretion of the office personnel	3.15	1.14	Accepted
5	There is no inspection at all	2.05	0.97	Rejected
	Grand mean	2.83		Rejected

Table 3. Mean rating and standard deviations of the respondents on prevailing bureaucratic practices for processing information on dilapidating civil engineering structures.

S/N	Item Statements	$\bar{X}$	SD	Remarks
1	The top management pays less attention to the inspection report	2.96	1.16	Rejected
2	It takes longer time than necessary for the personnel to prepare inspection report	3.58	1.12	Accepted
3	There is tussle of interest among politicians on maintenance of civil structures	4.24	1.03	Accepted
4	The overall system process is slow	3.92	1.14	Accepted
5	The flow of information from bottom to the top of the managerial cycle is slow	3.72	0.99	Rejected

S/N	Item Statements	$\bar{X}$	SD	Remarks
6	The office personnel disagree over status of structures	2.31	0.91	Rejected
	Grand mean	3.46		Accepted

Table 4. Mean rating and standard deviations of the respondents on attitude of office personnel towards maintenance of civil engineering structures.

S/N	Item Statements	$\bar{X}$	SD	Remarks
1	The office personnel play nonchalant attitude to the inspection practice	2.82	1.01	Rejected
2	The office personnel pay less attention to dilapidation report from the society	2.70	1.15	Rejected
3	The office personnel manipulate the inspection report	3.05	1.26	Accepted
4	The maintenance works are done well	2.69	1.10	Rejected
5	The maintenance works are supervised well	2.58	1.08	Rejected
	Grand mean	2.77		Rejected

Table 5 shows the summary of the mean, standard deviation and t-test results of the study base on the variables namely: gender, age, and status. The study showed that the male gender had a greater feeling on the maintenance culture approach than the female counterpart in all the three dependent variables. Also, the table revealed that the higher the age, the more the feeling on the maintenance culture approach. Again, the professionals were more sensitive to the maintenance culture approach than the non-professionals.

Table 5Test analysis between the variables; gender, age, and status on civil engineering maintenance culture approach

Division			Inspection practice	Bureaucratic practice	Office personnel attitude
Gender	Male (S. D)	$n = 70 \pm$	$2.84 \pm (1.13)$	$3.47 \pm (0.98)$	$2.78 \pm (1.14)$
	Female (S. D)	$n = 30 \pm$	$2.80 \pm (1.02)$	$3.44 \pm (1.15)$	$2.76 \pm (1.03)$
		$t\text{-value}_{cal.}$	0.17	0.14	0.09
		$t\text{-value}_{table}$	2.00	1.99	1.98
Age	≥ 40 (S. D)	$n = 60 \pm$	$2.85 \pm (1.08)$	$3.49 \pm (1.06)$	$2.79 \pm (1.09)$

	Division		Inspectio practice	Bureaucratic practice	Office personnel attitude
Status	< 40 (S. D)	$n = 40 \pm$	$2.79 \pm (1.11)$	$3.42 \pm (1.12)$	$2.74 \pm (1.16)$
		t-value $_{cal.}$	0.25	0.41	0.22
		t-value $_{table}$	2.00	1.99	1.99
	Professional (S. D)	$n = 55 \pm$	$2.84 \pm (1.05)$	$3.48 \pm (1.02)$	$2.79 \pm (1.01)$
	Non-Professional (S. D)	$n = 45 \pm$	$2.81 \pm (1.14)$	$3.43 \pm (1.18)$	$2.75 \pm (1.17)$
		t-value $_{cal.}$	0.12	0.22	0.18
		t-value $_{table}$	2.00	1.99	1.99

Furthermore, the null hypothesis, that there is no significant difference in the opinion of the respondents on usual inspection practice, prevailing bureaucratic practice, as well as office personnel attitude for inspection and maintenance of civil engineering structures in Nigeria was upheld at 95 % confidence level.

Table 6. The correlation between the constructs of civil engineering maintenance culture approach variables

	Inspection practice	Bureaucratic practice	Office personnel attitude
Inspection practice	1		
Bureaucratic practice	0.72	1	
Office personnel attitude	0.68	0.30	1

Table 7. Regression analysis between the variables of civil engineering maintenance culture approach

Factors	Coefficient	Standard error	t-value	p-value
Intercept	2.950	0.100	29.448	5.81E-90
Gender	-1.413	0.301	-4.701	3.97E-06
Age	0.924	0.340	2.720	0.007
Status	0.677	0.304	2.230	0.026
	R		F	P
	0.09		9.311	0.000

Table 6 contains the correlation analysis of the construct of the variables for evaluating the approach of maintenance culture being used in Nigeria. It indicated that the bureaucratic practice has higher impact on the inspection practice more than the attitude of the office

personnel. Again, there was a high relationship between the attitude of the office Personnel and the usual inspection practice.

The regression analysis amongst the variables on the identification of maintenance culture approach for civil engineering structures in Nigeria was shown in Table 7. It showed that age and status variables had more positive influence than the gender variable. Equation 1 shows the relationship between the variables.

$$Y = 2.950 - 1.413G + 0.924A + 0.677S \qquad \text{Eq (1)}$$

Where, G is gender, A is age, S is status of the respondent, Y = maintenance culture approach.

4.0 Conclusions

The paper identified the prevailing maintenance culture approach for monitoring civil engineering structures in Nigeria. The analysis applied the questionnaire research instrument to collect data from 100 respondents on the usual inspecting practice, prevailing bureaucratic practice, and attitude of office personnel towards maintenance of civil engineering structures in Nigeria. The gender, age, and status of the respondents were used as variables for the analysis of the data, for the determination of the statistical mean, and standard deviation, and for testing the hypotheses. The correlation analysis was applied to determine the association between the construct of the variables. And the regression analysis was used to find out the relationship amongst the independent variables and the dependent variables on maintenance culture approach foe civil engineering structures in Nigeria.

The finding showed that inspection of civil engineering structures was done based on reports of dilapidation of structures from the society. It also indicated poor inspecting practice in the country. Also, there was strong existence of tussle of interest among politicians on maintenance of the civil engineering structures. Again, the flow of information from bottom to the top of the managerial cycle was slow which resulted to delay of the overall system process. In addition, the maintenance work was neither supervised well nor done well. The implication was a case of poor maintenance culture and inadequate management of the sector. Again, the male gender had a greater feeling on the maintenance culture approach than the female counterpart in all the three dependent variables. Also, the higher the age, the more the feeling on the maintenance culture approach. Furthermore, the professionals were more sensitive to the maintenance culture approach than the non-professionals. Moreover, the bureaucratic practice has higher impact on the inspection practice more than the attitude of the office personnel. Again, there was a high relationship between the attitude of the office Personnel and the usual inspection practice.

Finally, the study recommended that, workshops and seminars should be organised to sensitize the office personnel on the need for adequate and regular inspection of civil

engineering structures. Emphasis should be laid on the use of renowned and efficient maintenance culture approach. There should be a benchmarking practice for monitoring of civil engineering structures in Nigeria to ensure sustainability of the structures in particular, and the society in general.

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