Construction Focus, Vol. 1, No 1, (2007) 98-105

EVALUATION OF FACTORS AFFECTING MAINTENANCE EXPENDITURES OF FEDERAL TERTIARY INSTITUTIONS IN NIGERIA

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ABSTRACT

The study evaluated the factors affecting the maintenance expenditures in selected federal universities in Nigeria; with a view to examining which factors affect most, the maintenance management expenditures of these universities. It also aimed at determining the appropriateness of the funding arrangement. The data used for the study were collected from Federal Universities in the six geopolitical zones in Nigeria. These data were collected by the use of 240 well structured questionnaires administered on senior and experienced maintenance officers in the physical planning units, in addition to critical examination of relevant documents from the maintenance department of the National Universities Commission, (NUC). Friedman analysis of variance was used to evaluate the factors affecting the maintenance expenditures. From the results it was found that inadequate funds relating to maintenance needs, administrative policies and unavailability/high cost of construction materials are drastically affecting the system of maintenance. It is recommended that allocations to maintenance funds of the universities should be adequate to meet the necessary measures and periodic reviews of the maintenance policies should be considered by the management of the universities.

KEYWORDS: *Budgets, Maintenance Management, Tertiary Institutions.*

INTRODUCTION

The maintenance of public buildings in Nigeria has not been accorded the needed attention as observed by Ahmed (2000).Much emphasis is placed on the construction of new buildings; hence most of the emphasis in the public sector is for the construction of new structures, while maintenance, which commences immediately the builder leaves the site is taken for granted. Execution of maintenance works is mostly left for maintenance department to handle on direct labor basis or on contract. Jobs of higher amounts are in most cases usually given out in form of maintenance contract to mostly unqualified building maintenance contractors (Abba, 2003).

Abiodun, (1996) observed that most of the lucrative contracts for building maintenance are awarded without due process, especially in the public sector organisations in Nigeria. The end result is poorly executed maintenance jobs and in some cases maintenance is not carried out despite the fact that the contract has been awarded, with funds released, Abba (2003). Some of these problems can be reduced by carefully selecting suitable contractors for the maintenance of the public sector buildings.

The role of building maintenance management systems is to retain the usefulness of a property in the public or private sector. Maintenance has been defined by Derek (1987) as work undertaken in order to keep or improve every facility: that is part of a building, its service and surroundings to a currently acceptable standard and to sustain the utility and value of the facility. Maintenance work within the context of this study includes work, which frequently incorporates major improvement to bring a building to acceptable standards, such as, re-roofing or rebuilding defective walls; rehabilitation works, refurbishing works and so forth.

The United Nations Centre for Human Settlements " (Habitat, 1991), noted that in many developing countries, poor maintenance practices are the result not so much of lack of resources as of "lack of workable strategies, methodologies and techniques for effective utilization of available resources in a systematic and methodical manner". In Nigeria, for instance, Zubairu (1998) opined that, lack of proper maintenance organisation in tertiary institutions can be traced back to the rapid rate of students' enrolment in the country since independence in 1960, and the concomitant problems associated with it. In the villages on the other hand there is still a culture of maintenance and people take pride in the proper care and maintenance of their houses and surroundings. Mud houses are regularly re-surfaced with mud and smoothly polished; thatched roofs are periodically changed while village compounds are daily swept and kept neat and tidy.

The emerging changes in teaching strategies and funding arrangements for tertiary institutions in most developing countries of the world have forced the institutions' managements to find new and innovative ways of maximizing limited resources and increasing revenue (Buys and Nkado, 2003). However, student enrolment remains one of the major sources of revenue for the institutions. Learners are attracted not only by the academic standards of the institution but also by the available facilities, including buildings and equipment in the institutions. Institutions are often identifiable by their facilities (Camillus, 2004). Therefore, the need for attractive facilities places new demands on maintenance officers and requires them to adopt more systematic and pro-active approaches to their work.

The condition and quality of buildings in the tertiary institutions reflect public pride, the level of prosperity in the area, social values and behaviours and all the many influences both past and present, which combine to give the community its unique character. There can be little doubt that dilapidated and unhealthy buildings in a decaying environment jeopardise the quality of life and contributes in some measure to anti-social behaviour. Unfortunately these issues are rarely given proper consideration (Lee, 1988). In the case of Nigeria, Oladapo (2004) reported that there is an increase in the rate of decay in public buildings of Universities. This may however be as a result of inadequate maintenance. The National Universities Commission's capital allocations to the Universities are based on a strategy that grouped the Universities into generations. These are: first generation, second generation and third generation Universities.

This policy was meant to allow the first generation Universities to consolidate their physical development and ensure the adequate maintenance of existing facilities, while the policy allows the second and third generation Universities to develop new facilities to accommodate their planned growth and maintain the existing ones, (Esenwa, 1999). Most Maintenance Officers (such as Directors of Works) in some of these institutions have been unable to distinguish between maintenance and rehabilitation. Often, routine maintenance works are described and treated as rehabilitation, as the National Universities Commission currently considers it.

It is quite evident that managements of tertiary institutions in Nigeria spend an extremely small proportion of their total budget on maintenance (Zubairu 1998, and Camillus 2004), while Buys, (2003) shared the same opinion for developing countries. This provides the basis for maintenance to be given a higher priority in the institutions' overall budget plan. At present maintenance budgets are based on the previous years' spending plus adjustments for inflation. This approach could become a recipe for disaster. The continued neglect of the assets of tertiary institutions is not only storing up potentially enormous bills for the future, but also seriously affecting the quality of teaching and learning within the institutions (Buys, 2003).

There is an apparent lack of maintenance culture in our tertiary institutions. This, corroborated by Zubairu, (1998), has persisted in Nigeria mainly due to the fact that the country does not have a statutory maintenance policy. The situation can be seen reflecting in most public sector infrastructures, such as offices and so on, which are in a state of dilapidation. This situation according to Ebah, (2000) is mainly due to the fact that in maintenance departments of most public institutions in Nigeria, quite a number of management personnel exist without the correct knowledge and skill for effective management practice, and also lack of effective organization of their skills.

This is further compounded by the lack of necessary maintenance tools and according to Ebah (2000), funds for maintenance work are never provided until there is a breakdown of a facility or part of it. In addition, there are shortages of both skilled maintenance management staff and craftsmen. Such lapses contribute in no small way to the premature dilapidation of most infrastructures. With an ever increasing number of students' enrolment coupled with fewer facilities, the situation makes it difficult for such institutions to adopt a more systematic and pro-active approach to their work, hence, the need for new and innovative ways of maximizing resources and increasing revenue in this area, which is the focus of the investigations.

The general aim of the study is to examine and appraise the factors affecting maintenance management expenditures of buildings in Universities in Nigeria. In order to achieve this general aim, the specific objectives are as follows:

1. To generate data relating to factors affecting maintenance expenditures of universities in Nigeria.
2. To analyze data relating to factors affecting maintenance expenditures of universities in Nigeria with the aim of determining the appropriateness or otherwise of the funding arrangement.

METHODOLOGY

Data used for the research work were obtained from the Federal universities in the six geopolitical zones in Nigeria. The choice of the geopolitical zones for data collection was informed by the fact that these institutions were assumed to be developed on similar master plans in terms of offices, lecture theatres and students' hostels and more importantly, they are all funded by the same parastatal; that is the National Universities Commission. In all data from 12 Federal universities were used. The results are presented in Tables 1, 2a, 2b and 3.

The data were generated through administration of 240 questionnaires on Universities' senior and experienced Maintenance officers, and officers in the physical planning unit of the National Universities Commission, as well as examination of relevant documents from the maintenance department of the NUC and the annual reports, for the years under study. Paired t-tests, simple and multiple regression analyses were carried out using Microsoft Excel and Minitab software packages.

The Friedman's Analysis of Variance (ANOVA)

The Friedman's ANOVA based on ranks was used to test the degree of agreement among the maintenance officers with respect to factors militating against effective maintenance management system of the universities in Nigeria. The procedure is based on within-block ranks. It has approximately a $\chi 2$ distribution when H_o is true (Larsen and Marx, 1986). The test provides a method of detecting a shift in location in a set of K populations. Like other non-parametric tests, it requires no assumptions concerning the nature of the populations other than the ranking of the individual observation (Scheaffer and McClave, 1982; Conover, 1980; Siegel, 1956).The expression is as follows;

$$F_r = \frac{12}{bk(k+1)}\left(\sum R_j{}^2 - 3b(k+1)\right) \ldots\ldots 3.1$$

Where:

b = number of blocks

k = number of treatments

R_j = rank sum of the i^{th} treatment, where the rank of each measurement is computed relative to its position within its own block.

For the Friedman's ANOVA to be valid, treatments should be randomly assigned to experimental units within a block by ranking and the number of blocks (b) or the number of treatment (k) should exceed 5 for the χ^2 approximation to be adequate. The Friedman's ANOVA is used to test the null hypothesis (H_o) that the probability distributions for the K treatments are identical as against the alternative Hypothesis (H_1) that at least two of the probability distributions differ in location. The decision rule for the Friedman's ANOVA is based on calculated F_r. If the F_r (calculated) is greater than χ^2 (from the statistical table), then the null hypothesis is accepted and the alternate hypothesis is rejected and vice-versa (Iman and Davenport, 1980).

The Friedman's ANOVA was used to test the null hypothesis that the probability distributions of factors affecting the effective maintenance management systems in the selected universities in Nigeria are identical. The test was adopted because no assumption is required concerning the nature of the population other than ranking of individual observations. The results are presented in Tables 4a and 4b.

ANALYSIS OF FACTORS MILITATING AGAINST EFFECTIVE MAINTENANCE MANAGEMENT SYSTEM IN THE SELECTED UNIVERSITIES IN NIGERIA

The Friedman's Analysis of Variance (ANOVA) was carried out to analyze the factors affecting maintenance management system in the selected universities in Nigeria. The analysis was based on ranking these factors in order of severity for the universities with respect to maintenance needs in Nigeria. The factors were identified from a pilot survey where by the questionnaire where administered. The Friedman's test was used to test the null hypothesis that the probability distributions for the treatments are identical.

Results of the analysis are shown in Table 4. The Fr (Calculated) is -464.11 which is less than the χ^2 (table) which is +23.68. Thus, the null hypothesis that the probability distributions for the treatments are identical is accepted. Hence it is concluded that all the maintenance manager/officers in the selected universities are in agreement as regards to the ranking of factors responsible for low effective maintenance management. This shows that most respondent perception of the attributes does not differ significantly from each other. Hence, the order of factors affecting maintenance management system as ranked by the maintenance officers/managers in ascending order of severity is as follows; inadequate funding, administrative policies, unavailability/high cost of construction materials, scope of maintenance work, lack of equipment,

interference from management, shortage of skilled manpower, inadequate incentives to staff, mobility of maintenance staff, efficiency of maintenance staff, conflict of interest, maintenance work by unqualified personnel, lack of communication, and corruption.

Table 1: Maintenance Expenditures for First Generation Universities

	Amount (budget) Approved Universities			Amount Released universities		
Years	A1	B1	C1	A1	B1	C1
1992	5331417	3,221,200	1,963,508	2,236,681	3,221,200	1,707,398
1993	8291240	2,588,294	2,805,011	5,527,265	2,588,294	2,439,140
1994	24,943,721	6,876,521	2,298,698	11,215,506	6,876,521	1,998,868
1995	10,451,677	4,916,884	635,026	9,461,049	4,916,884	448,877
1996	15239777	16,736,720	7,072,611	12,817,999	16,736,720	540,289
1997	23,122,321	71,502,000	700,000	15,178,293	71,502,000	693,708
1998	25,649,490	8,028,567	5,607,733	16,028,279	8,028,567	682,294
1999	350909286	2,842,647	41,213,500	39,076,485	2,842,647	1,336,913
2000	38,342,242	32,839,631	41,213,500	30,431,136	32,839,631	1,608,000
2001	97,018,405	47,169,750	154,742,457	61,288,295	47,169,750	1,608,000
2002	166246211	154,471,950	182,573,125	47,907,431	154,471,950	1,970,421
2003	191183142	259,241,266	306,371,637	45,522,305	259,241,266	1,798,726
2004	299,767,200	259,241,266	416,107,373	56,019,850	259,241,266	1,798,726
TOTALS	**941,496,129**	**869,676,696**	**1,163,304,179**	**333,616,865**	**869,676,696**	**18,631,360**

Table 2a: Maintenance Budgets for Second Generation Universities

	Amount (budget) Approved Universities					
Years	A2	B2	C2	D2	E2	F2
1992	1,999,788	3,211,337	1,923,431	4,526,928	1,654,521	1,996,278
1993	2,933,363	4,568,331	2,103,245	9,350,815	2,080,449	2,967,201
1994	4,179,384	9,431,000	6,291,430	10,919,076	2,895,476	3,346,991
1995	9,545,280	5,832,566	4,969,117	16,604,675	3,635,034	4,858,979
1996	30,819,342	14,431,567	1,429,360	20,796,481	3,901,492	1,857,500
1997	46,336,211	18,191,400	9,931,761	22,665,491	4,100,000	11,533,000
1998	65,439,737	13,506,700	5,744,161	25,005,291	5,500,000	11,360,000
1999	75,910,09	39,846,761	6,144,161	25,269,018	8,500,000	2,288,000
2000	270,863,608	62,315,327	49,321,761	44,989,800	26,778,212	81,533,979
2001	325,036,330	148,203,700	19,564,265	51,488,780	13,476,226	13,787,433
2002	24,582,267	152,506,567	69,300,137	56,637,658	14,780,058	78,220,102
2003	28,269,607	187,277,300	70,000,000	62,301,424	7,135,857	84,380,206
2004	920,502,887	162,385,000	83,238,363	72,065,869	7,135,857	97,787,106
TOTALS	910,098,813	**821,707,556**	**329,961,192**	**422,621,306**	101,573,182	**395,916,775**

Table 2b: Maintenance Allocations for Second Generation Universities

	Amount Released universities					
Years	A2	B2	C2	D2	E2	F2
1992	1,785,525	1,008,001	803,383	3,936,498	881,359	726,180
1993	2,550,750	1,440,001	823,251	8,131,143	783,598	1,037,400
1994	3,799,440	6,113,444	4,431,737	9,494,848	2,635,736	1,521,017
1995	8,113,488	3,078,365	2,772,041	11,451,500	4,286,627	2,280,392
1996	26,799,428	8,551,626	8,670,392	17,075,886	3,029,038	662,242
1997	40,645,799	9,731,168	5,900,701	18,143,092	4,083,417	6,294,720
1998	56,904,119	21,338,008	5,733,252	21,651,071	5,108,545	3,086,571
1999	9,665,767	35,894,148	6,925,880	40,322,558	6,301,173	1,048,105
2000	23,684,067	43,603,100	1,771,425	26,118,226	23,610,239	64,571,220
2001	25,629,064	65,385,600	11,191,036	43,102,061	11,907,135	921,096
2002	18,190,878	140,645,500	22,863,848	54,344,157	12,244,133	8,899,720
2003	24,594,559	138,475,800	11,819,041	37,300,707	3,390,556	8,977,726
2004	13,874,433	148,224,200	16,044,141	34,869,610	2,265,187	18,897,726
TOTALS	**256,237,317**	**623,488,961**	**99,750,128**	**325,941357**	**80,526,743**	**118,924,115**

Table 3: Maintenance Expenditures for the Third Generation Universities

	Amount (budget) Approved universities			Amount Released universities		
Years	A3	B3	C3	A3	B3	C3
1992	2,292,237	189,132	1,084,377	1,432,648	157,610	484,732
1993	3,550,394	1,418,372	6,484,732	2,629,921	1,202,010	3,656,797
1994	3,777,023	3,372,732	7,325,461	2,574,626	2,932,810	4,273,869
1995	2,446,114	5,133,254	4,415,404	1,678,650	4,668,828	4,415,404
1996	4,008,234	11,492,499	4,507,287	3,572,755	10,261,160	4,507,287
1997	4,842,875	20,522,320	9,794,057	4,156,560	16,623,079	7,646,577
1998	6,406,490	27,140,768	5,893,329	4,842,872	23,600,668	2,666,820
1999	6,157,782	31,211,883	7,823,755	5,794,500	27,140,768	4,400,000
2000	6,863,675	54,281,536	6,539,364	6,157,782	46,139,306	4,400,000
2001	17,907,830	70,496,165	11,827,214	7,399,500	59,921,740	7,815,818
2002	17,399,500	81,070,590	13,047,966	5,637,073	70,531,413	8,988,191
2003	19,986,250	93,231,178	12,800,000	15,726,500	79,246,501	8,988,191
2004	20,907,872	93,231,178	49,791,081	13,517,755	55,938,707	12,942,995
TOTALS	116,546,276	492,791,607	141,334,027	75,121,142	398,364,600	75,186,681

Table 4a: Results of Friedman's Analysis for Factors Affecting M.M.S for the Selected Universities

S/N	FACTORS	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1	ADMINISTRATIVE POLICIES	3	1	1	2	3	1	13	1	5	4
2	ALLOWANCES AND MOBILITY OF MAINT. STAFF	10	3	4	2	7	6	6	8	7	10
3	CONFLICT OF INTEREST	9	5	6	3	8	5	12	5	6	11
4	CORRUPTION	14	6	13	1	9	7	14	12	14	12
5	EFFICIENCY OF MAINTENANCE STAFF	11	2	12	3	2	2	10	14	8	6
6	INADEQUATE IN CENTIVES TO STAFF	8	5	11	4	10	3	11	9	9	8
7	INTERFERNCE FROM MANAGEMENT	4	3	9	3	6	4	9	2	10	7
8	INADEQUATE FUNDING	1	3	2	3	5	10	1	3	1	1
9	LACK OF EQUIPMENT	5	4	14	4	11	8	4	4	2	2
10	LACK OF COMMUNICATION	6	2	5	2	12	9	7	10	11	14
11	MAINTENANCE WORK BY UNQUALIFIED FERSONEL	12	1	3	3	13	11	8	11	3	13
12	SCOPE OF MAINTENANCE WORK	7	2	8	2	1	12	5	13	4	5
13	SHORTAGE OF SKILLED MANPOWER	13	2	7	2	14	14	2	7	12	9
14	UNAVAILABILITY/HIGH COST OF SPACE PARTS	2	2	10	4	4	13	3	6	13	3

Table 4b: Results of Friedman's Analysis for Factors Affecting M.M.S for the Selected Universities

/N	FACTORS	R11	R12	R13	R14	R15	R16	R17	R18	Rank order
1	ADMINISTRATIVE POLICIES	7	2	1	1	9	1	2	3	2
2	ALLOWANCES AND MOBILITY OF MAINT. STAFF	9	5	3	4	10	6	12	10	5
3	CONFLICT OF INTEREST	8	10	11	7	8	10	4	13	11
4	CORRUPTION	6	11	10	8	14	14	10	14	14
5	EFFICIENCY OF MAINTENANCE STAFF	5	4	1	2	7	11	4	2	9
6	INADEQUATE IN CENTIVES TO STAFF	4	7	6	3	4	7	14	1	6
7	INTERFERNCE FROM MANAGEMENT	3	3	8	4	6	8	3	12	7
8	INADEQUATE FUNDING	2	8	6	5	1	2	5	5	1
9	LACK OF EQUIPMENT	1	9	9	6	2	5	11	4	8
10	LACK OF COMMUNICATION	6	12	7	6	12	13	13	9	12
11	MAINTENANCE WORK BY UNQUALIFIED FERSONEL	8	13	9	8	11	12	4	8	13
12	SCOPE OF MAINTENANCE WORK	4	1	4	1	13	4	3	11	4
13	SHORTAGE OF SKILLED MANPOWER	5	6	2	4	3	3	2	7	10
14	UNAVAILABILITY/HIGH COST OF SPACE PARTS	4	5	5	2	5	9	1	6	3

CONCLUSION

From the foregoing analysis, it is clear that though the National Universities Commission makes allocations and releases to Capital and Maintenance work, such Funds are very inadequate to cater for Maintenance need as they are affected by these factors to the Nigerian Universities. In view of this, it becomes imperative to search for appropriate Maintenance Management System that can function within the in arrangement for effective Maintenance Management.

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