



## **ASSESSMENT OF MAINTENANCE COST OF BUILDINGS AT TERTIARY INSTITUTIONS IN KWARA STATE**

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### **ABSTRACT**

*The maintenance of tertiary institution buildings in Nigeria as over time been faced with the issue of funding. Funding is not the only problem militating against the maintenance work of Nigeria tertiary institution buildings; cost overrun and underestimating also contribute to maintenance problem in tertiary institutions and this frequently result in failure of management to recognize the value and need for realistic budget and in return affect the maintenance work of tertiary institution buildings in Nigeria. This study focus on the assessment of maintenance cost of buildings at tertiary institutions in Kwara State. The objective of the study were to: identify factors affecting maintenance cost of tertiary institutions buildings in Kwara State; examine the determinants of maintenance cost for buildings at the tertiary institutions under study; examine the maintenance budgets implementation strategy for execution of maintenance works at these tertiary institutions. To achieve these, 105 questionnaires were administered and 87 was recovered and analyzed using MIS, RII and one way ANOVA. The study found that the most important factor affecting maintenance cost was building material with a Mean score of 4.70 and age of the building as the most important determinant of maintenance cost of tertiary institutions in kwara state with RII of 0.93. Condition assessment costs was also discovered the most significant in maintenance budget composition of tertiary institutions buildings with a mean of 4.45 and RII of 0.89 while Establishing priorities was discovered to be the most significant implementation strategy with a mean of 4.59 and RII of 0.92. Finally a one-way between-groups analysis of variance was conducted to examine the maintenance budgets implementation strategies for execution of maintenance*

*works at the institutions of study on effective cost estimation and allocation strategy. The result depicts no significant difference in relationship between Maintenance budget composition and Maintenance Budget Implementation*

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## **INTRODUCTION**

According to Ekundayo and Ajayi (2009), higher education plays a crucial role in the supply of high level manpower for the socio-political and economic development of a nation. Among many other problems that militate against the effective management of the Nigeria education system are financial crisis, poor infrastructure and brain-drain. Olanrewaju *et al* (2010) pointed out that institutional buildings are most procured to create suitable, conducive and adequate environment to support, stimulate and encourage learning, teaching, innovations and researches. "A sound state of mind supports a student's academic excellence, and a well-maintained living-and-learning environment provides physical security and a base for healthy, social and behavioural stability (Aluko, 2011)". Building components generally depreciate over time, thus resulting in problems making it impossible for them to fulfil their purposes maximally. Putting this depreciation/deterioration problem right and sustaining the property in a good state usually involves maintenance costs either directly or indirectly (Afolayan and Etoniru, 2016).

Okosun and Olagunju (2017) identified inadequate funds and high maintenance cost, as some of the major factors contributing to maintenance problem of buildings in Nigeria higher institutions. Similarly, Ogwu *et al.* (2018) also identified lack of maintenance policy, inadequate provision of funds for maintenance and poor execution of maintenance as key factors that militate effective maintenance of buildings at higher institutions. Ofide *et al.* (2015) further pointed out that the higher institution in Nigeria have a budget for maintenance though in a short term form and despite the fact that the annual estimated range of maintenance budget for the higher institution is about 50million naira and above, it is still not sufficient to meet the maintenance need of the higher institution. Adamu (2015) concluded that Maintenance activities at Nigerian public universities are not adequately funded and the problem may be partly blamed on lack of proper maintenance planning and operations programs. Furthermore, the managers do not have proper knowledge of the conditions of the facilities; therefore proper estimate of the maintenance

requirement are not feasible (Adamu, 2015). Faremi *et al.* (2016) also identified budget constraint, poor budgetary control poor maintenance tracking, poor workmanship and many more as some of the factors that affect maintenance cost of tertiary institutions buildings in Nigeria.

Owolabi *et al.* (2014) observed that some major variables that lead to the inefficiency and ineffectiveness of the maintenance work of Nigeria tertiary institution buildings; the occurrence of poor contract management, lack of availability of material and the incidence of inaccurate estimate. Additionally, Olatunji *et al.* (2016) reported that lack of funding is not the only problem militating against the maintenance work of Nigeria tertiary institution buildings; cost overrun and underestimating also contribute to maintenance problem in tertiary institutions and this frequently result in failure of management to recognize the value and need for realistic budget and in return affect the maintenance work of tertiary institution buildings in Nigeria.

This has ripple effects on the structural health and functional integrity of the buildings; thus causing the buildings to dilapidate/deteriorate and therefore affect the performance of the users (students and staffs) negatively who are directly involved with the buildings. It is to this effect that this study wishes to assess the maintenance cost of buildings in Nigeria tertiary institutions in Kwara State with a view to establishing an effective cost estimation and allocation strategy. In order to achieve the aim, the following objectives will be pursued by the study:

- i. To identify factors affecting maintenance cost of tertiary institutions buildings in Kwara State.
- ii. To examine the determinants of maintenance cost for buildings at the tertiary institutions under study.
- iii. To examine the maintenance budgets implementation strategy for execution of maintenance works at these tertiary institutions

## **LITERATURE REVIEW**

In order to achieve the objectives of the study and to place the study in its proper context, this section reviewed issues related to the themes related to the study.

### **Factors Affecting Maintenance Cost of Institutional Buildings**

The factors affecting maintenance cost of tertiary institution building are categorized into five (5) major groups; building characteristics and maintenance management cost, occupant factors and maintenance management cost, maintenance factors and maintenance management cost, political factors and maintenance management cost, other factors and maintenance management cost.

### **Building Characteristics and Maintenance Management Cost**

Building characteristics always have an influence on the maintenance costs (El-Haram and Horner, 2002). Basically, building characteristics include the building age, function, building or unit area, height of building, type of structure, finishes, services, building materials and others. Every building has its own characteristics and this makes the buildings require different amount of maintenance costs distribution and allocation to be maintained in good condition. For instance, building characteristics of apartment and serviced apartment are different in terms of the building amenities provided, facilities and services available (Sonthya, 2006).

### **Occupant Factors and Maintenance Management Cost**

Housing maintenance cost is always influenced by the occupants or residents in numerous aspects. According to El-Haram and Horner (2002), occupant factors that have an impact on the maintenance cost include the expectation of occupants or residents, use of the property, vandalism by the occupants, delay in reporting failures, complete failure to report problems, as well as accessibility to the property. Olubodun (2001) noted that 25 per cent of total maintenance needs could be due to the occupant influence. Thus, participation of occupants and residents in housing management can be considered as a strategy of the top management in bridging the gap between expensive maintenance management and the legitimate expectation or demand of the occupants (Yip, 2001).

### **Maintenance Factors and Maintenance Management Cost**

Maintenance factors are likely to have great influence on building maintenance costs (El-Haram and Horner, 2002). Generally, maintenance factors can be divided into two main factors, which are

- i. Technical factors



ii. Administration factors.

In terms of technical factors, some aspects that affect the maintenance cost are poor workmanship, and poor quality of spare parts and materials. While in terms of administration factors, the aspects that influence maintenance cost include poor maintenance management, budget constraints, failure to execute maintenance at the right time and poor budgetary control. The selection of the maintenance management team and staff is closely related to the maintenance factors that affect the housing maintenance cost.

### **Political Factors and Maintenance Management Cost**

Political factors affect the buildings maintenance cost in some circumstances, especially when there are changes of political policies through government or local authority. El-Haram and Horner (2002) proved that the political factors considerably affect the housing maintenance cost. The variables include right to buy policy, new health and safety regulations and poor management. However, the “right to buy policy” aspect is only applicable for public housing and “poor management decision system” is not obvious in affecting the housing maintenance cost. So, only the “new health and safety regulations” aspect will be discussed in this study. Health and safety is a key factor influencing the planning of maintenance tasks (Lee and Scott, 2009). Thompson (1994) noted that building maintenance is so important, whereby its role is not only to ensure the facilities and services in buildings are operating at the optimal standard of functions, but to satisfy the performance to the requirements of the building’s occupants. In order to obtain the objective of building maintenance, maintenance staff must consider all aspects of requirements of occupants to be compliant to the statutory health and safety regulations. Those aspects may include environmental conditions (ventilation, lighting and sanitation), data communication and electrical power. For time being, new health and safety regulations might be created to improve the building performance. Hence, new design concepts that comply with such new regulations are required when designing or refurbishing a building. This often affects the design cost for a new building or maintenance cost for an existing building.

### **Other Factors and Maintenance Management Cost**

Besides, the factors that have been stated, there are other factors that affect the housing maintenance cost such as third-party vandalism and poor or lack of training (El-Haram and Horner, 2002). These factors can have an impact on the housing maintenance cost, which are often neglected by maintenance

management staff. Third-party vandalism is one of the factors that affect building maintenance cost. According to Tiun (2003), vandalism is one of the serious problems observed in many high-rise residential buildings. Although the security guards are assigned to protect the property of the buildings, such vandalism activities are still occurring. This factor has been proven by El-Haram and Horner (2002) as highly affecting the housing maintenance cost with the rank of 8 among 24 factors in their study. This factor is commonly caused by third-parties that have no relationship or interest to a building.

Poor or lack of training is likely to have an impact on the housing maintenance cost. Narayan (2003) stated that lack of maintenance personnel training is one of the reasons for poor operating practices in maintenance management. Maintenance personnel or operator's skill is an essential factor that influences the maintenance performance (Pascual *et al.*, 2008). Poor operating and maintenance practices often lead to human error and consequently the occurrence of poor quality of maintenance outcomes. The poor maintenance outcome is then increasing the failure rate, which leads to the avoidable failures or further implications and subsequent repairs or additional maintenance works that are required in order to ensure the building performance standard.

### **Maintenance budget composition**

In determining the composition of a maintenance budget, a department's maintenance funding needs should be split into the following cost components (as endorsed by the Cabinet Budget Review Committee):

- i. Condition assessment costs
- ii. Statutory maintenance costs
- iii. Preventative maintenance costs
- iv. Condition-based maintenance costs
- v. Unplanned maintenance costs
- vi. Agency maintenance management costs

A definition for each of these budget components is presented in **Table 2.1**.

*Table 1: Maintenance budget components*

Cost component	Definition
<b>Condition assessment cost</b>	This is the cost of undertaking condition assessments in accordance with the MMF.

<b>Statutory maintenance cost</b>	This is the cost associated with undertaking maintenance to meet mandatory requirements of various regulations such as the servicing of fire protection systems.
<b>Preventative maintenance cost</b>	This is the cost associated with the periodic servicing of plant and equipment and preventative repairs to other building components to ensure reliable operation, comply with "duty of care" responsibilities and general good maintenance practice to preserve assets in a condition appropriate for service delivery.
<b>Condition-based maintenance cost</b>	Condition-based maintenance is maintenance undertaken as a result of deteriorated condition identified through condition assessments. In this regard, funding of this component is variable and less predictable.
<b>Unplanned maintenance cost</b>	Unplanned maintenance is reactive work undertaken as a result of breakdowns and routine failure of building components and services. Funding of this component of maintenance would fluctuate in varying degrees between agencies. However, historical data should provide guidance in terms of annual estimates of funding required.
<b>Agency management cost</b>	This is the cost incurred by agencies in managing maintenance and includes the costs of management personnel, maintenance management systems, financial administration and other overhead costs. Activities to be costed include: general management; administration; maintenance planning; program formulation; program management; and contract management (if maintenance is outsourced).

Agency management cost; however, the magnitude of this cost component should be relative to the total maintenance expenditure for the building portfolio. Departments must ensure that there are appropriate mechanisms in place to achieve sustained reductions of management costs by using appropriate

administrative and decision making processes and systems for planning and monitoring the maintenance delivery. Departments should structure ledgers or cost centers around the cost components listed above to get a clear indication of where maintenance funds have been expended.

**Maintenance Budget Implementation Strategy**

Managing a maintenance budget includes:

- i. Establishing priorities
- ii. Regular monitoring and reporting including analysis of budget components against actual expenditure. Where maintenance services are contracted, the monitoring of budgets may include consultation with facility managers/maintenance service providers regarding scheduling, and material and equipment needs
- iii. establishing accountabilities and performance requirements
- iv. monitoring against benchmarks and policy requirements
- v. Managing variances and contingencies and monitoring the effects of deferred maintenance where required. Where additional maintenance funding is allocated for emergent priorities (e.g. the reduction of backlog/deferred maintenance), this should be integrated into the maintenance budget.

**RESEARCH METHODOLOGY**

*Table 2: Summary of Research Methodology*

S/N	Objectives	Type of Data	Instrument for Data Collection	Method(s) of Data Analysis	Sample frame and size
1	To identify factors affecting maintenance cost of tertiary institutions	Primary.	Questionnaire	Mean Item Score (MIS)	(7) out of the seventeen (17) tertiary institutions within Kwara state

	buildings in Kwara State.				
<b>2</b>	To examine the determinants of maintenance cost for buildings at the institutions under study.	Primary and Secondary.	Questionnaire	Relative Importance Index (RII)	three (3) personnel each from five (5) professionals the sample size will make One hundred and five (105)
<b>3</b>	To examine the maintenance budgets implementation strategies for execution of maintenance works at these institutions.	Primary and Secondary.	Questionnaire	1. MIS (to rank the maintenance budgets implementation strategies in order of effectiveness). 2. One Way ANOVA (to come up with the most effective cost estimation and allocation strategy).	The criteria for selection is based on age, population of staff/students accommodated and a functioning Maintenance Department/Unit

*Source: Researcher's Construct (2019)*

## RESULTS AND DISCUSSIONS

This section demonstrates data utilised for analysis and discussion of the results gotten from the analysis. The analysis of data and the result discussions were premised on the data obtained from primary and secondary source through literature and questionnaire.

### Factors Affecting Maintenance Cost of Tertiary Institutions Buildings in Kwara State.

The MIS and RII analysis results for the frequency of factors affecting maintenance cost of tertiary institutions buildings in kwara state is presented in the Table 3 below.

The Mean Item Score (MIS) was adopted in order to identify the main factors and sub factors collected from the survey while the most important factors were identified by arranging the magnitude of RII values in their descending order in their respective category.

*Table 3: Factors Affecting Maintenance Cost of Tertiary Institutions Buildings in Kwara State*

	Factors	Frequency					Mean Score	RI	Ranking	Overall Ranking
		5	4	3	2	1				
	<b>Building Characteristics</b>						<b>4.44</b>	<b>0.89</b>		<b>1<sup>st</sup></b>
<b>1.</b>	Age of the building	56	18	12	10	0	4.48	0.9	2 <sup>nd</sup>	3 <sup>rd</sup>
<b>2.</b>	Building height and building area/size	36	39	8	4	0	4.23	0.85	5 <sup>th</sup>	12 <sup>th</sup>
<b>3.</b>	Type of structure	46	31	10	0	0	4.41	0.88	3 <sup>rd</sup>	7 <sup>th</sup>
<b>4.</b>	Building services	46	26	15	0	0	4.36	0.87	4 <sup>th</sup>	8 <sup>th</sup>
<b>5.</b>	Building materials	69	14	2	0	2	4.70	0.94	1 <sup>st</sup>	1 <sup>st</sup>



	<b>Occupant Factors and Maintenance Management Cost</b>						<b>4.2</b>	<b>0.</b>		<b>3<sup>rd</sup></b>
							<b>2</b>	<b>84</b>		
<b>1.</b>	Expectation of occupants	2 8	4 1	1 3	3 0	2 0	4.0 3	0. 81	5 <sup>th</sup>	17 <sup>th</sup>
<b>2.</b>	Use of the property	5 1	2 8	7 0	0 1	1 0	4.4 7	0. 89	1 <sup>st</sup>	4 <sup>th</sup>
<b>3.</b>	Vandalism by occupants	3 6	3 9	1 1	1 0	0 0	4.2 6	0. 85	2 <sup>nd</sup>	10 <sup>th</sup>
<b>4.</b>	Delay and failure in reporting problems	3 9	3 3	1 2	3 0	0 0	4.2 4	0. 85	3 <sup>rd</sup>	11 <sup>th</sup>
<b>5.</b>	Accessibility to the property	3 5	3 2	1 5	5 0	0 0	4.1 1	0. 82	4 <sup>th</sup>	15 <sup>th</sup>
	<b>Maintenance Factors and Maintenance Management Cost</b>						<b>4.4</b>	<b>0.</b>		<b>2<sup>nd</sup></b>
							<b>3</b>	<b>88</b>		
<b>1.</b>	Poor workmanship	6 4	1 8	4 0	0 1	1 0	4.6 6	0. 93	1 <sup>st</sup>	2 <sup>nd</sup>
<b>2.</b>	Poor quality of spare parts and materials	4 8	2 7	8 0	3 1	1 0	4.3 6	0. 87	4 <sup>th</sup>	8 <sup>th</sup>
<b>3.</b>	Poor maintenance management	4 8	3 4	4 0	0 1	1 0	4.4 7	0. 89	2 <sup>nd</sup>	4 <sup>th</sup>
<b>4.</b>	Budget constraints	4 7	3 3	7 0	0 0	0 0	4.4 6	0. 89	3 <sup>rd</sup>	6 <sup>th</sup>
<b>5.</b>	Poor budgetary control	3 1	4 6	8 0	0 2	2 0	4.2 4	0. 84	5 <sup>th</sup>	13 <sup>th</sup>
	<b>Political Factors and Maintenance Management Cost</b>						<b>4.0</b>	<b>0.</b>		<b>4<sup>th</sup></b>
							<b>3</b>	<b>81</b>		
<b>1.</b>	Right to buy policy	2 4	4 3	1 2	7 0	1 0	3.9 4	0. 79	3 <sup>rd</sup>	19 <sup>th</sup>
<b>2.</b>	New health and safety regulation	3 0	3 4	1 8	4 0	1 0	4.0 1	0. 80	2 <sup>nd</sup>	18 <sup>th</sup>
<b>3.</b>	Poor management decision system	3 4	3 7	1 1	4 0	1 0	4.1 4	0. 83	1 <sup>st</sup>	14 <sup>th</sup>

	<b>Other Factors and Maintenance Management Cost</b>						<b>3.94</b>	<b>0.79</b>		<b>5<sup>th</sup></b>
<b>1.</b>	Third-party vandalism	233	291	318	244	188	3.78	0.76	2 <sup>nd</sup>	20 <sup>th</sup>
<b>2.</b>	Poor or lack of training in house maintenance	299	477	524	244	449	4.09	0.82	1 <sup>st</sup>	16 <sup>th</sup>

Source: Researcher's Data Analysis (2019)

Table 3 reveal “Building characteristic” as the major affecting factor to rank 1<sup>st</sup> among five factors with the highest mean score of 4.44; “Maintenance Factors and Maintenance Management Cost” as the subsequent factor to rank 2<sup>nd</sup> with a mean score of 4.43 and “Occupant Factors and Maintenance Management Cost” to rank 3<sup>rd</sup> with a mean score of 4.22. These three factors emerged to be the major factors affecting maintenance cost of tertiary institutions buildings in kwara state. Furthermore survey from overall ranking reveal “Building Materials” as the major affecting sub-factor to rank 1<sup>st</sup>; “Poor Workmanship” subsequently ranked 2<sup>nd</sup> and “Age of Building” ranked 3<sup>rd</sup>. These three factors emerged to be the major sub-factors affecting maintenance cost of tertiary institutions buildings in kwara state.

### **Determinants of Maintenance Cost of Tertiary Institutions Buildings in Kwara State**

Table 4.: *Determinants of Maintenance Cost of Tertiary Institutions Buildings in Kwara State*

	Factors	Frequency					Mean Score	RII	Ranking	Overall Ranking
		5	4	3	2	1				
	<b>Building Characteristics</b>						<b>4.43</b>	<b>0.88</b>		<b>1<sup>st</sup></b>
<b>1.</b>	Age of the building	61	24	1	1	0	4.67	0.93	1 <sup>st</sup>	1 <sup>st</sup>

<b>2.</b>	Building height and building area/size	3 2	4 0	1 5	0	0	4.20	0.8 4	5 <sup>th</sup>	9 <sup>th</sup>
<b>3.</b>	Type of structure	5 9	2 5	3	0	0	4.64	0.9 3	2 <sup>nd</sup>	2 <sup>nd</sup>
<b>4.</b>	Building services	3 3	4 2	1 0	2	0	4.22	0.8 4	4 <sup>th</sup>	7 <sup>th</sup>
<b>5.</b>	Building materials	5 1	2 3	1 1	2	0	4.41	0.8 8	3 <sup>rd</sup>	4 <sup>th</sup>
	<b>Occupant Factors and Maintenance Management Cost</b>						<b>4.08</b>	<b>0.8 1</b>		<b>3<sup>rd</sup></b>
<b>1.</b>	Expectation of occupants	2 9	4 1	1 4	3	0	4.10	0.8 2	3 <sup>rd</sup>	12 <sup>th</sup>
<b>2.</b>	Use of the property	4 3	3 3	1 0	1	0	4.36	0.8 7	1 <sup>st</sup>	5 <sup>th</sup>
<b>3.</b>	Vandalism by occupants	2 9	3 2	1 5	8	3	3.87	0.7 7	5 <sup>th</sup>	18 <sup>th</sup>
<b>4.</b>	Delay and failure in reporting problems	3 4	3 8	8	5	2	4.12	0.8 2	2 <sup>nd</sup>	11 <sup>th</sup>
<b>5.</b>	Accessibility to the property	2 6	4 0	1 5	4	2	3.97	0.7 9	4 <sup>th</sup>	16 <sup>th</sup>
	<b>Maintenance Factors and Maintenance Management Cost</b>						<b>4.22</b>	<b>0.8 4</b>		<b>2<sup>nd</sup></b>
<b>1.</b>	Poor workmanship	5 4	2 6	2	2	3	4.45	0.8 9	1 <sup>st</sup>	3 <sup>rd</sup>

<b>2.</b>	Poor quality of spare parts and materials	4 9	2 4	7	6	1	4.31	0.8 6	2 <sup>nd</sup>	6 <sup>th</sup>
<b>3.</b>	Poor maintenance management	4 5	2 4	1 3	2	3	4.22	0.8 4	3 <sup>rd</sup>	7 <sup>th</sup>
<b>4.</b>	Budget constraints	3 2	3 8	1 3	4	0	4.13	0.8 3	4 <sup>th</sup>	10 <sup>th</sup>
<b>5.</b>	Poor budgetary control	3 0	3 7	1 1	9	0	4.01	0.8	5 <sup>th</sup>	13 <sup>th</sup>
	<b>Political Factors and Maintenance Management Cost</b>						<b>3.94</b>	<b>0.7 9</b>		<b>4<sup>th</sup></b>
<b>1.</b>	Right to buy policy	2 7	2 7	2 7	5	1	3.85	0.7 7	3 <sup>rd</sup>	19 <sup>th</sup>
<b>2.</b>	New health and safety regulation	2 8	3 1	2 6	2	0	3.98	0.7 9	2 <sup>nd</sup>	15 <sup>th</sup>
<b>3.</b>	Poor management decision system	2 9	3 5	1 7	6	0	4.00	0.8	1 <sup>st</sup>	14 <sup>th</sup>
	<b>Other Factors and Maintenance Management Cost</b>						<b>3.83</b>	<b>0.7 7</b>		<b>5<sup>th</sup></b>
<b>1.</b>	Third-party vandalism	2 3	3 4	1 8	8	4	3.74	0.7 5	2 <sup>nd</sup>	20 <sup>th</sup>
<b>2.</b>	Poor or lack of training in house maintenance	3 0	3 8	6	9	4	3.93	0.7 9	1 <sup>st</sup>	17 <sup>th</sup>

*Source: Researcher's Data Analysis (2019)*

Survey from overall ranking reveal “Building characteristic” as the major determinant Factor of Maintenance cost to rank 1<sup>st</sup> among 5 factors with RII of 0.88; “Maintenance Factors and Maintenance Management Cost” as the subsequent factor to rank 2<sup>nd</sup> with RII of 0.84 and “Occupant Factors and Maintenance Management Cost” to rank 3<sup>rd</sup> with RII of 0.81. These Factors emerge as the three major determinants of maintenance cost of tertiary institutions buildings in kwara state.

Furthermore from the overall ranking, “Age of Building” ranked 1<sup>st</sup> as the major determinant sub factor of maintenance cost among 20 sub-factors with RII of 0.93; “Type of Structure” subsequently ranked 2<sup>nd</sup> with RII of 0.93 and “Poor Workmanship” ranked 3<sup>rd</sup> with RII of 0.89. These Factors emerge as the three major sub determinants of maintenance cost of tertiary institutions buildings in kwara state. Table 4.3 shows the Determinants of Maintenance Cost for Buildings at The Institutions under Study in Kwara.

**Maintenance budget composition**

The Mean Item Score (MIS) was adopted in order to examine the main Costs collected from the survey while the most important factors were identified by arranging the magnitude of RII values in their descending order in their respective category. Table 5 Reveals the Maintenance budget composition for Buildings at the Institutions under Study in Kwara State thereby illustrating the RII values and ranking positions of controlling actions. RII creates values ranging from 0 to 1 where 0 denotes least significance and 1 denotes highest significance.

*Table 5: Maintenance budget composition*

S/No	Budget Composition	Frequency					Mean	RII	Ranking
		5	4	3	2	1			
1	Condition assessment costs	47	32	8	0	0	4.45	0.89	1 <sup>st</sup>
2	Preventative maintenance costs	47	30	10	0	0	4.43	0.89	2 <sup>nd</sup>
3	Condition-based maintenance costs	35	40	12	0	0	4.26	0.85	3 <sup>rd</sup>

4	Agency maintenance management costs	30	45	7	4	1	4.14	0.83	4 <sup>th</sup>
5	Statutory maintenance costs	29	42	13	3	0	4.11	0.82	5 <sup>th</sup>
6	Unplanned maintenance costs	31	35	20	1	0	4.10	0.82	6 <sup>th</sup>

Source: Researcher's Data Analysis (2019)

From the survey, “Condition assessment costs” ranked 1<sup>st</sup> among six maintenance budget composition cost with a mean of 4.45 and RII of 0.89 as the major maintenance budgets in composition for execution of maintenance; “Preventative maintenance costs” ranked 2<sup>nd</sup> among the maintenance budget composition with a mean of 4.43 and RII of 0.82; “Condition-based maintenance costs” ranked 3<sup>rd</sup> with a mean of 4.26 and RII of 0.85 respectively. These Budget Compositions emerge as the three majors among the six Maintenance budget composition cost.

From the survey, Cost level of effectiveness was observed to be RII >0.5; Six variables were ranked in the order of its RII; However, results reveal six analyzed variables to be cost effective with individual variables ranging from 0.89-0.82.

### Maintenance Budget Implementation

The Mean Item Score (MIS) was adopted in order to examine the main Costs collected from the survey while the most important factors were identified by arranging the magnitude of RII values in their descending order in their respective category. Table 6 Reveals the Maintenance budget composition for Buildings at The Institutions under Study in Kwara State thereby illustrating the RII values and ranking positions of controlling actions. RII creates values ranging from 0 to 1 where 0 denotes least significance and 1 denotes highest significance.

Table 6: Maintenance budget implementation

	Implementation Strategies	Frequency					Mean	RII	Ranking
		5	4	3	2	1			
1	Establishing priorities	58	22	7	0	0	4.59	0.92	1 <sup>st</sup>



2	Regular monitoring and reporting including analysis of budget components against actual expenditure	36	49	2	0	0	4.39	0.88	2 <sup>nd</sup>
3	Availability of adequate maintenance funding	47	25	13	2	0	4.34	0.87	3 <sup>rd</sup>
4	monitoring against benchmarks and policy requirements	30	51	5	1	0	4.26	0.85	4 <sup>th</sup>
5	Establishing accountabilities and performance requirements	36	37	10	4	0	4.21	0.84	5 <sup>th</sup>

*Source: Researcher's Data Analysis (2019)*

From the Survey, “Establishing priorities” ranked 1<sup>st</sup> among five implementation strategies with a mean of 4.59 and RII of 0.92 as the major maintenance budgets implementation strategies for execution of maintenance; “Regular monitoring and reporting including analysis of budget components against actual expenditure” ranked 2<sup>nd</sup> with a mean of 4.39 and RII of 0.88; “Availability of adequate maintenance funding” ranked 3<sup>rd</sup> with a mean of 4.34 and RII of 0.87 respectively. These Budget Implementations emerge as the three majors among five Maintenance budget implementations.

From the survey, effective implementation strategy was observed to be RII >0.5; Six variables were ranked in the order of its RII; However, results reveal five analyzed variables to be implementation effective with individual variables ranging from 0.92-0.84.

### **Inferential Analysis of Data**

This section shows the results of the One-way ANOVA carried out between-groups analysis of variance to explore the most effective allocation strategy. The result of this analysis is presented in Table 7.

*Table 7: One-Way ANOVA of the relationship between Maintenance Budget Implementation and maintenance budget composition.*

Source		Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
<b>Maintenance budget implementation</b>	Between Groups	0.522	1	0.522	2.361	0.126	0.014
	Within Groups	38.024	17	0.221			
	<b>Total</b>	<b>38.546</b>	<b>17</b>				

Source: Researcher's Data Analysis (2019)

KEY: NS= NOT SIGNIFICANT

A one-way between-groups analysis of variance was conducted to examine the maintenance budgets implementation strategies for execution of maintenance works at the institutions of study on effective cost estimation and allocation strategy. Factors were divided into two groups according Maintenance budget composition and Maintenance budget implementation. The mean of variable of the Result revealed from Table 4.6 that there was a non-statistically significant relationship between Maintenance Budget Implementation and maintenance budget composition both at the p value observed to be  $> .05$  level with a result of  $F(1, 172) = 2.361, p = 0.126$ . The effect size of both factors, calculated using Eta squared, was 0.014. Test indicated that for Group one, the mean score is  $X = 4.25$  and  $SD = 0.46$ ; Group 2, the mean score is  $X = 4.36$  and  $SD = 0.48$ . Result depicts no significant difference in relationship between Maintenance budget composition and Maintenance Budget Implementation.

## CONCLUSION AND RECOMMENDATIONS

From the study carried out and findings from this study, it can be concluded that the most important factors affecting maintenance cost of tertiary institution are Building materials”, “Poor workmanship” and Age of building while the most important determinants of maintenance cost of tertiary institution are “Age of Building”, “Type of Structure” and “Poor Workmanship”.

The study also reveal “Condition assessment costs”, as the first ranked maintenance budget composition of tertiary institutions building, followed by “Preventative maintenance costs”, “Condition-based maintenance costs”,

“Agency maintenance management cost”, “Statutory maintenance cost” and “Unplanned maintenance costs”. The result also ranked the maintenance implementation strategy and “Establishing priorities” was ranked 1<sup>st</sup> among five implementation strategies “Regular monitoring and reporting including analysis of budget components against actual expenditure”; “Availability of adequate maintenance funding”, “monitoring against benchmarks and policy requirements” and “Establishing accountabilities and performance requirements”. The study also concluded that the variables considered for the maintenance budget composition are cost effective and the implementation strategies are also effective.

The following recommendations are made based on the findings from the study:

- i. Adequate attention should be given to the factors affecting maintenance cost of tertiary institutions buildings and strategy on how to minimize its effect on the buildings should be developed.
- ii. Adequate attention should also be given to those factors that determine the maintenance cost of tertiary institution buildings.
- iii. The maintenance budget composition can be adopted for effective cost estimation for maintenance work of tertiary institution buildings.
- iv. The maintenance implementation strategies can also be adopted for effective maintenance budget implementation.

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