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MAINTENANCE MANAGEMENT SOURCING ROUTES AND THE CONDITION OF TERTIARY INSTITUTIONS' BUILDINGS IN SOUTHWEST, NIGERIA

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ABSTRACT

Buildings are strategic infrastructures for the sustainability of tertiary institutions and as such, appropriate maintenance management approaches of insourcing or outsourcing maintenance activities are essential for the buildings to fulfil their functions. Hence, there is a need to examine the extent to which the condition of tertiary institution buildings is influenced by maintenance activity insourcing and outsourcing. Through a cross-sectional survey, data were gathered from 112 respondents from tertiary institutions across Southwestern Nigeria. Mean score and independent samples t-test were employed as statistical tools for descriptive and inferential statistical data analysis. The results indicate that 77% of building elements and systems maintained through insourcing are in good condition while 97% of those maintained through outsourcing are in good condition. The results further show that there is no significant difference in the condition of three out of the four categories of building elements and systems based on whether their maintenance activities are insourced or outsourced. The study concludes that building elements and systems that are maintained through outsourcing are in better condition than those maintained through insourcing. The study recommends training and retraining of in-house maintenance crew for tertiary institutions whose maintenance activities are majorly executed through insourcing.

Keywords: Buildings, Insourcing, Maintenance, Outsourcing, Tertiary institutions.

1. Introduction

The condition of buildings and their associated services in schools have an impact on the performance of students and staff (Akomolafe et al., 2016). Previous studies on the impact of school buildings on students (Baker & Bernstein, 2012; Mcintyre, 2016) reveal that the condition of school buildings influences the academic performance of students, their health as well as their psychological well-being. Mcintyre (2016) posits that school buildings that are characterised by various forms of defects have both physical and psychological consequences on all categories of users. Faremi et al., (2021) posit that it is practically impossible to produce maintenance-free buildings. Although much can be done at the design stage to reduce the amount of maintenance work to be executed at the operation and maintenance phase of buildings, building elements nonetheless deteriorate over time relative to the nature and characteristics of construction materials, method of construction, age, environmental conditions, usage, method of design and maintenance management system in place for the building (Adenuga, Odusami and Faremi, 2007).

Previous studies have decried the deteriorating state of institutional buildings (Moja, 2000; Odia & Omofonmwan, 2007; Aluko, 2011; Yusuff, 2011; Ifenkwe, 2013). The poor state

of the facilities in institutional buildings is not only a result of a lack of maintenance activities as many of the institutions have dedicated maintenance units usually within the works and physical planning department. However, despite these dedicated maintenance units, most of the buildings and infrastructure in the nation's tertiary institutions are in a state of disrepair which undoubtedly has hindered the delivery of quality tertiary education (Edukugbo, 2013).

There have been several research efforts on insourcing and outsourcing maintenance activities. For example, Adenuga, Olufowobi and Raheem, 2010; Kumar, Soni and Agnihotri, 2013; and Evans and Delegge, 2014, investigated strategies for achieving effective building maintenance operations; with a focus on the development of maintenance policies that could assist the in-house staff of maintenance department of organisations and institutions in the delivery of improved building maintenance services. The studies proposed strategies for improving the traditional maintenance management practice of insourcing services through an emphasis on structuring and restructuring of in-sourced maintenance organisations or units for effective service delivery.

Similarly, previous studies on outsourcing services such as Hirschheim and Lacity (1997); Burdon and Bhalla (2005); Bergkvist (2008); Stanimirovic (2013); focused extensively on the risks and benefits of outsourcing services and concluded that critical failures, service provider underperformance, financial performance and loss of knowledge were the potential risks of outsourcing services. Consequently, the authors recommend that outsourcing requires that both the client organisation and its consultants carry out a full strategic assessment and evaluation of the proposed outsourcing strategy in which several critical success factors such as cost reduction, improved service quality, better customers satisfaction, internal processes efficiency and staff development are considered.

The poor physical and functional state of many institutional buildings in Nigeria requires urgent intervention as many of the buildings presently suffer from maintenance neglect. Studies on maintenance management of institutional buildings across the various region of Nigeria has shown that a large proportion of the buildings are in a state of disrepair. For example, from the east, Ugwu et al., (2018) posit that 80 per cent of the buildings within the University of Nigeria, Nsukka require varying degrees of urgent maintenance attention ranging from defective plumbing systems to roof maintenance needs. Similarly from the North, Ofide et al., (2015) lamented the haphazard approach to the maintenance demands of institutions in Niger State, Nigeria. Olanrewaju and Anifowose, (2015) report that many of the public institutional buildings in Ekiti State, Southwest Nigeria are in poor physical and functional condition. The study posits that the buildings are plagued with varying degrees of defects ranging from defective toilet water closets, rising dampness in substructure walls as well as defective windows and doors. Alejo, 2018 and Ohaedeghasi et al., (2021) argue that many of the buildings and allied facilities in tertiary institutions across the country are in a state of disrepair and that the level of maintenance activities in the tertiary institutions is below the minimum acceptable standards.

Premised on the foregoing, the study aims to assess the condition of building elements and services based on insourcing and outsourcing of maintenance activities to determine the extent to which the choice of maintenance practices influences the condition of buildings across tertiary institutions in Southwestern Nigeria.

Flowing from the aim of the study, the hypothesis postulated for the study is as follows:
Ho: There is no significant difference in the condition of tertiary institution buildings maintained using insourcing and outsourcing maintenance practices

2. Literature Review

Maintenance Management of Buildings

Building maintenance can be defined as the process by which a building is kept usable at a predetermined standard for the use and benefit of its occupants or users (Mydin, Ismail & Ulang, 2012). For buildings in tertiary institutions, Lateef, Khamidi and Idrus (2011) state that maintenance focuses on building care and can thus be said to be the required processes and services undertaken to preserve, protect, enhance and care for tertiary institution buildings' fabric

and services after completion, following the prevailing standards to enable the building and services to perform their intended functions throughout their lifespan without drastically upsetting their basic features and uses.

Mydin, Ismail and Ulang (2012) report that investment in building maintenance is usually massive throughout the world, as it gulps approximately 50% of the entire revenue of the construction industry in most countries. Lateef, Khamidi, and Idrus (2011) found that the assets of tertiary institutions comprise funds, technology, human resources, equipment and plant as well as buildings. Tertiary education is labour-intensive and human resource is its most significant asset, but human resource needs buildings to function effectively. It is, therefore, no wonder that buildings may sometimes constitute up to 90% of a tertiary institution's assets (Hassan, 2021). Generally, buildings are essential assets to institutions, organisations and the nation at large, as they provide people with the shelter and facilities that support the carrying out of daily activities. However, buildings deteriorate and dilapidate during their service lives since their components and systems suffer wear and tear underuse and associated external factors. It is therefore critical that for a building to be functional and perform efficiently, a building maintenance system has to be in place (Jin *et al*., 2012). Lateef, Khamidi, and Idrus (2011) have thus noted that building maintenance impacts everyone's life because the comfort and productivity of building users are relative to the performance of the building in which they live and work. In the case of tertiary institution buildings, how effectively users learn, conduct research and work is often a function of building conditions.

In summary, maintenance management is the total of all activities undertaken to achieve the goals and objectives of an institution or organisation. It is simultaneously the integration of effort, the design of an organisational structure, the acquisition and judicious use of maintenance resources, motivating people, providing leadership, planning strategies, controlling, innovating and creating an environment in which the maintenance goals of the organisation can be achieved (Liu & Arifin, 2021).

The concept of insourcing and outsourcing services

Maintenance management services can be procured through insourcing or outsourcing (Natukunda & Pitt, 2011). Sometimes a combination of insourcing and outsourcing is employed in a hybrid sourcing arrangement. Atkin and Brooks (2009) opine that the approach is taken often depends on the priority set by the organisation or institution procuring the service. Association for Public Service Excellence

APSE (2011) posits that insourcing was regarded as a means of delivering efficiency and cost savings in the face of mounting budgetary pressure. Although Goure (2011) argue that the expectation of efficiencies and cost savings through insourcing public projects are seldom met. Outsourcing, on the other hand, results from an economic climate, where the emphasis is on cost savings and increased quality, especially for lean operations (Faremi, Adenuga and Ameh, 2017). Ikediashi et al.(2012), and Brown and Fersht (2014) argue that the guiding principle of outsourcing is that non-core activities of an enterprise or organisation could be handed over to companies with lower labour costs and with expertise in those activities, thereby freeing internal resources to focus on enhancing the value-add of the organisations core business.

Physical and Functional Condition of Buildings

The physical and functional state of a building is the major feature by which its condition can be evaluated. Adenuga and Dosumu (2012), in a study of the assessment of procurement methods used for maintenance works of buildings, found that only 27% of surveyed respondents perceived their buildings as being in very good condition. Once they have been completed, buildings are generally expected to perform certain functions for a certain period. However, a building must be maintained to keep it in optimal operation since it is impossible to have maintenance-free buildings (Ajetomobi & Olanrewaju, 2015). The physical and functional condition of any building is a reflection of the amount of maintenance attention given to it. Lateef, Khamidi, and Idrus (2010) assert that a building is an asset whose value changes following the quality and quantity of maintenance activities invested in it. The essence of

building maintenance is, therefore, to increase the service life of a building by delaying deterioration, decay, and failure.

Building maintenance must, therefore, be considered a strategic process if the value of a building is to be sustained (Idrus, Khamidi & Lateef, 2009). It has thus been established in the literature that for optimum performance in tertiary institutions, functional assets are required. Waziri and Vanduhe (2013) observe that both public and private buildings in Nigeria are faced with neglect owing to lack of maintenance, which in turn results in a rapid rate of defects, deterioration, and failure in some cases. Previous studies (Adenuga, 2012; Ajayi et al., 2019; Daniel & Berinyuy, 2010; Faremi et al., 2017, 2022) present a comprehensive list of various building elements and maintenance services that are required for keeping a building well maintained, the building elements and services include; building frames, floors, roof, walls, windows and doors, finishes, ceilings, sanitary appliances, electricals systems, plumbing systems and eternal services. These systems and services are categorized into building fabrics, services, environment, and aesthetics. This study adopts the list of maintenance services as presented by the authors of reviewed literature to evaluate the operational state of buildings in tertiary institutions in Southwest Nigeria.

3. Research Methods

A cross-sectional survey design was adopted for this study. The survey was conducted across tertiary institutions in Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. The population of the study comprise maintenance managers and maintenance technical staff within the study area. Primary data were collected for this study using structured questionnaires. Secondary data were collected for this study from the archives of the National Universities Commission (NUC). Table 1 shows the distribution of institutions that were sampled for the study across each of the six states of the Southwestern Nigeria geopolitical zone.

Table 1: List of sampled institutions

State	SN	Name of Institution	Institution Category
Lagos	1	University of Lagos	Federal University
	2	Lagos State University	State University
	3	Yaba College of Technology	Federal Polytechnic
	4	Lagos State Polytechnic	State Polytechnic
Ondo	5	Federal University of Technology Akure	Federal University
	6	Rufus Giwa Polytechnic Owo	State University
	7	Adekunle Ajasin University	State University
Oyo	8	University of Ibadan	Federal University
	9	The Polytechnic Ibadan	State Polytechnic
Ogun	10	Mountain Top University	Private University
	11	Covenant University	Private University
	12	Tai Solarin University	State University
	13	Babcock University	Private University
	14	Olabisi Onabanjo University	State University
	15	Federal University Of Agriculture Abeokuta	Federal University
	16	Federal Polytechnic Ilaro	Federal Polytechnic
	17	Moshood Abiola Polytechnic Abeokuta	State Polytechnic

State	SN	Name of Institution	Institution Category
	18	Bells University	Private University
	19	Crawford University	Private University
Osun	20	Obafemi Awolowo University	Federal University
	21	Redeemers University	Private University
	22	Adeleke University	Private University
	23	Bowen University	Private University
	24	University of Osun State	State University
	25	Federal Polytechnic Ede	Federal Polytechnic
Ekiti	26	Federal Polytechnic Ado-Ekiti	Federal Polytechnic
	27	Afe Babalola Private University	Private University
	28	Federal University Oye-Ekiti	Federal University

Source: Author's Field Survey (2020)

Table 1 shows that the study sample both universities and polytechnics across the six states of the Southwestern geopolitical zone. The sampled institutions also cut across three different categories of federal, state- and privately-owned institutions.

Two sample sizes were determined for this study. The summary of the sample size, the number of questionnaires administered and retrieved as well as the response rate of return is shown in Table 2. The first sample for this study was a census of the twenty-eight (28) maintenance managers across the universities in Southwest Nigeria while the second sample for the maintenance technical staff was determined using the simplified formula for proportions proposed by Yamane (1967). A purposive sampling technique was adopted in administering the research instrument for the maintenance technical staff. This was to ensure that the research instruments were completed by the targeted respondents.

Table 2: Sample sizes and survey rate of returns for this study.

State	**Maintenance manager**				**Maintenance technical staff**			
	SS	**NA**	**NR**	**RR**	**SS**	**NA**	**NR**	**RR**
LAGOS	4	4	4	100%	16	17	16	94%
ONDO	3	3	3	100%	6	6	6	100%
OYO	2	2	2	100%	12	12	12	100%
OGUN	10	10	10	100%	24	27	24	89%
OSUN	6	6	6	100%	17	18	17	94%
EKITI	3	3	3	100%	9	11	9	82%
TOTAL	**28**	**28**	**28**		**84**	**91**	**84**	

Source: Author's Field Survey (2020)

Note: SS= Sample size, NA= Number of questionnaires administered, NR = Number of questionnaires retrieved, RR= Response rate (%).

This study assesses the perception of both the maintenance staff and building users on the condition of buildings in tertiary institutions within the study area. The respondents were asked to identify buildings that are maintained through insourcing and outsourcing maintenance arrangements respectively. Thereafter, they were asked to rate the physical and functional condition of the various building elements and services in the buildings. This was done to ascertain the physical and functional state of key elements as well as essential services in the

various tertiary institutions to determine the extent to which the condition of the building elements and services are influenced by the maintenance sourcing practice(s) used for maintenance activities in the various institutions. In doing this, a list of building elements and services was presented to the respondents in two parallel columns for assessing the condition of insourced and outsourced building elements and services respectively.

The respondents were presented with a 5-point Likert scale ranging from 1= very poor to 5= very good as the means for expressing their perceptions. Consequently, the mean scores from the responses were calculated. This study adopts the cut-off points of Pandey and Pandey (2015) for the interpretation of the mean values in which $1.00 \leq MS \leq 1.49$ means very poor, $1.50 \leq MS \leq 2.49$ means poor, $2.50 \leq MS \leq 3.49$ means average, $3.50 \leq MS \leq 4.49$ means good and $4.50 \leq MS \leq 5.00$ means excellent condition. Table 4.23 shows the descriptive results of the analysis of the perception of maintenance staff and users on the condition of buildings in tertiary institutions based on insourcing and outsourcing maintenance practices respectively.

4. Data Presentation and Analysis

The result in Table 2 shows that none of the thirty (30) building elements and services was rated as being in excellent condition.

Table 2: Condition of buildings in tertiary institutions based on the insourced and outsourced maintenance

Building Elements and Services	Mean (I.M)	Remark	Mean (O.M.)	Remark
Building Fabrics				
Frames	3.52	Good	3.67	Good
Upper floors	3.70	Good	3.68	Good
Roofs	3.59	Good	3.68	Good
Stairs	3.66	Good	3.77	Good
External walls	3.66	Good	3.74	Good
Windows and external doors	3.70	Good	3.69	Good
Internal walls and partitions	3.74	Good	3.74	Good
Internal doors	3.66	Good	3.52	Good
Wall finishes	3.61	Good	3.63	Good
Floor finishes	3.62	Good	3.67	Good
Ceilings	3.62	Good	3.57	Good
Nettings	3.51	Good	3.52	Good
Building Services				
Sanitary appliances	3.50	Good	3.49	Average
Service equipment	3.51	Good	3.54	Good
Disposal installation	3.57	Good	3.54	Good
Water installation	3.62	Good	3.56	Good
Electrical installation	3.72	Good	3.69	Good
Gas installation	3.20	Average	3.62	Good
Lift and conveyor installation	2.50	Average	4.02	Good
Protection installation	3.39	Average	3.63	Good
External services	3.48	Average	3.60	Good
Ventilation system	3.63	Good	3.70	Good
Building Environment				
Sanitation of environment	2.43	Poor	4.23	Good
Drainages	3.49	Average	3.52	Good
Lawns and gardens	3.83	Good	3.67	Good

Building Elements and Services	Mean (I.M)	Remark	Mean (O.M.)	Remark
Car park and parking lot	3.84	Good	3.58	Good
Building Aesthetics				
Fittings and furnishings	3.51	Good	3.65	Good
Internal painting	3.54	Good	3.65	Good
External painting	3.53	Good	3.68	Good
External cornices	3.49	Average	3.72	Good

Source: Author's Field Survey (2020)

Note: I.M. = Insourced maintenance; O.M. = Outsourced maintenance

For the building elements and services that are maintained through insourced maintenance, the results show that the respondents rated 77% (23) of the building systems and services to be in good condition, 20% (6) and 3% (1) in average and poor conditions respectively. The respondents' rating of the building systems and services that are maintained through outsourced maintenance shows that 97% (29) are in good condition, 3% (1) in average condition and none (0) in poor condition.

The result in Table 2 further shows that elements of the building fabrics category were generally rated to be in good condition as their respective mean values fall within the range of 3.50-4.49. This implies that the fabrics of buildings in tertiary institutions in Southwest, Nigeria are generally perceived by the respondents to be in good condition regardless of whether they are maintained by insourcing or outsourcing maintenance practices.

In the building services category, the respondents' ratings varied from average condition to good condition as the range of mean values was 2.50 to 4.02. Building services that are maintained through insourced maintenance and whose ratings were average include gas installations (m= 3.20), lift and conveyor installation (m=2.50), protection installation (m=3.39) and external services (m=3.48), others were rated good.

In the building environmental services category, the results show that the sanitation of the environment maintained by insourcing practice was rated as poor (m=2.43). Also, drainages maintained through insourced maintenance were rated to be in average condition. Meanwhile, all the building environment elements that are maintained through outsourcing were rated to be in good condition (m≥3.52).

In the building aesthetics category, all the building aesthetics elements were rated to be in good condition except for the external cornices which had an average (m=3.49) score rating.

Test of Hypothesis

Null Hypothesis (H_0): There is no significant difference in the condition of tertiary institution buildings maintained using insourcing and outsourcing maintenance practices.

The postulated hypothesis was tested using the independent samples t-test. The hypothesis seeks to establish if there was a significant difference in the condition of tertiary institution buildings maintained using insourcing and outsourcing maintenance practices in Southwest, Nigeria. The results of the analysis are presented in Table 3.

Table 3: Independent samples t-test of difference in the condition of tertiary institution buildings maintained using insourcing and outsourcing practices in Southwestern Nigeria.

Building Elements and Systems	Insourced	Outsourced	t	df	*p*-value	Remark/Decision
Building Fabrics	3.63	3.65	-0.79	21	0.44	NS, Ho accepted
Building Services	3.41	3.63	-1.86	12	0.09	NS, Ho accepted
Building Environment	3.40	3.75	-0.95	4	0.39	NS, Ho accepted
Building Aesthetics	3.52	3.68	-8.12	5	0.00	S, Ho rejected

Note: *p* is significant at: *p≤0.05, NS = Not significant, S= Significant

Table 3 shows that the *p*-value for each of the three out of the four categories of building elements and systems is greater than 0.05 ($p > .05$). Specifically, the results show that for; Building Fabric t (21) =-0.79, p=0.44, Building Services t (12) =-1.86, p=0.09, and Building Environment t (4) =-0.95, p=0.39. This implies that there is no significant difference in the condition of these three categories of building elements and systems based on whether their maintenance activities were done using insourcing and outsourcing maintenance practices. Hence the null hypothesis was accepted for each of the three categories of building elements and systems.

On the contrary, the results in Table 3 for Building Aesthetics t (5) =-8.12, p= 0.00 show that $p<0.05$ therefore, the null hypothesis was rejected for this category. This implies that there is a significant difference in the condition of building aesthetic elements comprising fittings and furnishings, internal and external painting, and external cornices that are maintained using insourcing from those that are maintained through outsourcing maintenance practices in tertiary institutions in Southwest, Nigeria. The building aesthetic elements maintained through outsourcing were in better condition than those that are maintained through maintenance insourcing.

5. Discussion of Findings

The result of this study shows that none of the building elements and systems of buildings across Southwestern, Nigeria tertiary institutions are in excellent or in very good condition. The condition ratings of the building elements and systems range from poor to good. For instance, the results show that the sanitation of the environment maintained through insourcing practice was in poor conditions while those carried out through outsourcing practice were reported to be in good conditions. Although the statistical difference in the condition of the building environment was generally insignificant regardless of whether they were maintained through insourcing or outsourcing practices. This result is consistent with the findings of Hines (1996) that the condition of school buildings is usually on average and oftentimes unsatisfactory. However, the study of Lewis *et al.* (2000) on the condition of schools in the United States of America shows that the perceived condition of about 56% of schools was very good and satisfactory. Such a report suggests that it is feasible to have buildings that are visually appealing and functionally sound in tertiary institutions in Southwest Nigeria.

Furthermore, the results show that building elements whose maintenance activities are outsourced had better condition ratings. This suggests that tertiary institutions should further embrace the concept of outsourcing building maintenance activities. The result aligns with the findings of Stanimirovic (2013) that institutions should consider outsourcing non-core activities. The study opines that outsourcing consideration should be driven by the need for specialised expertise, strategic alliance with contractors, need for specialised management, accountability and the lack of internal resources for a service. The result also compares with the result of Sheng (2012), and Muchai and Acosta, (2012) that institutions oftentimes engage the services of third-party vendors to execute maintenance activities requiring high-level speciality.

The result suggests that maintenance activities are critical to the preservation of buildings in tertiary institutions. This justifies the position of Lateef, Khamidi, and Idrus (2011) that strategic decisions are required in the maintenance management of buildings in tertiary institutions if the buildings are to fulfil the function of creating a suitable, conducive and adequate environment to support, stimulate and encourage learning, teaching, innovation and research activities.

6. Conclusions and Recommendations

The study established that tertiary institution-building elements and systems that are maintained through outsourcing are in better physical and functional condition than those maintained by insourcing or in-house maintenance crew. In addition, tertiary institutions whose environmental sanitation is insourced have a poor level of environmental sanitation.

Furthermore, the study affirmed that tertiary institution management could leverage outsourcing to achieve a strategic alliance with contractors for improved maintenance service delivery, especially in the areas where the performance of the insourced team is poor. Premised on the findings of the study, tertiary institutions should always adopt a mix of both insourcing and outsourcing in the maintenance management of their buildings. The choice of the sourcing option

at any particular point in time should be the product of what policymakers consider strategic and the extent to which the sourcing option aligns with the overall objective of the institution.

The study, therefore, recommends that for tertiary institutions whose maintenance activities are majorly executed through insourcing, the in-house maintenance crew should be properly trained and equipped to improve the quality of insourced maintenance service delivery. Tools and equipment used for maintenance activities should be periodically audited. Such audit should be aimed at replacing old, worn-out, and outdated tools and equipment to enhance the quality of insourced maintenance services. Moreover, janitorial services and allied environmental sanitation activities that are executed through insourced maintenance practice should be better supervised. It is expected that better environmental sanitation can be achieved through improved supervision of insourced janitorial activities.

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