

Maintenance Management Practices and Factors Affecting Maintenance of Private University Buildings in Ogun State Nigeria

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ABSTRACT: Building maintenance management is an efficient and viable technique used for addressing issues with construction's upkeep. Nigerian tertiary institutions have been accused of lacking maintenance culture. Meanwhile, quality and sustainable education is delivered when educational buildings are adequately maintained. The present study seeks to investigate the factors affecting maintenance management of private university buildings in Ogun state Nigeria. Questionnaire survey was utilized as a research instrument to gather information from the maintenance personnel within private universities in Ogun state, Nigeria. The data analysis techniques used were descriptive and inferential statistics. The results revealed that use of poor quality components and materials, no adoption of appropriate maintenance cycle for building maintenance, lack of discernable maintenance culture in the country, and inadequate training and development of maintenance personnel are the top most four factors affecting maintenance management of private university buildings in Ogun state, Nigeria. The study provides insights into the factors affecting maintenance management of university buildings. An understanding of these factors would help tertiary institutions and maintenance personnel facilitate the development of strategies required in minimizing the factors affecting maintenance management practices in tertiary institutions.

KEYWORDS: Maintenance; management; maintenance practices; Ogun state; Nigeria; educational buildings; tertiary institutions

1. Introduction

Maintenance management is important for economic use of buildings. Maintenance is described as a set of a task carried out to maintain the structure and amenities of buildings to ensure it function as expected during its life cycle. It is defined as the amount of all specialized and managerial operations aimed at restoring or maintaining an element to its right position in order to function effectively [1]. It has been established that, building maintenance increases the building life cycle and improves its longevity as well as ensures users safety [2]. Maintenance management is concerned about the condition of the structures and administrations to guarantee the necessary prerequisites for proper operation [3]. In other words, maintenance management's goal is to determine the optimal mix of building

maintenance methods by selecting the best maintenance approach for each structure component. According to Adenuga et al. [4], maintainability of building is one of the main areas in which the construction industry attains significant improvement. Omar et al. [5] opined that maintenance of buildings is an important process in retaining the quality and value of building. The approach of maintenance management utilized should be checked on a regular basis to ensure high-quality facilities [3], and lack of effective maintenance management affects the financial performance of a building [6]. Hence, maintenance management is essential for building structures and construction business.

The International Organization for Standardization of Building identified the following measures to help enhance maintenance management practices: (i) having maintenance personnel that is well-trained and experienced is important; (ii) having maintenance systems that provide requirements and response times; (iii) taking note of all site information, maintenance dates, service agreements, buildings, redecorating, technical services, and expenses; and (iv) using the most effective strategies for disseminating knowledge to aid in the reduction of costs and deficiencies that resulted from them [7]. Successful maintenance activities result in meeting and fulfilling the needs of building users as well as maintaining all building services. All maintenance work should be performed by the maintenance department, and all user reports should be taken seriously. Despite the importance of maintenance, buildings still suffer maintenance problems in the country. In Nigeria, according to Adenuga et al [8], public buildings including university buildings are in very terrible conditions. Besides, maintenance of university buildings is vital if sustainable and quality education is to be delivered [9, 10]. However, previous studies have found a clear link between educational building performance and educational quality [11]. Therefore, buildings at universities must be maintained to create a suitable atmosphere that encourages learning, teaching, creativity, and science. Past studies have identified several factors that affect building management and maintenance to include lack of policy guidelines, poor service quality, ineptitude, corruption, insufficient money, poor maintenance plan, and maintenance backlogs [12, 13].

The studies by [14] found that lack of preventive maintenance, inadequate funds to repair the structure, lack of building maintenance standards, non-availability of spare parts and components, and failure to respond to maintenance requests were the main factors affecting the public buildings in Penang, Malaysia. Waziri and Vanduhe [15] found that, lack of preventive maintenance, poor workmanship, the design resolution factor, and the use of substandard materials were the factors affecting residential building in Nigeria. These factors pose a serious threat to the building's structural and functional integrity, resulting in rapid degradation. Faremi and Adenuga [16] investigated the factors affecting maintenance management in the banking industry and found that, user conduct and abuse of facilities and lack of discernible maintenance culture are the most significant factors affecting bank building maintenance in Lagos, Nigeria.

A number of studies have been carried out in Nigeria to figure out the factors that contribute to poor maintenance of buildings [4, 8, 9, 13, 17]. For example, previous studies have covered topics such as prison facilities in south-west, Nigeria [13], and public hospital buildings in Lagos, Nigeria [4]. Aghimien et al. [9] reported that the study of building maintenance within the private tertiary institutions is scarce. Due to the benefits associated with maintenance of educational buildings, it is essential to exam the maintenance

management practices and factors affecting maintenance of university buildings. Thus, this suggests that, there is very little understanding of maintenance management practices in the four walls of private universities in Nigeria. However, the study of factors affecting maintenance of private university buildings in Nigeria has not been studied in sufficient detail. Hence, need for the present study.

The aim of the presented study is to address this gap in knowledge by examining the factors affecting maintenance management of private university buildings in Ogun state, Nigeria. Since maintenance of university buildings is vital in delivering sustainable and quality education, it is important to investigate factors affecting maintenance management of private university buildings in Ogun state, Nigeria. Although this study applies specifically to the private universities in Ogun state, Nigeria, the same technique could be further extended to other nations' universities experiencing maintenance challenges.

2. Research Significance

The research examines the factors affecting maintenance management of private university buildings in Ogun state, Nigeria. This investigation is done to explain the importance of maintenance management of private university buildings. Thus, it is important to sustain a structure to protect the underlying worth of property speculations. Keeping a structure in a condition that permits it to keep on serving its capacity and guaranteeing its safety are both fundamental contemplations that can be accomplished by legitimate structure support. The research is important because the results would assist private university administrators in making decisions about building maintenance. The study contributed to more effectively maintenance management studies by highlighting the factors affecting maintenance management practice of private university buildings. An understanding of these factors is vital for facilitating the development of strategies required in reducing the factors affecting maintenance management of private university buildings in the tertiary institutions.

3. Research Methodology

This study aimed at determining the factors affecting maintenance management of private university buildings in Ogun state, Nigeria. The study adopted cross-sectional survey design approach as demonstrated in the research process (see Figure 1) to achieve the aim of the study. Factors affecting maintenance management of buildings were identified through a comprehensive literature review. These factors were used to design a questionnaire to achieve the research objective. The questionnaire survey was used to obtain the responses of personnel from the department of physical planning and works at the chosen universities regarding the factors affecting maintenance management in private university buildings. The study uses personnel from the department of physical planning and works at the chosen universities and the target participants were maintenance personnel in private universities in Ogun state, Nigeria. To ascertain the accuracy and comprehensiveness of the questionnaire survey, pilot study was carried out before distributing it to the respondents. The questionnaire was updated with the help of maintenance personnel in education sector as a result of the pilot test.

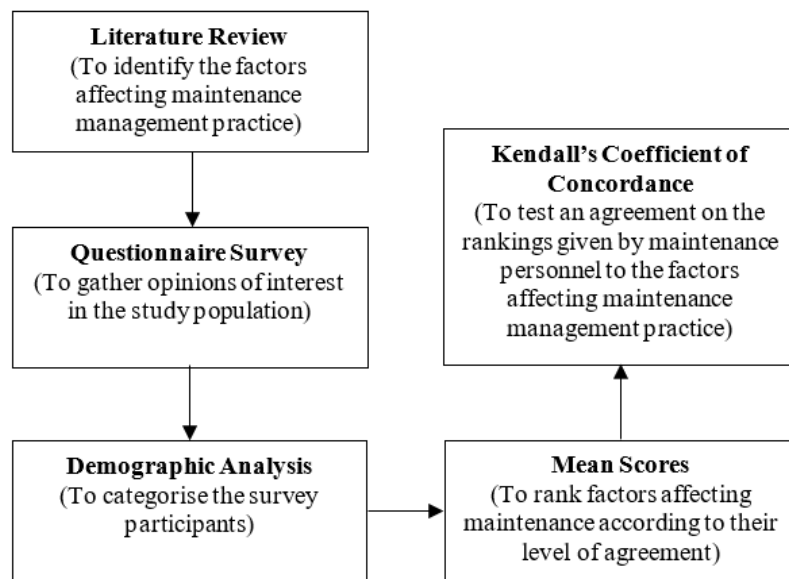


Figure 1. Research procedure.

3.1. Research area.

The study area for this research work was restricted to private university buildings in Ogun state. Ogun state is a metropolitan city in western Nigeria and was created in 1976. Ogun state is chosen as the study area, because is the state that has the highest number of private university (eleven private universities) in Nigeria.

3.2. Data collection.

A random sampling method was used to select five (5) private universities from a detailed list of private universities in Ogun state for the distribution of the questionnaire survey. The simple random sampling method was adopted to ensure that all of the universities on the list had an equal opportunity. To determine the factors affecting maintenance management, participants were presented with a 5-point Likert scale, where strongly disagree = 1, disagree = 2, neutral = 3, agree = 4 and strongly agree = 5. A total of 75 questionnaires were sent out to the five private universities in Ogun state, Nigeria (Table 1). Out of the 75 questionnaires distributed, 50 questionnaires were adequately completed and returned, representing a response rate of 67%, which indicates a good response rate.

Table 1. Responses of questionnaire (maintenance personnel).

S/No.	University Name	Distributed Questionnaire	Returned Questionnaire
1	Bells University of Technology, Ota	15	13
2	Covenant University, Ota	15	12
3	Chrisland University, Abeokuta	15	8
4	Crawford University, Atan-Agbara	15	10
5	Crescent University, Abeokuta	15	7
6	Total	75	50

3.3. Method of analysis.

The data for this research were analyzed using descriptive and inferential methods. The response rate and total percentage of returned questionnaires based on the sample size were calculated, and the raw data was coded before being entered into a Statistical Package for Social Sciences (SPSS) version 21. The data collected was analyzed using this statistical package. The research used descriptive statistical tools such as frequency, percentage, mean, and ranking as well as inferential statistics such as Kendall's coefficient of concordance to analyze the data collected.

4. Results and data analysis

This section of the paper presents the background information of the respondents, results and analysis of factors affecting maintenance management of private university buildings in Ogun state, Nigeria.

4.1. Background information of respondents.

Table 2. Respondents' background information.

Background Information	Frequency	Percentage
Post of Respondents		
Principal engineer	3	6.0
Technical officer	6	12.0
Secretary	2	4.0
Chief technical officer	5	10.0
Clerical officer	2	4.0
Supervisor officer	2	4.0
Mechanical maintenance officer	9	18.0
Work & services officer	6	12.0
Electrical maintenance officer	7	14.0
Estate manager	4	8.0
Facility officer	4	8.0
Total	50	100.0
Gender		
Male	31	62.0
Female	19	38.0
Total	50	100.0
Age Bracket		
30 years and below	8	16.0
31 – 35 years	12	24.0
36 – 40 years	19	38.0
41 – 45 years	7	14.0
46 – 50 years	3	6.0
51 years and above	1	2.0
Total	50	100.0
Educational Qualification		
HND	17	34.0
B.Sc.	25	50.0
M.Sc.	3	6.0
PhD	5	10.0
Total	50	100.0
Length of Service in Years		
1 – 5 years	15	30.0
6 – 10 years	21	42.0
11 – 15 years	9	18.0
16 - 20 years	5	10.0
Total	50	100.0

The study investigated the profile of the survey participants to provide an insight into the reliability of the responses received. The summary result of the background information is

shown in Table 2. The respondents that participated in the study were males and females. The study revealed that the majority of the survey participants were males with 62%, while the remaining 38% of the survey participants are females as shown in the Table 2. The post of respondents that participated most was mechanical maintenance officers with 18% followed by electrical maintenance officers with 14% as shown in the Table 2. From the rear, secretary, clerical officer and supervisor officer were the least in participation with 4% each. 84% of the survey participants are above 30 years old, indicating that most of the respondents are mature to participate in the study. Concerning the academic qualification of the respondents, 50% of the survey participants were bachelor degree holders, and 34% had HND degrees. In addition, as shown in Table 2, 70% of the respondents have more than five years of experience in the department of physical planning and works at the chosen universities and this demonstrated their capability to participate in the study.

4.2. Factors affecting maintenance of private university buildings in Ogun state Nigeria.

Table 3. Factors affecting maintenance of private university buildings.

S/N	Factors	Mean	Rank
1	Use of poor-quality components and materials	4.08	1
2	No adoption of appropriate maintenance cycle for building maintenance	3.96	2
3	Lack of discernable maintenance culture in the country	3.94	3
4	Inadequate training and development of maintenance personnel	3.92	4
5	Inadequate/inappropriate maintenance of facility plant and equipment for maintenance operations	3.88	5
6	Lack of long-term arrangements made for the supply of essential parts for replacements	3.84	6
7	Level of technology, cultural background and environment not been considered	3.84	6
8	Natural deterioration due to age and environment	3.82	8
9	Lack of successful maintenance program by the maintenance department	3.82	8
10	Frequent shortage of materials and spare parts due to absence of efficient inventory system	3.82	8
11	The scale of efforts, extent of facilities and resources for maintenance operations on the quality of management in an organization	3.82	8
12	Persistent breakdown through indiscipline and ignorance	3.80	12
13	Lack of skilled manpower to maintain works in buildings designed and constructed by expatriates	3.80	12
14	Lack of skilled personnel in maintenance department	3.78	14
15	Reluctance of some establishment to innovation support	3.78	14
16	Difficulty in procurement of spare parts due to unavailable funds	3.74	16
17	Complexity of design and non-involvement of maintenance experts during design stage	3.72	17
18	Lack of effective maintenance due to de-emphasize training, retraining and continuing education	3.72	17
19	Insufficient funds for maintenance jobs	3.70	19
20	Inflation of cost of maintenance by the operatives	3.66	20
21	Absence of a form of planned maintenance program	3.64	21
22	Attitude of users and misuse of facilities	3.60	22

This section of the paper showed the results of the data analysis of factors affecting maintenance of private university buildings in Ogun state Nigeria. Twenty-two (22) factors that affect maintenance of building were identified for the study. As shown in Table 3, “use of poor-quality components and materials” has the highest mean score of 4.08 and was ranked first. This was followed by “no adoption of appropriate maintenance cycle for building maintenance” with a mean score of 3.96, ranked second, “lack of discernable maintenance culture in the country” with a mean score of 3.94, ranked third, and “inadequate training and development of maintenance personnel” with a mean score of 3.92 was ranked fourth. These findings are in support of the previous studies by [14, 15, 16]. From the rear, “attitude of users and misuse of facilities” was ranked lowest with a mean score of 3.60. The results of the mean scores in the Table 3 suggest that the factors affecting maintenance of

private university buildings in Ogun state Nigeria are very common in the tertiary institutions.

Furthermore, the study used Kendall's statistical tool to test an agreement on the rankings given by maintenance personnel to factors affecting maintenance management in private university buildings in Ogun state Nigeria. Thus, Kendall coefficient of concordance which is a non-parametric test was used to determine the degree of agreement or disagreement of target group responses concerning the factors affecting maintenance management in private university buildings in Ogun state Nigeria. SPSS v. 21 was used to run the test. The obtained result showed high significant (Table 4). Therefore, the study concluded that there was a statistically degree of agreement between different groups of maintenance personnel in private universities in Ogun state Nigeria.

Table 4. Kendall's coefficient of concordance test.

Frequency (N)	50
Kendall's Wa	0.032
Chi-Square	33.198
Degrees of Freedom (df)	21
Significance Level (Asymp. Sig.)	0.044

5. Discussion of findings

Maintenance management of university buildings is not practiced as widely in Nigeria compare to developed countries, which is vital in achieving sustainable and quality education. This study investigated the factors affecting maintenance management of private university buildings in Ogun state Nigeria. The study identified many factors affecting maintenance management of private university buildings. Results showed that “use of poor-quality components and materials”, “no adoption of appropriate maintenance cycle for building maintenance”, “lack of discernible maintenance culture in the country” and “inadequate training and development of maintenance personnel” were the top most four factors affecting maintenance management of private university buildings in Ogun state Nigeria. These findings are in support of findings reported in past studies [4, 9].

Ranking of the twenty-two (22) factors affecting maintenance management of private university buildings demonstrates that use of poor-quality components and materials was considered the most important factor affecting maintenance management of private university buildings in Ogun state Nigeria. This finding is in support of studies by [15]. This finding could be due building components and materials are marketed without approval from the Standard Organisation of Nigeria (SON) and inadequate testing laboratories for these components and materials [18]. This finding suggests quality components and materials should be used for building construction and maintenance. Building components and materials should be put together so as to be functional and as well maintain its lifespan. Oke and Abiola-Falemu [18] opined that matters concerning verification of quality of building components and materials in construction must be critically looked into to prevent situations where most of buildings failed to meet safety obligations to the people. This result can guide construction stakeholders in private universities buildings to improve in the use of quality building components and materials. Secondly, this finding can assist the SON to enhance performance by reducing the gaps of poor-quality components and materials that are being displayed in the market. This will minimise the factors affecting maintenance management of buildings in the educational sector.

The second and third in rank of factors affecting maintenance management of private university buildings in Ogun state Nigeria are; no adoption of appropriate maintenance cycle for building maintenance and lack of discernible maintenance culture in the country respectively. These findings could be due to lack of maintenance culture in Nigeria [4, 9, 19]. These findings suggest regular maintenance of buildings. When building is regularly maintained, it will continue to function in the purpose in which it was originally designed. Maintenance culture is the behaviour, values, perception and the basic assumptions of any society or group or individual that deems maintenance important and practices it [20]. Lack of maintenance can only bring about negative effect on both building and nation development. According to Tijani et al. [20], careless attitude of Nigerians on maintenance culture has negatively affected infrastructural development. Thus, maintenance culture is essential and significant to nation development. Another important factor that affects maintenance management of private university buildings in Ogun state Nigeria is inadequate training and development of maintenance personnel. This finding suggests that, adequate maintenance management training and education should be given to maintenance personnel as one of the encompassing strategies to mitigate the factors affecting maintenance management practice. Training is the process of developing abilities, skills and knowledge [21]. According to Ibrahim et al. [22], training enables organisations to attain a high work performance culture. Maintenance performance is achieved when the implementation process is conducted by personnel with high level ability and adequate skill [21]. According to Dalkilic [23], inadequate training and lack of technical knowledge causes maintenance errors. If this training and knowledge is attained, maintenance personnel and building stakeholders would like to tap the benefits of building maintenance.

This study has provided in-depth understanding of the factors affecting maintenance management of private university buildings that can help maintenance personnel and stakeholders in private universities facilitate the development of strategies required in mitigating the factors affecting maintenance management of private university buildings in the tertiary institutions.

6. Conclusion

In Nigeria, many factors are affecting maintenance management practices. Despite that, maintenance management practices have positive effect on educational buildings and building users which include increase in the building life cycle, longevity improvement, ensures users safety as well as create a suitable atmosphere that encourages learning, teaching, creativity, and science, maintenance culture has not been fully embraced in Nigeria as it has in developed countries. This study aims to explore the factors affecting maintenance management of private university buildings in Ogun state Nigeria. A questionnaire survey of 50 respondents consisting of maintenance personnel in private university in Ogun state Nigeria was conducted to determine factors affecting maintenance management of private university buildings. The study has shown that use of poor-quality components and materials, no adoption of appropriate maintenance cycle for building maintenance, lack of discernible maintenance culture in the country and inadequate training and development of maintenance personnel are the top most four factors affecting maintenance management of private university buildings in Ogun state Nigeria. Furthermore, the results from the study revealed that, there is an agreement on the rankings given by maintenance personnel to factors

affecting maintenance management in private university buildings in Ogun state Nigeria. The findings of the study provide detailed insights into the factors affecting maintenance management of private university buildings in tertiary institutions. An understanding of the factors affecting maintenance management of university buildings is important for university management as well as maintenance personnel. This information can be used for developing strategies needed for mitigation of the factors affecting maintenance management of university buildings.

Based on the data analysis, it is evident that use of poor-quality components and materials was the main factor affecting maintenance management of private university buildings. The present findings suggest the need for quality components and materials should be used for building construction and maintenance so as to prevent situations where most of buildings failed to meet safety obligations to the people. The findings indicate the need to train and educate maintenance personnel in tertiary institutions about building maintenance and the outcome of maintenance culture. This information can guide construction stakeholders in private universities buildings to improve in the use of quality building components and materials as well as practicing maintenance as a culture within the tertiary institutions and the nation at large.

7. Recommendations

The study contributed to more effectively maintenance management studies by highlighting the factors affecting maintenance management practice of private university buildings. An understanding of these factors is vital for facilitating the development of strategies required in reducing the factors affecting maintenance management of private university buildings in the tertiary institutions. The study focuses only on factors affecting maintenance practice. Highlighting other variables such as approaches or methods would have been a credit to the present paper. Future study can be carried out on methods of maintenance used in maintaining university buildings. This will inform university management and maintenance personnel on strategy to adopt towards building maintenance practice.

As a result of the study's findings and conclusions, it is suggested that:

- i. Since private college structures are places of learning, more needs should be done by both building users and maintenance personnel to improve the physical condition.
- ii. Corrective maintenance should be used by maintenance personnel to reduce the event of deformities, bringing about predominant physical and functional university building elements and services.
- iii. Private institutions should be adequately funded, according to university administration. University administration should also make it a policy for universities to have a maintenance policy that guides their maintenance program.
- iv. Maintenance personnel of private university buildings should keep the predicted factors under control, as this would help them design and execute maintenance programs, as well as overcome the factors affecting maintenance management of university buildings.

Competing Interest

The authors declare no conflict of interest.

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