CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Tertiary institutions take a very fundamental position in socio-political and economic advancement of a nation. Financial crisis, poor infrastructure and brain-drain happen to be some out of many other problems that affect the successful running of the education system in Nigeria (Ekundayo and Ajayi, 2009). According to Olanrewaju *et al.* (2010), institutional buildings are supposed to provide an appropriate, favorable and sufficient atmosphere that will help maintain, motivate and promote academic knowledge, teaching, innovations and researches. Aluko (2011) opined that a conducive leaning habitation and a sound mind help students to excel academically, provides physical security and a better background for strong societal stability. Building components generally depreciate over time, thus resulting in problems making it impossible for them to fulfill their purposes maximally. Therefore maintenance costs is required in order to correct this depreciation/deterioration issues affecting the tertiary institutions buildings and to help put the asset in good condition (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 pointed out that some of the key factors affecting effective maintenance of buildings at higher institutions include lack of funds for maintenance work, poor implementation of maintenance activities and lack of maintenance policy. 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 insufficient to cover the maintenance activities of the higher institution. Adamu (2015) concluded that Maintenance activities at Nigerian public universities are not provided with adequate fund required for maintenance work and this because the universities lack a suitable maintenance planning and operational program. Furthermore, the maintenance officers lack the appropriate information about the current state of the facilities and as a result it affects the provision of a proper maintenance estimate (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.

1.2 Statement of the Research Problem

Owolabi *et al.* (2014) observed that the major variables responsible for the inefficiency and ineffectiveness of the maintenance work in Nigerian tertiary institution buildings are; the occurrence of poor contract management, unavailability 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 Nigerian tertiary institution buildings but cost overrun and underestimating also contribute to maintenance problem in tertiary institutions and this frequently result in failure of management to recognise the value and need for realistic budget and in return affect the maintenance work of tertiary institution buildings in Nigeria. Hence, Kunya (2012) carried out maintenance operation on sub structural and super structural components in housing facilities, on substructure he catalogue rising dampness, foundation failure and floor slab failure while in super structure he catalogue peeling of wall surfaces, openings defects (doors and windows), sagging of beam and leaking roof. From his findings he opined that maintenance culture requires the correct diagnosis of defects, sound

technical knowledge of material usage, current remedial measures, management resources as well as the formulation and implementation of integrated plan and policies to sustain utility. According to Oluwole, (2018), maintenance culture is the way of thinking, values, perception, behavior and the underlying assumption of any group or society or person that considers maintenance as a matter that is vital and practices it in their life. Notwithstanding, it will be reasonable enough if maintenance culture is revived with concise and effective mode of operation, this will result to an appreciable reduction in cost of building maintenance; eradication of building collapse will evolve, high risk of endangering the life of students and their properties in the tertiary institutions of Kwara state will come to the end.

It is to this effect that this study assessed the maintenance management of tertiary instittution buildings in Kwara state.

1.3 Research Questions

i. What are the factors to be considered in the maintenance management of tertiary institutions buildings in Kwara State?
ii. What are the challenges of maintenance management for the buildings at the tertiary institutions under study?
iii. What are effective maintenance management implementation starategy at the tertiary institutions?

1.4 Aim and Objectives

This study is aimed at assessing maintenance management of tertiary institutions buildings in Kwara State with a view to establishing an effective maintenance management implementation strategy. To achieve this aim, the following are objectives:

i. To examine factors affecting maintenance management of tertiary institutions buildings in Kwara State.

ii. To examine the challenges of maintenance management of the tertiary institutions buildings in Kwara State.

iii. To determine the most effective maintenance implementation strategies, for the execution of the maintenance works at the tertiary institutions.

1.5 Justification for the Study

According to Ogwu *et al.* (2018), some of the issues affecting the maintenance of buildings in Nigeria tertiary institutions comprise; insufficient funding of maintenance activities, poor implementation of maintenance activities and lack of maintenance policy. Owolabi *et al.* (2014) and Olatunji *et al.* (2016) further established that inaccurate estimate in addition to inadequate fund is some of the problems affecting the maintenance of tertiary institution buildings. These entire problems cause the building to further deteriorate, increase the maintenance cost and also bring about poor users satisfactions. Mbachu *et al.* (2004) expressed that high maintenance costs have unhelpful inference on key stakeholders.

Therefore, this study was carried out to address the issues of maintenance cost and deterioration of higher institutional buildings while proffering solution to it. The result of this study is of immense benefit to stakeholders which include, the school management, the works department which is the department in charge of maintenance and even the end users of the buildings (staffs and students of the institutions) as this help to improve, better academic and project performance and to achieved a triumphant project delivery.

1.6 Scope of the Study

This study covered selected public and private tertiary institution buildings in Kwara State. The criteria for the selection of these institutions were based on age of the institution, population of staff/students accommodated and presence of a functioning Maintenance Department/Unit in the institution. Over a decade now, Government has established new Federal and State tertiary institutions (including private institutions) in Kwara State in spite of the limited geographical size of the State. It is therefore imperative to assess how the buildings of these institutions are being maintained for the comfort of the occupants. In view of this, the study will cover maintenance managers and related construction professionals in the Maintenance Department/Unit of each of the selected tertiary institutions in Kwara State for vital information.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Concept of Building Maintenance Management

Effective building maintenance can contribute immensely to reducing the lifecycle cost (LCC) of a building through optimal maintenance execution at the operation and maintenance phase of a building's lifecycle. Moreover, the reduction of building maintenance cost can be achieved through deep understanding of building maintenance cost concepts. Al-arjani (2002) asserts that governments of developing countries all over the world commit considerable expenditure to maintenance and operations of buildings but according to chanter and swallows (2007), the backlog of repair and maintenance work are depriving these country's building stock from attaining minimum acceptable maintenance level consequently, the deterioration of these building stock are growing at an unacceptable rate. Francis *et al*. (2002) posit that building maintenance management is an operation that involves interaction or combination of technical, social, legal and fiscal determinants that govern and manage the use of buildings. For instant, the state of facilities in an academic institution may impact the quality of academic service delivery. In other words, the assets of tertiary institutions must be in optimum operable performing state at all times in order to deliver quality education. Institutions asset comprises funds, technology, human capital, equipment, plants and buildings. Although, human capital is institution's most significant resource, because tertiary educations are labour intensive, building is the most valuable asset of the institutions. Specifically, institutional buildings are procured to create a suitable, conducive, and adequate environment to support, stimulate and encourage learning, teaching, innovations and researches (Olanrewaju *et al.,* 2010).

The cost of maintaining buildings consumes a great portion of the limited resources available for running organizations and institutions. According to El-haram and Horner (2002) and Ali (2009), factors that affect maintenance cost of buildings can be divided into four groups of variables comprising building characteristics, political factors, technical and administrative. Building characteristics parameters comprises; the building size, building age, function, height of building, type of structure, finishes, building materials and building components. Sonthya (2006) opine that building characteristics are different in terms of the building amenities provided in the building as well as facilities and services available. El-Haram and Horner (2002) identified technical and administrative factors which affects maintenance costs of buildings as poor workmanship and poor quality of spare parts and materials, 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. Besides, the factors that have been stated, there are other factors that affect the building maintenance cost such as third-party vandalism and poor or lack of training (El-Haram and Horner, 2002). These factors can impact building maintenance cost Due to the inflexibility of buildings, institutions, organizations and occupiers need to have clear strategies to manage, control and develop buildings profitably (Zulkarnain *et al.*, 2011).

2.2 Factors Affecting Maintenance Management of Institutional Buildings

There are five (5) major factors mitigating against cost of maintenance for tertiary institution institutional buildings and under each of this factors are some other sub factors.

2.2.1 Building characteristics

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).

2.2.1.1 Building age

According to Slater (1982), Skinner (1982) and O'Neill (1974), the age of a building has a close relationship with the maintenance costs. Whereby, the maintenance costs increase while the building age is increasing. When the age of a building increases, some maintenance works such as painting work, replacement of new roof, tiles and other works are required to ensure the sustainability of building. Additionally, higher maintenance cost and remedial cost are required for aged plumbing and drainage systems in buildings because of corrosion problems (Wong, 2002). Thus, the maintenance cost is likely to be increased over the aging of building.

2.2.1.2 Building height and building area or size

There is an impact on maintenance costs regarding the height of a building. The higher the building, additional costs would be required for the tools and equipment used to carry out the maintenance tasks (Skinner, 1982). For example, scaffolding is needed to carry out various maintenance tasks at high rise buildings such as painting work, window cleaning or repair and other external works.

2.2.1.3 Type of structure

The structure of a building is another factor that always affects maintenance costs. Owing to intensive investments in the design of civil infrastructures in the 1960s and 1970s, the number of deteriorating structures has increased considerably in the last decade. In this phenomenon, the structures require a great amount of financial resources for inspection, maintenance, repair, rehabilitation and replacement (Neves *et al*., 2004). The structural stability of a building must be inspected and maintained from time to time in order to ensure the occupants' safety. Thus, periodical maintenance of steel structures is required to prevent the corrosion and maintain their strength and stability. Maintenance cost is significantly subjected to the type of structure in buildings.

2.2.1.4 Building services

According to John and Clements-Croome (2005), building services systems are generally installed in buildings to provide a healthy and safe living environment for the occupants or residents. The building services include ventilation, lighting and power supply, water supply, sanitation, transportation communication and other systems. Building services accommodated in buildings is one of the factors affecting housing maintenance costs. According to Lam (2001), building services is a vital aspect to be concerned in building maintenance management, especially the mechanical and electrical services, which are the active components in a building. Owing to the high maintenance cost involved and the consequences of building services' failure, awareness on the significance of building services maintenance has increased in the building services industry.

2.2.1.5 Building materials

Building materials selected in the early design stage have an effect on maintenance costs. High maintenance cost is required to repair or replace the existing building components because of cutting cost at the initial design and construction stage, as well as wrong choices of materials. Shabha (2003) proved that the incompatible and poor quality materials used in construction and lack of regular-planned maintenance has caused the deteriorations or defects occurred in the building components. Moreover, Cheung and Kyle (1996) noted that material selections chosen over the life of a facility or building component undoubtedly influence the maintenance and operating costs of an asset and its service life.

2.2.2 Occupant factors

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).

2.2.2.1 Expectation of occupants

High expectation of occupants significantly affects building maintenance cost. According to Yip (2001), the operating and maintenance account of estate management in Hong Kong has

dramatically increased from time to time. For instance, the surplus of HK$432 million (RM 185 million) in 1988 had increased to HK$1.7 billion (RM 727 million) in 1997 based on the annual report from the Hong Kong Housing Authority because of rising demands from occupants and residents for better living environments. Therefore, it is proven that high standards of expectation from occupants and residents are likely to increase the maintenance cost.

2.2.2.2 Use of the property

According to the Queensland Department of Public Works (2010), one of the factors that influence the level of maintenance funding is the deterioration or wear associated with the usage and occupancy of residents and tenants. In fact, this problem can be minimized by introducing property operating manuals and rules, and educating occupants and residents (El- Haram and Horner, 2002). Otherwise, the maintenance and repair cost will increase gradually because of improper use of the property through further damage.

2.2.2.3 Vandalism by occupants

Vandalism by occupants is often discussed as a factor that affects housing maintenance cost. According to Olubodun and Mole (1999), vandalism is one of the factors that cause the defects on building components. In Malaysia, it is found that Kuala Lumpur City Hall (DBKL) spent RM 2.5 million solely for repairing faulty lifts and it was said that 95 per cent of the faulty lifts were caused by vandalism (Bavani, 2010). Consequently, the maintenance costs are influenced by distributing the repair costs to treat such defects, which are caused by vandalism.

2.2.2.4 Delay and failure in reporting problems

According to Lee and Wordsworth (2001), the rate of deterioration of the component and the corresponding increase in the cost of rectification is likely without early response to such defect. Early response to the building failure is necessary to reduce the maintenance cost. However,

early response to the building defect or failure cannot be done if there is a delay and failure in reporting the problems. In fact, delay and failure in reporting problems do affect the housing maintenance cost to some extent, but the significance of this factor is not that obvious (El-Haram and Horner, 2002).

2.2.2.5 Accessibility to the property

El-Haram and Horner (2002) proved that inability to gain access to the property is one of the major factors that affect building maintenance cost. Sometimes, the residents or occupants may not allow maintenance staff to access to their unit space for privacy reasons. According to Al-Arjani (1995), some tenants may not allow maintenance staff from gaining access to carry out maintenance works or tasks because of cultural issues. For instance, there are cracks found on the surface of external walls of a parcel unit in the sixth floor but is restricted to access to such unit space. Hence, maintenance staff can only access from the external building and additional equipment like scaffolding would be required to repair the affected portion.

2.2.3 Maintenance factors

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.

Poor workmanship during the implementation of maintenance tasks is greatly affecting the maintenance cost in both the short- and long-term. Khalid *et al.* (2006) noted that poor workmanship is the predominant cause of defects emerging on the projects or maintenance works. Owing to poor workmanship, more defects will occur immediately or after the period of time the maintenance works are done. Then, further and additional remedies might be required to treat such defects. As Love and Irani (2003) mentioned, direct cost is often quoted in evaluating quality of workmanship and represent a significant proportion of total project costs or total maintenance costs. Hence, the total maintenance costs are likely to be increased as a result of poor workmanship during the implementation of maintenance works. Poor quality of spare parts and materials used in the building components, elements, services or facilities significantly influence the maintenance costs.

Al-hammad *et al*. (1996) stated that the problems related to the lack or unavailability of the required spare parts, tools or materials to perform maintenance tasks. As a result, poor quality or second hand spare parts are acquired for the maintenance tasks. According to Horner et al. (1997), the main objective of maintenance management is to minimize the need of repair on building defects by enhancing planning and implementation, adopting suitable materials and tools at the appropriate time and minimizing the total LCC. Maintenance management quality is always an issue that significantly affects the housing maintenance cost. Effective building or housing maintenance management can minimize the operating and maintenance costs, while the building continues to function and operate efficiently. Pascual *et al*. (2008) reported that the asset or building failure rate increases as time passes and this produces more repair and maintenance

tasks. In order to ensure the sustainability of a building, the increasing maintenance cost is needed while the building age is growing older. It is often seen that deferral or delay of some maintenance tasks occurred because the budget allocated is not sufficient to cover the need for maintenance (El-Haram and Horner, 2002). Consequently, further implications such as damage, wear and defect will be incurred.

According to Narayan (2003), failure or delay to execute maintenance actions at the right time may cause further implications to incur such as excessive damage, wear and defect. Then, additional maintenance works are necessary to be carried out in order to treat the problems. For instance, maintenance staff may have identified a problem occurring in a lift system such as the defective lift motor, but they delay the maintenance and repair to accommodate the occupants, which may result in permanently damaging the lift motor. This results in an increase in material and labour costs while additional maintenance and repair works are required.

2.2.4 Political factors

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.

2.2.5 Other factors

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.

2.3 Challenges facing maintenance management of tertiary institutions

The state and performance of the tertiary institution buildings and their components depends in large extend on continuous and planned periodical maintenance, which challenges the manager and management, to establish precise planning based on a well structure maintenance programe, Lateef et. al, (2010) Maintenance of building received little attention from the users, designers and contractors, Siyanbola et.al, (2013). Gross neglect of maintenance coupled with other factors such as structural failure which may be due to poor design, poor construction, settlement, act of God, poor materials, defect of component part including joints and connections has led to the state of structures of most federal universities today, Samuel et.al, (2016). Building maintenance has until recently been a neglected field of technology. It possesses little glamour and is unlikely to attract very much attention (Baba and Buba, 2013). According to Oluwole (2018), some of the challenges facing building maintenance includes, Finance, Social political factors, Building materials, Exotic taste, Poor workmanship, Ineffective maintenance staff, Poor attitude to maintenance but with critical emphasis on finance, poor attitude to maintenance work and ineffective maintenance staff. Kalgo el at, (2017) also pointed out Poor contract management, Age of the building, Lack of maintenance culture, Inadequate funds and high maintenance cost, Pressure on building facilities by number of users, Poor construction work and maintenance work done by the maintenance personnel of the institution. The continued efficient and effective performance of public institutions depends on the nature of their buildings in addition to other factors such as enhanced conditions of service and provision of the requisite tools. Tertiary

Institution buildings consist of both dwelling (residential accommodation) and office accommodation. Both are prone to defects due to their permanent and lengthy usage. All elements of buildings deteriorate at a greater or lesser rate dependent on materials and methods of construction, environmental conditions and the use of the buildings (Mills, 1980).Building maintenance is a process by which a building is kept usable at a predetermined standard for utilization and benefit of its occupant.

2.4 Budget Method for Building Maintenance Measures

Making up a maintenance cost assessment for building is not always an easy task. Maintenance budget has important issue of discussion in today maintenance practice irrespective of the method of maintenance. According to Horner *et.al* (1997), studies has proven that maintenance of building are done as a result of the available budget and not because the actual maintenance needs of the buildings and as a result, maintenance officer did not bother to carry out building maintenance assessment in order to ascertain the actual maintenance need of the building. To determine the maintenance budget of a building, it needs to be done alongside the type and implementation of the maintenance strategies. These strategies include

(i) Condition-based

(ii) Preventive

(iii) Corrective

Bahr and Lennerts (2010), in their study of building maintenance budget in Europe discovered some methods that have been in existence from the year 1952 – 1984. This method was divided in four distinct groups.

(i) Key figure-oriented budgeting

(ii) Value-oriented budgeting

(iii) The analytical calculation

(iv) Budgeting by condition description

Another approach the lead to the development of a new budgeting method was launch by Bahr *et.al* (2010). This new budgeting is known as practical adaptive budgeting implementation (PABI). The study by Bahr *et.al* (2010) and the Queensland Department of Public Works method are very similar. The "Queensland Department of Public Works" has put to use, the "Maintenance Management/Administration Framework (MMF)" as strategy for managing the department valuable asset since 1999 and in 2007 it was work upon for better output and this development continues until the year 2017. The manual direct maintenance officers on how develop maintenance budget for buildings every year. It also came with a policy for maintenance budget and the policy state that; in order for a building support the delivery of government service, the maintenance budget must focus on the total amount of money that a section need to take care of the maintenance issues for their buildings. This manual also focus on how to management human being in relation to communication / information management and staffing as a fundamental means through which execution and budget determinant and cost maintenance effectiveness can be achieved.

2.4.1 Maintenance Management Variables

According to the Queensland Department of Public Works (2017), before a department can come up with a maintenance budget composition, their maintenance fund must cut across the following cost component as approved by the committee that review budget. The component include; condition assessment costs; preventative maintenance costs; condition-based maintenance costs; unplanned maintenance cost and agency maintenance management costs

Condition assessment cost; this is a process whereby the condition of a building is been assess according to the MMF guidelines.

Statutory maintenance cost; this is the cost that is been carries out in accordance mandatory requirements of various regulations such as fire service protection requirement.

Preventative maintenance cost; this a cost that is been carried out periodically to avoid maintenance work other parts of the building to ascertain smooth running, obey the duty of care responsibilities and generally a good maintenance practice that safeguard the assets in a condition suitable for service delivery.

Condition-based maintenance cost; this is the maintenance cost that is been carried out base on deterioration that was identified from building condition survey/assessment. In this regard, funding of this component is variable and less predictable.

Unplanned maintenance cost; this is a reactive maintenance work that is been carried because of breakdown and regular failure of building elements and services. To fund this parts of maintenance work, the fund would vary base on level/hierarchy among the agencies. Nevertheless, past data should provide guidance in terms of annual estimates of funding required.

Agency management cost; this happens to be the cost that is subjected the agencies to run or carry out maintenance work effectively and efficiently. This cost also covers the cost human resources management (management of personnel), fiscal or monetary control/management and cost of overhead and maintenance administration/management structure. The various aspect that require costing includes: the administration system, the maintenance planning unit, the section formulating program, the contract management unit and the overall management system.

2.4.2 Maintenance Management Strategy Factors

According to the Queensland Department of Public Works (2017), the maintenance budget implementation strategies includes: Regular monitoring and reporting together with investigation of budget components against real disbursement. To monitor a budget, most especially when maintenance service are been contracted out, there will be need to consult the facility manager or the provider of maintenance service without minding the required material, equipment and schedule, establishment of account and performance requirements, establishment of priorities, monitoring against benchmarks and policy requirements and 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.

2.5 Summary of Literature Review

The review of literature in this chapter was undertaken to throw more light to issues surrounding maintenance practice for tertiary institution building. During the course of this review of literature vital issues have been found concerning the factor affecting maintenance cost of tertiary institution buildings, maintenance budget composition and maintenance budget implementation strategies. The following sub-sections give summary of the variables identified from the review of literature based on the research objectives.

2.5.1 Summary of factors affecting maintenance management of buildings

The factors affecting maintenance cost of tertiary institution building, as reviewed in this chapter are summarized in Table 2.2.

Table 2.1: Factors Affecting Maintenance Cost of Buildings

	Factors	Source
	Building Characteristics	**El-Haram and Horner (2002) and Sonthya (2006)**
1.	Age of the building	Wong (2002)
2.	Building height and building area/size	Skinner (1982)
3.	Type of structure	Neves *et al* (2004
4.	Building services	Clements-Croome (2005)
5.	Building materials	Shabha (2003)
	Occupant Factors	**El-Haram and Horner (2002)**
1.	Expectation of occupants	Yip (2001)
2.	Use of the property	Queensland Department of Public Works (2010)
3.	Vandalism by occupants	Bavani (2010)
4.	Delay and failure in reporting problems	Lee and Wordsworth (2001) & El-Haram and Horner (2002)
5.	Accessibility to the property	El-Haram and Horner (2002)
	Maintenance Factors	**El-Haram and Horner (2002)**
1.	Poor workmanship	Khalid *et al*. (2006)
2.	Poor quality of spare parts and materials	Al-hammad *et al*. (1996)
3.	Poor maintenance management	El-Haram and Horner (2002)
4.	Budget constraints	Narayan (2003)
5.	Poor budgetary control	Narayan (2003)
	Political Factors	**El-Haram and Horner (2002)**
1.	Right to buy policy	El-Haram and Horner (2002)
2.	New health and safety regulation	El-Haram and Horner (2002)
3.	Poor management decision system	El-Haram and Horner (2002)
	Other Factors	**El-Haram and Horner (2002)**
1.	Third-party vandalism	El-Haram and Horner (2002)
2.	Poor or lack of training in house maintenance	El-Haram and Horner (2002)

2.4.2 Summary of maintenance management variables

The review of literature in this chapter identified several maintenance composition variables. Table 2.2 presents a summary of these variables.

Table 2.2: Maintenance Management variables

S/No	Factors	Source
1	Condition assessment costs	Queensland Department of Public Works (2017)
2	Preventative maintenance costs	Queensland Department of Public Works (2017)
3	Condition-based maintenance costs	Queensland Department of Public Works (2017)
4	Agency maintenance management costs	Queensland Department of Public Works (2017)
5	Statutory maintenance costs	Queensland Department of Public Works (2017)
6	Unplanned maintenance costs	Queensland Department of Public Works (2017)

2.4.3 Maintenance management strategies factors

The maintenance management strategies factors have been identified and discussed in this chapter. These maintenance management strategies factors are summarized in Table 2.4.

Table 2.3: Maintenance Management strategies factors

	Implementation Strategies	Source
1	Establishing priorities	Queensland Department of Public Works (2017)
2	Regular monitoring and reporting including analysis of budget components against actual expenditure	Queensland Department of Public Works (2017)
3	Availability of adequate maintenance funding	Queensland Department of Public Works (2017)
4	monitoring against benchmarks and policy requirements	Queensland Department of Public Works (2017)
5	Establishing accountabilities and performance requirements	Queensland Department of Public Works (2017)

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

Research design is required for a successful research work. It enables the researcher to come up with a suitable and appropriate method of research that matched the kind of study/survey/examination or investigation that the research wants to achieves (Schensul, 2008). To be able to come up with a good research design, the research focus/purpose and the relative characteristics must have been spell out including the research question. Because they all throw light to the research problem and give a better understanding to the problem under study (Wahyuni, 2012).

This study adopted the quantitative research approach. Data collection was carried out with the use of questionnaire survey. Analysis of data was undertaken with the use of descriptive and inferential statistical techniques.

This study undertook a thorough literature review basically from conference papers, online reputable journals, and past relevant projects work to identify factors affecting maintenance cost of tertiary institutions. The use of well-structured questionnaires was used to gather data from primary source for all acknowledged objectives. The questionnaires were distributed to the works department to be filled by relevant and experience professionals of department which includes the Architects, Quantity Surveyors, Engineers and Builders.

Quantitative method/approach was put into use to sample the various points of view of the people (respondent). In order to achieve this, the quantitative method was giving the necessary foundation to guide and investigate into the root of the research and thereafter, the quantitative

method was employed to give a thorough and better insight for problem of research (Creswell and Plano, 2011). Using a quantitative approach in this study is consider to be very important as it is going to provide a sufficient and adequate proof for a empirical research in order to give thorough illumination to the occurring event and to also help the researcher to attends to difficult subject matter in form of a question such as ('How much'? and 'How many') according to Walker (1997). A quantitative research method/approach can be achieved in three (3) different ways which are survey, desk research and experimentation (Fellows and Liu, 2008). For this study, the survey quantitative research method was used to gather data using a cross-sectional survey; it was through intensive literature review that the item instrument was identified.

3.2 Research Population

A complete/whole or total set of element/cases out of which a few are taken as sample can be refer to as the population sample (Bryman *et al*. 2007). In this study, the population covers unit/body or persons that match the required criteria set up by the research. The population for this study consist of all the seventeen (17) tertiary institutions including Federal, State and Private own tertiary institution within Kwara State, Nigeria.

3.3 Sample Frame

An accessible/available segment of a focus population group, from which a list/sample can be extracted is called the sample frame (Bhattacherjee, 2012). The sample frame for this research covers/include all the professionals in the works department of the tertiary institutions in Kwara State because it is the works department that actually handle all maintenance issues. The works department consist of professionals such as Architects, Quantity surveyors, Structural Engineers, Mechanical & Electrical Engineers and Builders. This research therefore focuses majorly on the

works department of the tertiary institution in Kwara State in order to achieve the aim of the research.

3.4 Sample Size

The sample size for this study was seven (7) out of the seventeen (17) tertiary institutions within Kwara State. This institutions includes two (2) Federal own institutions, three (3) State own institutions and two (2) Private own institutions. Taking at least three (3) personnel each from five (5) professionals in the institutions under study, the sample size sum up to be One hundred and five (105). The criteria for the selection of these institutions were based on age of the institution, population of staff/students accommodated and presence of a functioning Maintenance Department/Unit in the institution.

3.5 Sample Technique

According to Morenikeji (2006), the mothod or technique used by the researcher chose some element that turn out to be part of the population is known as the sample techniques. These techniques are:

A. Probability sampling: the circumstances where the possibility of a stated component is being identified. This includes stratified random sampling, systematic random, cluster sampling method and simple random sampling.
B. Non probability sampling: this is the circumstances whereby the researcher is not bothered with representing the sample. This includes convenience sampling, snowball method, purposive sampling and quota sampling.

According to Morenikeji (2006), the selection a very few people or variable from a complete set of population, done in way and manner that whereby every member of the complete population

have equal opportunity of being selected is known as simple random sampling, while the selection done with a purpose in mind is known as purposive sampling. For the purpose of this research, purposive sampling was adopted because some of the institutions are new, some do not have enough student and staff, while in some of these institution do not have an active maintenance department.

3.6 Method of Data Collection

Data can be defined as fact, observations and information in isolation which is relating to the subject of study. The usage of questionnaire in a research work according to Saunders (2007), is allow/permit or give room for the research assess and to give detail explanations of the existing relationship between variables particularly the relationship between the causes of a problem and the effect of such problem. The data collection approach applied for this work was primary method. The data was collected through using a questionnaire. The questionnaire was designed on a 5-point Likert's scale format. It was broken down into three (3) sections. Each of the sections addressed the objectives of the study respectively.

3.7 Method of Data Analysis

The data collected for this study were analysed with the use of descriptive statistical techniques. The use of frequency counts and percentage were employed to analyse the profile of respondents. Mean Item Score (MIS) was employed in order to analyse the data collected on the research objectives. The use of Microsoft Excel was employed to aid the analysis of data in this study. Table 3.1 shows a summary of the method of analysis adopted to achieve the research objectives of this study.

Table 3.1: Summary of Research Methodology

S/No.	Objectives	Type of Data	Instrument for Data Collection	Method(s) of Data Analysis
1	To examine factors affecting maintenance management of tertiary institutions buildings in Kwara State.	Primary.	Questionnaire.	MIS
2	To examine the challenges of maintenance management of the tertiary institutions buildings in Kwara State.	Primary	Questionnaire	MIS
3	To determine the most effective maintenance implementation strategies, for the execution of the maintenance works at the tertiary institutions.	Primary	Questionnaire,	MIS

Source: Researcher's Construct (2019)

MIS is also referred to as weighted aggregate score is defined as the summary of the result of response rating and corresponding number of responses and dividing the figure by the total number of responses in the group (Skitmore & Lyons, 2004). The MIS also known as arithmetic mean or mean score is the measure of central tendency for determining the position of a particular variable among other ones. The MIS for each criterion ready for analysis by this study is based on the Likert scale which ranges from 1 to 5. This was derived from the equation below:

$$MeanItemScore = \frac{5n5+4n4+3n3+2n2+n1}{(n5+n4+n3+n2+n1)} \text{ ---------- (3.3)}$$

Where,

n_1 = number of people that responded as very low

n_2 = number of people that responded as low

n_3 = number of people that responded as average

n_4 = number of people that responded as high

n_5 = number of people that responded as very high

The decision rule used for the analysed MIS is display in Table 3.3.

Table 3.2: Decision Rule for MIS Analysis

Scale	Cut-off points		Remarks/ Decision		
	MIS	R.F	Factors	Challenges	Strategies
5	4.50 -5.00	0.81 – 1.00	Very important	Very important	Very important
4	3.50 -4.49	0.61 – 0.80	Important	Important	Important
3	2.50 -3.49	0.41 – 0.60	Less important	Less important	Less important
2	1.50 -2.49	0.21 – 0.40	Least important	Least important	Least important
1	1.00 -1.49	0.01 – 0.20	Not important	Not important	Not important

Source: Shittu *et al.*, (2016); Agumba and Haupt (2014); Morenikeji (2006)

CHAPTER FOUR

4.0 DATA PRESENTATION AND DISCUSSION OF RESULTS

4.1 Response Rate

This section display the response rate to questionnaire and it is presented in Table 4.1

Table 4.1: Response Rate of Questionnaires

Questionnaires Sent	Questionnaires Received	Response Percentage
105	87	82.90%

Source: Researcher's Field Survey (2019)

From Table 4.1, one hundred and five (105) questionnaires were distributed. The questionnaire respondent profession consists of Architect, Builder, Engineer, and Quantity Surveyor. A total of eighty-seven (87) questionnaires were returned showing an efficient reaction rate of 82.90% which is higher than average. The residual 18 questionnaires representing 17.10% that was not gotten back as at when this report is been prepared could be because the respondent are not interested or time did not permit them to provide adequate response as required.

4.2 Analysis of Respondents' Profile

This section shows the profile of the respondents. The use of percentage and frequency counts was employed for this purpose. The profile of respondents is presented in Figures 4.1 – 4.4.

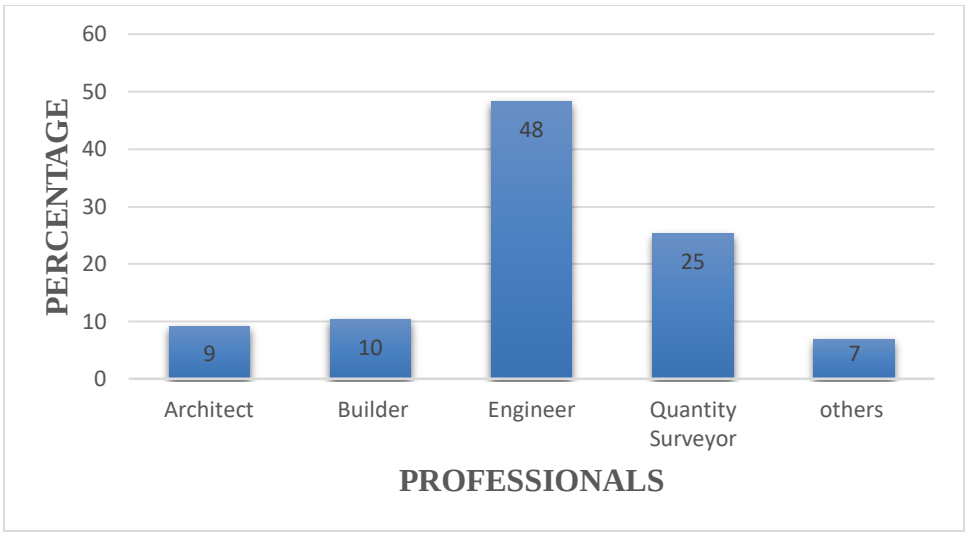

Figure 4.1: Profession of Respondents

Source: Researcher's Field Survey (2019)

From figure 4.1, Engineers was the major contributor to this study with 48%, the Quantity Surveyors followed with 25% contribution, then followed by Builders with 10%, then Architects with 9% and lastly others with 7% which is lowest.

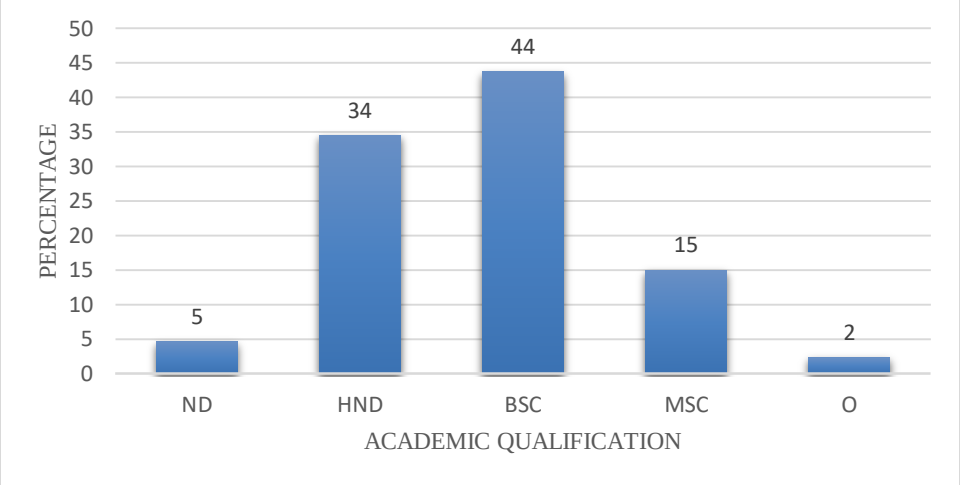

Figure 4.2: Academic Qualifications of Respondents

Source: Researcher's Field Survey (2019)

Figure 4.2 reveals the educational levels of each respondent, respondents with BSc. / B. Tech have the largest responses to this study with 44%, after which HND, MSC, ND, and Others follows with 34%, 15%, 5% and 2% respectively.

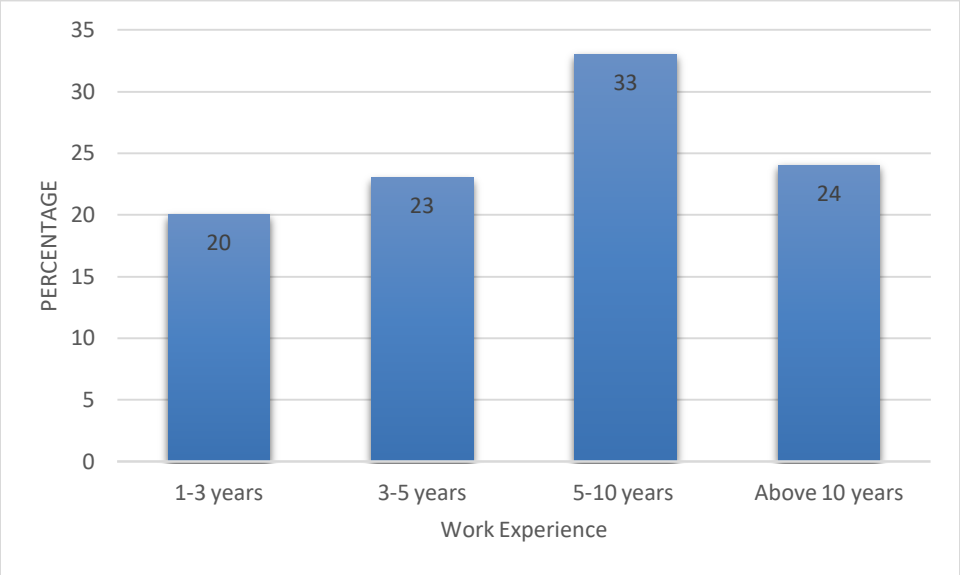

Figure 4.3: Experience of Respondents

Source: Researcher's Field Survey (2019)

Figure 4.3 reveals the respondent's years of experience in maintenance activities. Therefore 1-3 years, 3-5 years, 5-10 years and 10 years and above have 20%, 23%, 33%, and 24% respectively. This confirms that all the respondents have the required experienced in maintenance activities and will be able to supply the appropriate information for this study.

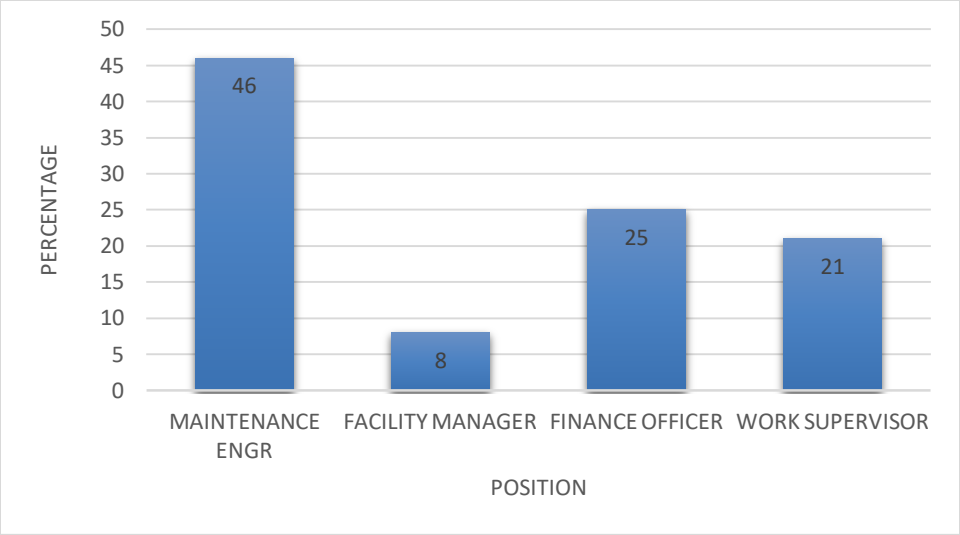

Figure 4.4: Position of Respondents

Source: Researcher's Field Survey (2019)

Figure 4.4 reveals the Position of all the Respondents in their organizations, where maintenance engineer emerged as the highest respondent followed by the finance officer, work supervisor and the facility manager with a percentage of 46%, 25%, 21% and 8% respectively.

4.3 Descriptive Data Analysis

This section presents the results of the descriptive analysis of data where the use of Mean Item Score was employed. The summary of the results here have been presented in Tables 4.2 - 4.5.

4.4.1 The Results on Factors Affecting Maintenance Cost of Tertiary Institutions Buildings in Kwara State

The Mean Item Score (MIS) was adopted in order to identify the most important factors and sub factors collected from the survey. The result of the MIS analysis is summarised in Table 4.2.

Table 4.2: Factors Affecting Maintenance Management of Tertiary Institutions Buildings in Kwara State

	Factors	Mean Score	Ranking	Overall Ranking	Decision
	Building Characteristics	**4.44**		**1st**	**Important**
1.	Age of the building	4.48	2nd	3rd	Important
2.	Building height and building area/size	4.23	5th	12th	Important
3.	Type of structure	4.41	3rd	7th	Important
4.	Building services	4.36	4th	8th	Important
5.	Building materials	4.70	1st	1st	Very important
	Occupant Factors	**4.22**		**3rd**	**Important**
1.	Expectation of occupants	4.03	5th	17th	Important
2.	Use of the property	4.47	1st	4th	Important
3.	Vandalism by occupants	4.26	2nd	10th	Important
4.	Delay and failure in reporting problems	4.24	3rd	11th	Important
5.	Accessibility to the property	4.11	4th	15th	Important
	Maintenance Factors	**4.43**		**2nd**	**Important**
1.	Poor workmanship	4.66	1st	2nd	Very important
2.	Poor quality of spare parts and materials	4.36	4th	8th	Important
3.	Poor maintenance management	4.47	2nd	4th	Important
4.	Budget constraints	4.46	3rd	6th	Important
5.	Poor budgetary control	4.20	5th	13th	Important
	Political Factors	**4.03**		**4th**	**Important**
1.	Right to buy policy	3.94	3rd	19th	Important
2.	New health and safety regulation	4.01	2nd	18th	Important
3.	Poor management decision system	4.14	1st	14th	Important
	Other Factors	**3.94**		**5th**	**Important**
1.	Third-party vandalism	3.78	2nd	20th	Important
2.	Poor or lack of training in house maintenance	4.09	1st	16th	Important
	Group MIS	***4.21***			***Important***

Source: Researcher's Field Survey (2019)

The MIS results of the five main factors affecting the maintenance of tertiary institutions buildings in Kwara State, as shown in Table 4.2, revealed that Building Characteristics (MIS = 4.44) is the most important factor affecting the maintenance of tertiary institutions buildings in Kwara State. On the other hand, the least important factor affecting the maintenance of tertiary institutions buildings in Kwara State is Other Factors and Maintenance Management with MIS value of 3.94. On the average, all the five factors affecting the maintenance of tertiary institutions buildings in Kwara State are important (Group MIS = 4.21).

Building Characteristics which ranked highest among the five main factors affecting the maintenance of tertiary institutions buildings in Kwara State has five factors under it. Of these five factors, the most important is Building materials with MIS value of 4.70. The least important factor under Building Characteristics is Building height and building area/size with MIS value of 4.23. On the average, all the factors under Building Characteristics are important (average MIS = 4.44).

Maintenance Factors and Maintenance Management Cost which ranked 2nd among the five main factors affecting the maintenance cost of tertiary institutions buildings in Kwara State, has five factors under it. Of these five factors, Poor workmanship is the most important (MIS = 4.66). The least important factor here is Poor budgetary control with MIS value of 4.20. On the average, all the factors under Maintenance Factors and Maintenance Management are important (average MIS = 4.43).

Occupant Factors and Maintenance Management which ranked 3rd among the five main factors affecting the maintenance of tertiary institutions buildings in Kwara State, also has five factors under it. Of these five factors, Use of the property is the most important factor (MIS = 4.47).

Expectation of occupants is the least important factor (MIS = 4.03). Averagely, all the factors under Occupant Factors and Maintenance Management are important (average MIS = 4.22).

Political Factors and Maintenance Management which ranked 4th among the five main factors affecting the maintenance of tertiary institutions buildings in Kwara State, has three factors under it. Of these three factors, Poor management decision system is the most important factor (MIS = 4.14). Right to buy policy is the least important factor (MIS = 3.94). Averagely, all the factors under Political Factors and Maintenance Management are important (average MIS = 4.03).

Other Factors and Maintenance Management which ranked least among the five main factors affecting the maintenance of tertiary institutions buildings in Kwara State, has two factors under it. Of these two factors, Poor or lack of training in house maintenance is of high importance with MIS value of 4.09. Third-party vandalism is of a lesser importance with MIS value of 3.78. Averagely, all the factors under Other Factors and Maintenance Management are important (average MIS = 3.94).

4.4.2 Challenges facing maintenance management of tertiary institutions

The Mean Item Score (MIS) was adopted in order to examine the main challenges collected from the survey. Table 4.4 Reveals the Challenges facing maintenance management for Buildings at The Institutions under Study in Kwara State.

Table 4.3: Challenges facing maintenance management of tertiary institutions

	Factors	Mean Score	Ranking	Decision
1.	Building materials	4.70	1st	Very important
2.	Poor workmanship	4.66	2nd	Very important
3.	Age of the building	4.48	3rd	Important
4.	Pressure on building facilities by number of users	4.47	4th	Important
5.	Poor contract management	4.47	4th	Important
6.	Finance	4.46	6th	Important
7.	Lack of maintenance culture	4.24	7th	Important
8.	Inadequate funds and high maintenance cost	4.20	8th	Important
9.	Poor attitude to maintenance	4.14	9th	Important
10.	Ineffective maintenance staff	4.09	10th	Important
11.	Exotic taste	4.03	11th	Important
12.	Social political factors	4.03	11th	Important
	Group MIS	***4.33***		***Important***

Source: Researcher's Field Survey (2019)

Table 4.4 revealed the result of the twelve (12) challenges identified in this study. Out of these factors, Building materials ranked first with MIS value of 4.70 while Exotic taste and Social political factors was the least ranked factor with MIS value of 4.03 each. On the average, all the identified challenges facing maintenance management are important (MIS = 4.33).

4.4.3 Maintenance management strategies factors for tertiary institutions

The Mean Item Score (MIS) was adopted in order to examine the main Implementation Strategies collected from the survey. Table 4.5 Reveals the Maintenance management strategies factors for Buildings at The Institutions under Study in Kwara State.

Table 4.4: Maintenance management strategies factors for tertiary institutions

	Implementation Strategies	Mean score	Ranking	Decision
1	Establishing priorities	4.59	1st	Very Important
2	Condition assessment costs	4.45	2nd	Important
3	Preventative maintenance costs	4.43	3rd	Important
4	Regular monitoring and reporting including analysis of budget components against actual expenditure	4.39	4th	Important
5	Availability of adequate maintenance funding	4.34	5th	Important
6	monitoring against benchmarks and policy requirements	4.26	6th	Important
7	Condition-based maintenance costs	4.26	6th	Important
8	Establishing accountabilities and performance requirements	4.21	8th	Important
9	Agency maintenance management costs	4.14	9th	Important
10	Statutory maintenance costs	4.11	10th	Important
11	Unplanned maintenance costs	4.10	11th	Important
	Group MIS	***4.30***		***Important***

Source: Researcher's Field Survey (2019)

Table 4.4 revealed the result of the eleven (11) maintenance management strategies factors identified in this study. Establishing priorities was ranked first as the most important factor with a mean score of 4.59 while unplanned maintenance costs was the least ranked factor with a mean score of 4.10.On the average, all the identified maintenance management strategies factors are important (MIS = 4.30).

4.5 Discussion of Results

The first objective of the study was to identify and examine factors affecting maintenance cost of tertiary institutions buildings in Kwara State. The factors were identified, examined and analyzed using MIS. Finding from the study reveal Building characteristic as the most important affecting factor follow by Maintenance Factors and Maintenance Management Cost and Occupant Factors and Maintenance Management Cost. These three factors emerged to be the major factors affecting maintenance cost of tertiary institutions buildings in kwara state. This was in agreement

with the findings of (Olubodun and Mole, 1999; Al-Arjani, 1995;Neves *et al.*, 2004; Wong, 2002 ;Neves *et al.*, 2004; Wong, 2002; and El- Haram and Horner, 2002) who also considered the aforementioned factors as the first three (3) factors affecting maintenance cost of tertiary buildings in that categories. But considering other factors under the five categories of factors affecting maintenance cost of tertiary institutions buildings, "Building Materials" "Poor Workmanship" "Age of Building" are the first three ranked factors to be considered as the major sub-factors affecting maintenance cost of tertiary institutions buildings in kwara state. This was contrary to the findings of (Faremi *et al*, 2015) where building age, building sizes and vandalism by users was considered as the first three factors affecting maintenance cost of tertiary institutions buildings. The second objective was to examine the challenges facing maintenance management of tertiary institution in Kwara state. Out of the twelve (12) identified challenges, building materials, poor workmanship and age of building was the first three (3) challenges respectively while exotic taste and social political factors was the last two (2). This was contrary to the findings of (Oluwole 2018 and kalgo *et al*, 2017) where finance and poor contract management was rank the first maintenance management challenges respectively.

The result also ranked the maintenance management strategies factors and "Establishing priorities" was ranked 1st among the eleven (11) maintenance management strategies factors. The study is in agreement with (Queensland Government 2, 2017) As for the MMF manual, emphasizes on human resource management; staffing, communication and information management as a crucial medium to execute and to determine the budget and the effective cost of maintenance.

4.6 Summary of Findings

This study employed the use of MIS to analyse data collected from professionals in the works department of the selected tertiary institution in Kwara State. Findings from the analysis of the data collected are summarised as follows:

i. There are five main factors affecting the maintenance cost of tertiary institutions buildings in Kwara State. These factors are Building Characteristics; Maintenance Factors and Maintenance Management Cost; Occupant Factors and Maintenance Management Cost; Political Factors and Maintenance Management Cost; and Other Factors and Maintenance Management Cost, in order of importance.

ii. The most important factor affecting the maintenance cost of tertiary institutions buildings in Kwara State is Building Characteristics (MIS = 4.44). The least important factor affecting the maintenance cost of tertiary institutions buildings in Kwara State is Other Factors and Maintenance Management Cost with (MIS = 3.94). On the average, all the five factors affecting the maintenance cost of tertiary institutions buildings in Kwara State are important (Group MIS = 4.21).

iii. The most important factor under Building Characteristics is Building materials (MIS = 4.70). The most important factor under Maintenance Factors and Maintenance Management Cost is Poor workmanship is (MIS = 4.66). The most important factor under Occupant Factors and Maintenance Management Cost is Use of the property (MIS = 4.47). The most important factor under Political Factors and Maintenance Management Cost is Poor management decision system (MIS = 4.14). The factor with a higher level of importance between the factors under Other Factors and Maintenance Management Cost is Poor or lack of training in house maintenance (MIS = 4.09).

iv. The most important challenges facing maintenance management of tertiary institution buildings is; Building materials (MIS = 4.70). On the average, all the identified challenges facing maintenance management of tertiary institution buildings are important (MIS = 4.33).

v. The most important maintenance management strategy factor was Establishing priorities (MIS = 4.59). On the average, all the identified maintenance management strategies factor are important (MIS = 4.30).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The main factors affecting the maintenance cost of tertiary institutions buildings in Kwara State are Building Characteristics; Maintenance Factors and Maintenance Management Cost; Occupant Factors and Maintenance Management Cost; Political Factors and Maintenance Management Cost; and Other Factors and Maintenance Management Cost. The most important of these five factors is Building Characteristics. On the average, all the five factors affecting the maintenance cost of tertiary institutions buildings in Kwara State are important. There are twelve (12) challenges facing maintenance management of tertiary institution building in Kwara state and building material was the most important but on the average all the challenges facing maintenance management of tertiary institution building in Kwara state are important. Establishing priorities is the most important maintenance management strategy factors in tertiary institution buildings in Kwara State. On the average, the all the maintenance management strategies factors in tertiary institution buildings in Kwara State are important.

5.2 Recommendation

In order to improve the maintenance practices in tertiary institution buildings in Kwara State, The following recommendations are made based on the findings from the study:

i. The stakeholders that are in-charge of maintenance should take cognizance of the strategies for mitigating the effect of Building Characteristics factors in order to improve the quality of maintenance undertaken in tertiary institution buildings.

ii. The stakeholders that are in-charge of maintenance should take cognizance of the most important challenges facing maintenance management of tertiary institution building.

iii. Also adequate attention should be given to the most important maintenance management strategy factors in tertiary institution buildings to achieve a successful maintenance practice for the tertiary institution buildings.

5.3 Contribution to Knowledge

The research premised on the basis of bringing about factors affecting maintenance cost of tertiary institutions buildings in Kwara State, maintenance budget composition and maintenance implementation strategies. There, the following contribution can be attributed to the body of knowledge by the findings of this study:

i. This study revealed the most important factors affecting maintenance cost of tertiary institution building.

iv. Findings from the study will assist the key stakeholder in charge of maintenance of tertiary institution buildings better address the challenges facing maintenance management of tertiary institution building.

ii. The adoption of the maintenance management strategy factors in tertiary institution buildings will enhance the maintenance culture of the tertiary institution buildings, thereby giving value for money.

5.4 Areas for Further Studies

The following areas are suggested for further research in order to improve the level of research success in addressing the assessment of maintenance practices for tertiary institution buildings in Kwara State:

i. Further study can be carry out to discover more maintenance implementation strategies
ii. The impart of top management on the maintenance practice of the tertiary institution buildings

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APPEDIX

QUESTIONNAIRE

FEDERAL UNVERSITY OF TECHNOLOGY MINNA, NIGER STATE.

SCHOOL OF ENVIRONMENTAL TECHNOLOGY,

DEPARTMENT OF QUANTITY SURVEYING

January, 2020

Dear Sir/Ma,

LETTER OF INTRODUCTION

I am a student of the above named institution undergoing an m.tech programme in Quantity surveying.Currently, I am carrying out a dissertation with the title; **ASSESSMENT OF MAINTENANCE COST OF BUILDINGS AT TERTIARY INSTITUTIONS IN KWARA STATE.**The findings of this study will be used strictly for academic purpose and all information provided would be treated as confidential.

I would appreciate if this questionnaire is filled with all sincerity so that the objectives of this research would be achieved.

Thank you

Yours faithfully,

……..

OLORUNLOGBON OLAYEMI OLAMIDE

SECTION A: DEMOGRAPHIC INFORMATION OF RESPONDENTS

Please kindly respond to the following questions by ticking (√) the appropriate box(s) for each item.

1. Name of Institution……?

2. Gender?

[ ] Male [ ] Female

3. What is your profession?

[ ] Architect [ ] Builder [ ] Engineer [ ] Quantity Surveyor [ ] others please specify…….

4. What is your professional qualification?

[ ] ND [ ] HND [ ] Bachelor's degree [ ] Master's degree [ ] others please specify…….

5. Years of working experience in the institution?

[ ] 1 – 3 [ ] 3 – 5 [ ] 5 – 10 [ ] above 10 years

6. Position in theinstitution

[ ] Maintenance Engineer [ ] Facility Manager [ ] Finance Officer

[ ] Work Supervisor [ ] others please specify……

SECTION B: FACTORS AFFECTING MAINTENANCE COST OF TERTIARY INSTITUTIONS BUILDINGS IN KWARA STATE.

Please kindly rank the following factors in order of importance based on a five point likert scale provided in the table.**Very important (5), Important (4), Less important (3), Least important (2), Not important (1).**

NO.	Factors(Please tick as appropriate)	5	4	3	2	1
Building Characteristics						
1.	Age of the building					
2.	Building height and building area/size					
3.	Type of structure					
4.	Building services					
5.	Building materials					
Occupant Factors and Maintenance Management Cost						
1.	Expectation of occupants					
2.	Use of the property					
3.	Vandalism by occupants					
4.	Delay and failure in reporting problems					
5.	Accessibility to the property					
Maintenance Factors and Maintenance Management Cost						
1.	Poor workmanship					
2.	Poor quality of spare parts and materials					
3.	Poor maintenance management					
4.	Budget constraints					
5.	Poor budgetary control					
Political Factors and Maintenance Management Cost						
1.	Right to buy policy					
2.	New health and safety regulation					
3.	Poor management decision system					

Other Factors and Maintenance Management Cost						
1.	Third-party vandalism					
2.	Poor or lack of training in house maintenance					

SECTION C: CHALLENGES FACING BUILDING MAINTENANCE

Please rank the following in order of importance based on a five point likert scale in the spaces provided in the table. **Very important (5), Important (4), Less important (3), Least important (2), Not important (1)**

NO.	Factors(Pleaser tick as appropriate)	5	4	3	2	1
1	Finance					
2	Lack of maintenance culture					
3	Inadequate funds and high maintenance cost					
4	Poor attitude to maintenance					
5	Ineffective maintenance staff					
6	Exotic taste					
7	Social political factors					
8	Poor contract management					
9	Pressure on building facilities by number of users					
10	Age of the building					
11	Building materials					
12	Poor workmanship					

SECTION D: MAINTENANCE MANAGEMENT STRATEGIES FACTORS FOR TERTIARY INSTITUTIONS

Please rank the following factors in order of effectiveness based on a five point likert scale in the space provided in the table. **Very important (5), Important (4), Less important (3), Least important (2), Not important (1)**

NO.	Strategies	5	4	3	2	1
1	Establishing priorities					
2	Regular monitoring and reporting including analysis of budget components against actual expenditure					
3	Establishing accountabilities and performance requirements					
4	monitoring against benchmarks and policy requirements					
5	Availability of adequate maintenance funding					
1	Condition assessment costs					
2	Statutory maintenance costs					
3	Preventative maintenance costs					
4	Condition-based maintenance costs					
5	Unplanned maintenance costs					
6	Agency maintenance management costs					