MAINTENANCE MANAGEMENT SYSTEMS OF ON-CAMPUS STUDENT HOSTELS AT NIGERIAN UNIVERSITIES

A Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Construction Management

At

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Abstract

Most universities have long recognised the importance and contribution of on-campus hostels to the learning process. In so doing, most of these institutions have provided and maintained building facilities for academic purposes (teaching and research). Hostels are integral components of most campuses of Nigerian universities, and they are part of the built assets of the institutions in terms of both administration and maintenance management. Currently, there is little understanding of the maintenance management systems of on-campus hostel buildings in both the public and the private universities. Moreover, there is a dearth of research evidence demonstrating that there is an appreciable difference in the maintenance management systems of the Federal, State and private universities in Nigeria. This research aimed at establishing an understanding of maintenance management systems of on-campus hostel buildings at Nigerian universities owned by the Federal and State governments and the Private Sector, relative to stipulated criteria for best practice.The qualitative method of research inquiry that is rooted in the phenomenological paradigm was employed in the investigations. The research activities included a comprehensive review of the related literature and study of selected cases. The North-central geopolitical zone of Nigeria was the selected geographical scope of this research. Ten universities were purposefully selected for the study, and they include three Federal, four state and three private universities. The nature and differences in the research questions necessitated generating different forms of data. The questions that were related to the maintenance management systems for the hostels in place at the universities were addressed with the outcomes of interviews with the hostel managers. The questions that were about the structures and current conditions of the hostel buildings at the three categories of universities were addressed with data that were generated from condition assessments of the facilities and physical observations with the aid of cameras. The study reveals apparent deteriorated and unhealthy conditions of most of the on-campus hostels at the public universities, while those of the private universities are satisfactory. The research also found that the maintenance management systems in use at all the universities are reactive and lack proper planning and coordination of maintenance activities. There is no significant difference in the maintenance management systems of hostels at the public and the private universities and the systems have major negative impact on the conditions of the buildings and their performances. The research has developed a conceptual model for the study of maintenance management informed by the theoretical framework. The model considered the impact of the external environmental factors on the management and maintenance of the hostels. Secondly, the interrelationships of strategic and performance management with maintenance management in developing an effective maintenance management system were established. The study has achieved its aim of establishing an understanding of maintenance management systems of on-campus hostel buildings at Nigerian universities owned by the Federal and, State governments and the Private Sector. The maintenance management model developed in the study is recommended to maintenance management departments as a guide for effective maintenance of the built facilities in their institutions.

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Declaration

This thesis is submitted under the Nelson Mandela Metropolitan University regulations for the award of a PhD degree by research. I, Anita Dzikwi Adamu with student number 213505622 hereby declare that this thesis is original and that no portion of it has been submitted in support of any application for another degree to any other university or institute of learning.

Signed: ....

Date: ....

Dedication

This research is dedicated to:

- My father Mallam Adamu Dzikwi Garkida; my mother and friend Mallama Flora Hauwa Dzikwi
- All the students that had to live in unfavourable conditions of the hostels during their studies at the Nigerian universities.

List of Abbreviations

ALGON: Association of Local Government of Nigeria

DCs: Developing Countries

EFF: External Environmental Factors

ETF: Education Trust Funds

FCT: Federal Capital Territory

FG: Federal Government

FGN: Federal Government of Nigeria

FM: Facilities Management

FME: Federal Ministry of Education

GDP: Gross Domestic Product

MAS: Minimum Academic Standards

NCCE: National Commission for Colleges of Education

NEEDS: National Economic Empowerment Development Strategy

NUC: National Universities Commission

OPEC: Organisation of Petroleum Exporting Countries

PM: Performance Management

SAD: Student Affairs Division

SADs: Student Affairs Divisions

SGs: State Governments

SM: Strategic Management

UCI: University College of Ibadan

UK: United Kingdom

UN: United Nations

UNESCO: United Nations Educational, Scientific and Cultural Organisation

NBTE: The National Board of Technical Education

M & E: Mechanical and Electrical

HVAC: Heating, Ventilation and Air Conditioning

PTDF: Petroleum Technology Development Fund

Chapter 1: Introduction

1.1 The Research Problem and its Setting

Living and learning are fundamental components of the entire developmental process of students at universities (Palmer, Broido & Campbel, 2008, p. 90). For this reason, of the services that universities must offer, accommodating students on campus is second only to the dissemination of specialist knowledge (Aigbavboa & Thwala, 2012, p. 2). Most universities have long recognised the importance and contribution of on-campus hostels to the learning process (Parameswaran & Bowers, 2012, p. 1). In so doing, most of these institutions have provided and maintained building facilities for academic purposes (teaching and research), that include residences to house students on-site as a means of supporting their learning activities (Alaka, Pat-Mbano & Ewulum, 2012, p. 181).

The prime purpose of establishing universities is for human capital development, which they achieve by offering advanced education in various fields (Arowolo & Ogunboyede, 2013, p. 138). These institutions also engage in research activities that produce significant output to advance national development (Arowolo & Ogunboyede, 2013, p. 138).

1.1.1 External Environmental Factors and Strategic Management of Universities

The strategic management of an organisation (e.g. a university) is influenced by dynamic External Environmental Factors (EEF). These factors exist in the economy where the organisation is domiciled (Voiculet, Belu, Parpandel & Rizea, 2010, p. 5). When the rate, at which they change, is volatile, EEF (social, economic, political, cultural and physical) can be turbulent and hostile to the business of an organisation (*Ibid*). Furthermore, it is very difficult to predict or anticipate any particular change in these factors and the change in one factor affects the others, thereby creating a complex environment for every sector of the economy. In common with other organisations within the same locality, strategic management of universities is always

under the influence of the EEF. Therefore, the ability of these prestigious institutions to maintain their balance within their environment is a major determinant of their success in achieving their main goals.

1.2 Influence of the External Environmental Factors on the Establishment and Management of Universities in Nigeria

There is a significant relationship between the development of Nigeria and the development of its universities. The global perception of the country is that it is a rich oil producing country. But it has a growing poverty index that is affecting every sector of the economy (Ogbonna & Ebimobowei, 2012, p. 406). Without a grasp of the economic background of the country, this paradox is difficult to understand. However, understanding the economic background of the country is important for gaining an insight into the management processes of the Nigerian universities.

Universities in Nigeria are categorised in four generations that coincide with prominent periods in the history of the country because they are products of the major decisions taken by the country's administrators during each of these periods. The decisions on establishing universities were influenced by the behaviour of the EEF (economic, social, political, cultural, and physical) prevailing during Nigeria's four prominent historical periods. The next sections describe the complex environments in which the Nigerian universities were established and the influence of the environments on strategic management of the institutions.

1.2.1 The First Generation of Universities in Nigeria during Pre and Post Political Independence (1960-1969) Period

Traditionally, most Commonwealth countries relied on public universities for the provision of higher education. These institutions implemented control mechanisms for quality assurance (Varghese, 2011, p. 20). In Nigeria, this tradition initiated the establishment of the University College of Ibadan (UCI) in 1948, which was affiliated to the University of London (Ajayi & Ekundayo, 2008, p. 212; Bulama, Ayuba & Malgwi 2012, p. 54). During this period, agriculture was Nigeria's main source of revenue, accounting for approximately 70% of its Gross Domestic Product (GDP) and 90% of

foreign earnings and government revenue. In 1958, crude oil became available in commercial quantities and provided another viable source of revenue.

For most former colonial countries, establishing universities is a priority on their development agendas because of the perceived importance of human resource development and perceived national prestige (Adesina, 2006, p. 6). For many countries on the African continent, establishing universities is of the highest priority. It is a part of the conscious effort made to develop human capital to address the shortage of skills in strategic aspects such as leadership; positive character development; preserving relevant cultural heritage; promoting good governance; unity and peaceful co-existence (Etuk,Okon, Udofia, Udofia & Udofia, 2007, p. 2). These views are assumed to have influenced the creation of five additional universities 14 years after the UCI, but only two years after political independence had been gained. The six universities existing in 1962; financed solely with subventions from the government, are known as 'first generation' universities (Ajayi & Ekundayo, 2008, p. 213).

1.2.2 The period of 'oil boom', sustained economy and the creation of the second generation of universities in Nigeria (1970-1980)

The period surrounding the creation of the 'second generation' universities was characterised by a growth in the economy of the country. The growth was induced by the progressive increase in crude oil production, indicating a leap in economic development for the young, ambitious nation (Adedipe, 2004, p. 1). A period known as 'oil shock' ensued in the early 1970s, during the crises in the Middle East. A period when an embargo, that was placed on crude oil production, caused a sharp reduction in the world supply and an increase in the crude oil price (Akinlo, 2012, p. 167).

The oil revenue reached a climax in 1973/1974 (the oil boom years). The increase in the revenue was because most industrialised economies (e.g. United States of America), which depend heavily on petroleum turned to non-Arab countries like Nigeria as their sources of crude oil supplies. During this period, Nigeria experienced a great boost in its economy arising from an increase in the oil price demanded by the Organisation of Petroleum Exporting Countries (OPEC). The economic boost supported a substantial

increase in public expenditure (Pinto, 1987, p. 419; Ogunu, 1990; Uwakonye, Osho & Anucha, 2006, p. 61). The construction industry boomed because of the massive investment in property development in both the Public and Private Sectors of the economy, with an emphasis on new projects (Odediran, Opatunji & Eghenure, 2012, p. 261).

The boost in the economy influenced the FGN to establish more universities in major regions of in the country with the aim of proffering equal opportunity to all citizens of the country access to university education. Eight additional universities were established between 1971 and 1978 referred to as 'second generation'. All the thirteen institutions (including 6 of the first generation) were solely owned by the Federal Government of Nigeria (FGN). Owing to the stability of the EEF, all universities during this period were on an exclusive list of the FGN to receive funds and management support (Ajayi & Ekundayo, 2008, p. 213).

The physical plans of universities established during this period were characterised by luxury, and these projects were constructed on extremely large expanses of land, far from main towns or cities. These institutions were designed as self-sufficient communities because they were intended to accommodate both staff and students on site (Esenwa, 2003, p. 1).

Facilities in the universities were adequate and furthermore, they received pre-requisite maintenance because there was sufficient funding from the FGN (Ikediashi, 2012, p. 725). A statutory body was created and mandated (under Decree No. 1 of 1974) to grant approval for the establishment of universities in Nigeria. The body also sets policies for managing the institutions (Saint, Harnett & Strassner, 2003, p. 16; Ajayi & Ekundayo, 2008, p. 212).

1.2.3 The Period of Economic Recession and Environmental Instability (1979- 1998)'s Impact on Nigerian Universities

In the early 1980s, Nigeria experienced a sharp decline in its economy due to an acute reduction in the price of oil. The oil price reduction was as a result of an excess supply of oil by other members of OPEC (Uwankonye *et al.*, 2006, p. 61; Akinlo, 2012, p. 167). The economic regression did not hinge solely on the reduction in crude oil revenue or overdependence on the oil sector (Uwakonye *et al.*, 2006, p. 62).

To a large extent, the regression may be attributable to a lack of fiscal prudence by successive governments during the prosperity period (Ogbonna & Ebimobowei, 2012, p. 406). In addition, the government also borrowed from domestic and external sources, leading to increased budget deficits and the collapse of external reserves (Saka & Lowe, 2010, p. 1302). Policies were initiated to curb these financial crises, but, unfortunately, most measures implemented were weak, and many policies were contradictory (Adedipe, 2004, p. 2).

During this critical period, establishing more universities became imperative for the following reasons:
- more universities were needed to boost skills in the technology and agriculture sectors,
- there was a major increase in the number of students who qualified for university admission;
- political pressure caused the FGN to yield to social demand for access to universities (Saint *et al.,* 2003, p. 4).

As a result, eleven FGN-owned universities emerged between 1980 and 1988 that are in the 'third generation' category.

In the face of Nigeria's declining economic fortunes, its federal universities have been operating under a state of financial stringency with tight budgets (Ogunu, 1990). The FGN subvention to public universities is 51.8% less than the 26% of the total budget allocation to the education sector recommended by the United Nations Education,

Scientific and Cultural Organisation (UNESCO) (Amaghionyeodiwe & Osinubi, 2012, p. 88; Bulama *et al.*, 2012, p. 54-55).

In 1979, an amendment to the Nigerian constitution paved the way for the second level of government (the individual State) to establish and own universities. This amendment was necessary because the FGN realised that its role as the sole provider of funds of universities was no longer feasible (Ajadi, 2010, p. 16). As a result, eleven SGs-owned universities were established between the years 1979 and 1992, enroling 160,174 students (Osinubi, 2003, p. 302; Aluede, Idogho & Imonikhe, 2012, p. 6). In spite of the adverse economic conditions, new development continued across the country by both FGN and SGs. However, no provision for maintaining existing stock, resulting in drastic deterioration at an alarming rate (Odediran *et al.*, 2012, p. 261).

1.2.4 The Post-economic Regression and the Emergence of Private Universities in Nigeria (mid 1990s to 2013)

This period is characterised by instability in the environment caused by dramatic changes in the EEF such as population explosion (58.1% increase), changes in political government, and an economy that was recovering from depression, commenced during the mid-1990s. An ever-increasing demand for skills and expansion of the knowledge economy are major factors responsible for the continuous global quest for expansion of higher education (Varghese, 2011, p. 7). In Nigeria, this rapidly growing expansion is based largely on political considerations. The growth rate is described as being due more to quantity than to quality, which receives minimal attention (Osinubi, 2003, p. 302).

Clearly, government alone could not continue to fund university education as it had in the past. Therefore, Private Sector participation became necessary to ensure effective management of the tertiary institutions (Ajayi & Ekundayo, 2008, p. 213). Both the State Government (SG) and FGN were unable to achieve the desired optimal establishment and management of universities due to constraints in funding. Hence, the imperative to involve private individuals and corporate organisations (Ajadi, 2010, p. 18).

As a result, in 1993, the FGN promulgated legislation, which permitted Private Sector participation in establishment of universities according to guidelines, prescribed by the NUC (UNESCO-IBE, 2011) and paved the way for the introduction of the first three privately-owned tertiary institutions. These pioneering private institutions are Igbinedion University, Okada, Backcock University, Ilisan-Remo and Madonna University, Okija, which were all instituted in the year 1999.

In 1999, the total number of public universities was 40 (27 federal and 13 states-owned). The FGN established thirteen universities between 2007 and 2013 that are in the 'fourth generation' category. One hundred and twenty-nine universities have been established in Nigeria within the four generations (1948-1969; 1970-1980; 1979-1998; 1999-2013). The private sector accounts for the highest number (50) while, those owned by the FGN and SGs are 40 and 39 respectively (NUC, 2014). The FGN owns the three universities established in 2013.

Funds allocated for university education by the FGN were expended on establishing new campuses in remote locations where providing and maintaining basic infrastructure services for local communities consumed the major share. The lesser share was allocated to main academic environments such as classrooms and administrative buildings (Osinubi, 2003, p. 304). Abigo, Madgwick, Gidado & Okonji (2012, p. 371) observed that the government seemed to be more interested in constructing new buildings than caring for the existing stock, thereby fostering the accelerated deterioration and decay; whilst the Government continued to construct new universities.

The FGN still remained responsible for 100% capital expenditure as well as supporting recurrent expenses incurred by the FGN-owned universities (Olaleye, 2012, p. 581). The capital allocations to universities have drastically reduced and academic buildings only (which do not include student hostels) are prioritised. The FGN is no longer able to provide adequate funding to enable universities to cater for their various management needs. As part of a survival strategy, the institutional management has been instructed to source alternative means of funding to supplement government subvention. However, there has been no significant increment in fees paid by students enroled at the public

universities and fees charged for hostel accommodation in the hostels owned by these institutions have also not been appropriately increased.

1.3 The Challenges of maintaining On-campus Hostels at Nigerian Universities

In Nigeria, most government-owned tertiary institutions are currently under pressure to preserve their respective built environments (Akinsola, Hussaini & Oyenuga, 2012, p. 490). This problem cannot be divorced from the influence of the national government on the strategic management of the institutions, which is beyond question, because the Nigerian university system has always been under strict FGN surveillance. Furthermore, because of the perceived importance of university education in nation building, the major responsibility for establishing and funding these institutions rests with the government.

While it has been a Nigerian tradition to accommodate students almost exclusively on campuses and hostel buildings have been an integral component of the university's built assets, this tradition is now facing challenges from several factors such as

- an emerging population explosion of students;
- ineffective management strategies/policies;
- financial constraints;
- a poor maintenance culture towards public infrastructure throughout the country (Adenuga, Olufowobi & Raheem, 2010, p. 99; Akingbohungbe & Akinluyi, 2012, p. 69-70); and,
- the demand for university education, which, despite an increase in the number of universities, is greater than the supply, further, aggravates the situation.

As a result, university hostels are overcrowded; and their facilities are stretched beyond their designed capacities. Maintenance standards and plans are not prioritised (Abigo *et al.*, 2012, p. 371; Ojedokun, Odewumi & Fasola, 2012, p. 6).

In the early 1980s, a national policy that instructed Federal universities to accommodate only 33% of their students in their on-campus hostels, was formulated and enforced

(Esenwa, 2003, p. 3). Unfortunately, the policy provided loopholes for illegal practices aggravating those previously existing in the already overcrowded hostels. For example, students sharing bed spaces with friends and relations in attempts to support each other at the expense of the hostels' capacity, thereby further complicating maintenance management and reducing the quality of general living conditions in the hostels (Esenwa, 2003, p. 3).

In 2013, students still struggled to secure admission to these hostels; a situation exacerbated by the fact that most universities are located in remote areas. There is little decent and affordable accommodation for students in the nearest suburban communities, and those living in the towns or cities face transport and security difficulties. The challenges of managing students' hostels prompted the FG to seek participative intervention by the Private Sector. In 2001, a policy on Private Sector participation in the provision and management of university hostels was formulated (Esenwa, 2003, p. 5). The main goals of the policy are to:

    i.   provide legal backing to support Private Sector participation in the provision of hostel facilities at the FG universities;

    ii.   encourage the Private Sector to plough back a portion of their profit into critical areas of national need;

    iii.   enable universities to channel their limited resources towards teaching and research activities, rather than funding Municipal functions and

    iv.   ease the problem of acute shortages of hostel accommodation in the university system.

Implementation of this policy faced two major challenges:

- fairness and affordability of the rent chargeable to students and the wisdom of charging high rentals in private hostels in comparison with relatively free accommodation at university-owned hostels; and,
- the concerns of investors about the viability and security of committing funds to such projects (Esenwa, 2003, p. 8).

Regrettably, initiatives to date have been geared solely towards addressing the problem of overcrowding rather than the maintenance of existing hostel buildings. In 2004, the

FG instructed the universities to withdraw from the management of existing hostels in favour of Private Sector involvement. The purpose was to free the universities from problems associated with the hostels, and redirect resources to the management of other aspects of institutional life (Ubong, 2007, p. 2; Onyike & Uche, 2012, p. 11).

However, by 2014 this hoped-for privatisation initiative had not taken root as most universities had retained the management and maintenance functions of their hostels and other facilities.

1.4 Problem Formulation

The development and maintenance of universities in Nigeria has been influenced by prevailing economic conditions. For decades, funding difficulties faced by these universities have resulted in the deterioration of every operational aspect of these institutions, with the physical facilities and amenities being the most affected.

Onyike & Uche (2012, p. 11) assert that rapid increases in student populations and limited funds are the main reasons for the incapacity of universities to maintain their on-campus hostels, which has resulted in overcrowded buildings, continuous deterioration and the decay of these facilities.

The financial crisis and the deregulation policies following the 'oil-doom' period in Nigeria during the 1980s created an enabling environment for the emergence of private universities (Ajadi, 2011). The major reasons for Private Sector participation in the provision of university education were adverse conditions such as overcrowding and deteriorating physical facilities, in addition to the lack of adequate maintenance in most government-owned universities (Adeogun, Subair & Osifila, 2009, p. 4).

No research reports on the conditions and maintenance systems of the private universities are available. However, reports on the poor maintenance of the hostels on campuses of public universities (both Federal and State-owned) exist (e.g. Ubong, 2007; Onyike & Uche, 2012), but with a dearth of discourse on their maintenance systems.

Since the early 1990s, the management of the hostel buildings in public universities in Nigeria has progressively become more complicated. The situation is blamed on the continuous increase in the intake of students with every academic session despite an increase in the number of both public and private universities established to date (Akingbohungbe & Akinluyi, 2012, p. 69; Ojedokun *et al.*, 2012, p. 4140).

In addition, developments such as global advancement in technology and diversification have necessitated the emergence of new academic and other programmes. These developments have further complicated general management functions within the universities - including the maintenance of buildings in the public institutions. These complications necessitate research into practices associated with the maintenance of on-campus hostels in Nigeria, which is required to establish an understanding of maintenance strategies and the impact of those strategies on the conditions of the buildings.

The state of existing hostel buildings on campuses of some public university in Nigeria has been the subject of controversy for some time now, and it remains largely not understood. Moreover, there is a lack of an established understanding of the maintenance management systems for these buildings.

1.5 Research Problem

Currently, there is little understanding of the maintenance management systems of on-campus hostel buildings in both the public and the private universities. Moreover, there is a dearth of research evidence demonstrating that there is an appreciable difference in the maintenance management systems of the Federal, State and private universities in Nigeria.

1.6 Main Research Question

What are the current strategies used in the maintenance of on-campus hostel buildings in public and private universities in Nigeria?

1.6.1 Sub-Questions

The following sub-questions emanate from the main research question:

i.   What are the criteria for an effective maintenance management system?

ii. What are the current maintenance management systems of the on-campus hostel buildings in the Nigerian

    a.   Federal;

    b.   State; and,

    c.   Private universities?

iii. What are the current conditions of the on-campus hostels at each of the foregoing types of universities?

iv. What are the effects of the maintenance management systems on the condition of the on-campus hostels at each of the foregoing types of universities?

v.   What criteria and model(s) can be recommended for a holistic maintenance management system to be implemented for the on-campus hostel buildings at each of the foregoing types of universities?

1.7 Research Aim and Objectives

This research aims to establish an understanding of maintenance management systems of on-campus hostel buildings at Nigerian universities owned by the Federal and, State governments and the Private Sector, relative to stipulated criteria for best practice.

The research objectives are to

i.   Articulate and identify the criteria for an effective maintenance management system.

ii. Identify the current maintenance management systems of the on-campus hostel buildings in the Nigerian

    a.   Federal;

    b.   State; and,

    c.   Private universities?

iii. Examine the condition of on-campus hostel buildings in each of the foregoing three types of universities.

iv. Evaluate the effect of maintenance management systems on the conditions of the hostels in each of the foregoing three types of institutions.

v. Develop a framework and a model for the maintenance management of university hostel buildings in Nigeria.

1.8 Delimitations of the Research

The research evaluated the maintenance management systems and observed the physical condition of on-campus hostel buildings in selected Nigerian universities. There are 129 universities established in different generations, with at least an FGN-owned university established in each of the 37 states (including the Federal Capital Territory). The in-depth nature of the research allowed for the study of selected cases that best represent the categories of universities in the country.

The geographical scope of the research is the central region of Nigeria, which is one of the six geopolitical zones in the country known as North Central. This zone tends to be the centre of diversity in Nigeria where there is a blend of the major cultures and traditions of the North, South, East and West.

The North Central zone consists of six (6) states (Niger, Kwara, Kogi, Plateau, Nassarawa and Benue) and includes the Federal Capital Territory (FCT), Abuja. All categories of the universities targeted for this study are represented in this zone. Therefore, purposeful selection of cases in this zone provided a valid representation of their counterparts nationwide. All the FGN-owned universities across the country have similar structures with the same fund allocation formula from the FGN.

The SGs-owned universities also have similar structures that were approved by the NUC. In addition, each SG is a subset of the FGN. Therefore, all SGs-owned universities are considered as public institutions. Unlike private universities, SGs-owned universities benefit from the FGN's Education Trust Funds (ETF) besides the major funding by their respective states, which all emanate from subventions to the SGs by the FGN.

There are nineteen universities in the zone: Five of which are FGN-owned, six different states within the region own a University, and eight others are owned by private organisations (majority are faith based). Only five of the private universities in the zone provide on-campus hostels for their students. Ten of the universities all with on-campus hostels were studied. Three FGN-owned, four SGs-owned and three owned by private organisations.

For a fair selection from all the three categories, the institutions established within the same period, preferably within the same year were selected. The only Islamic based university in the zone determined the year/period of any selected university in all categories. Therefore, the different types of the private universities were represented in the study.

1.9 Methodology Outline of the Research

The focus of the study and the in-depth investigation required to address the research problem determined the methodology of the study. The qualitative method of research was adopted because it is appropriate for in-depth inquiry as is the case in this research. The study began with intensive literature search that enabled an articulation of the underlying concepts and principles. The review of the related literature was carried out with the aid of data from secondary sources. The outcomes of this phase of the research position and examine the research problem.

A second phase of the research used the case study approach to generate the primary data through observations (inspections and photographs) with the aid of a condition survey guide and camera. Interviews conducted in each of the cases studied with the aid of a semi-structured guide provided an insight into the maintenance management systems at the universities.

Textual and descriptive methods were used to analyse and discuss the data. The results are presented in chapter five, and the findings and implications are discussed in chapter six. Conclusions and recommendations that emanated from the research are documented in chapter seven.

1.10 Assumptions of the Study

The study assumes that:

i. conditions of the hostel buildings affect living and learning of the students;

ii. students prefer on-campus hostels due to a wide range of advantages such as security and access to university facilities;

iii. all universities have a maintenance unit/department;

iv. maintenance management systems for on-campus hostels differ among universities;

v. maintenance management of on-campus hostels will continue to operate within tight budget and resource constraints.

1.11 Importance of the Study

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, p. 105). On-campus hostels have been an integral part of most universities in Nigeria (section 1.2 refers). Maintenance management is a key issue in managing hostels because it supports the university's strategic goal (human capital development) and sustains the quality of the built assets.

Findings arising from the few studies on maintenance of students' hostels at Nigerian public universities (Federal and State) suggest a state of disrepair of the hostel buildings. This was not the case when the first and even the second generation of universities were established (referring to section 1.3). While maintenance units/departments are responsible for the maintenance of the hostel buildings, the maintenance approach for these buildings is suggestive and predictive of their state. No research has provided a clear understanding of the formulation and implementation of the maintenance strategies and policies in place at these public universities; nor has there been a link between the strategy and state of repair.

However, there is also no research evidence on the condition of students' hostels at the private universities or their maintenance management strategies. The need to re-think the maintenance management approach of the existing buildings is vital for the

economic value benefit to the universities. Most importantly, it supports the smooth running of academic activities and the achievement of the strategic goals of the institutions. Hostel maintenance at Nigerian universities remains little understood; hence, the need to undertake this study in an attempt to improve on existing knowledge and proffer an increased understanding of the maintenance of on-campus students' hostels.

1.12 Outline of the Thesis

The thesis consists of seven chapters and the content of each chapter is as outlined next:

- ➢ Chapter 1: Provides an overview of the subject matter and factors that led to the formulation of the problem statement and research questions. An outline of the aim, objectives, assumptions, scope and importance of the study is provided. A synopsis of previous research on-campus hostels at universities is presented together with an outline of methodology of the research.
- ➢ Chapter 2: This chapter provides an overview of the educational system in Nigeria; the University system, the management and physical structures of the universities. The chapter also discusses the management and maintenance situations of the on-campus hostels at the Nigerian universities.
- ➢ Chapter 3: Here, the theoretical and conceptual frameworks of maintenance management are presented and discussed appropriately. The chapter also explores the aspects of management that are related to maintenance management, such as facility management, performance management and strategic management.
- ➢ Chapter 4: Presents the proposed research methodology and justification for the adopted method. In addition, research design/strategy, data collection instruments and consequent validity/reliability are also discussed.
- ➢ Chapter 6: Focuses on the presentation and analysis of data and discussions of findings in the case studies and consideration of implications. A framework and a

model for the maintenance management of on-campus hostels at Nigerian universities is also presented and discussed appropriately.

➢ Chapter 7: This chapter presents the summary of findings, conclusions and recommendations. The contribution of the research to knowledge and areas of further research are also highlighted.

1.13 Conclusive Remarks

Chapter 1 has presented the concept of universities, background of strategic management of their management and a brief genealogy of the Nigerian universities. The research problem and questions that emanated from the background were stated; thereafter, the aim and objectives of the study were carefully presented. This chapter also discusses the research delimitations, assumptions, and presents an outline of the methodology and importance of the study. The chapter concludes with an outline of the thesis. The next chapter provides an overview of the Nigerian system of education; describes the physical structures of the Nigerian universities and management. Discussions on the maintenance situations of the on-campus hostels at the Nigerian universities are also provided.

Chapter 2: The Review of Related Literature

2.1 Introduction

Review of related literature of the research area is necessary for articulating existing knowledge that provides theorical bases for the research. The existing grey areas are also exposed to enable the undertaking of research works that contribute to knowledge and to avoid replicating works that have already been done. Therefore, this chapter is central to the research and is a major pillar of the research investigation.

This chapter provides an overview of the educational system in Nigeria; the University system, the management and physical structures of the universities. The review is narrowed down to the built assets of the universities. The chapter also discusses literature on the management and maintenance situations of the on-campus hostels at the Nigerian universities.

2.2 Overview of the Nigerian System of Education

Nationally, the concept of education in Nigeria is a major vehicle for accelerating national development through individuals and communities (Kazeem & Ige, 2010, p. 40). The FGN controls the education system of the country through the Federal Ministry of Education (FME). The FME has been empowered by the FGN for the purpose of formulating and reviewing all national education policies. Secondly, the FME is responsible for setting and maintaining standards of managing the institutions irrespective of the ownership (UNESCO-IBE, 2011, p. 5).

The structure and administrations of all tertiary and secondary institutions that are owned by the FGN are defined by the FME. The States' Ministries of Education of the respective states are responsible for the tertiary and secondary institutions owned by their respective SGs. All Private owned institutions design their structures and administrations according to the FME guidelines (*Ibid.*).

There are governing bodies that have mandates to set Minimum Academic Standards (MAS) for all the categories of institutions in the country. At the tertiary level, the National Commission for Colleges of Education (NCCE) caters for the colleges of education. The National Board of Technical Education (NBTE) is responsible for the polytechnics, and technical colleges and NUC oversees the universities (Kazeem & Ige, 2010, p. 46).

2.3 The Management Structures of the Nigerian Universities

Universities are established primarily for the purpose of human capital development, which is vital for national development (Arowolo & Ogunboyede, 2013, p.138). Like other higher educational institutions, universities are responsible for teaching and research but globally, they are the only degree-awarding institutions (Alaka *et al.*, 2012, p.181). In Nigeria, the society looks up to the universities for essential knowledge and skills that are required for improvement in the quality of life and the sustenance of the economy (Kazeem & Ige, 2010, p. 40).

The Nigerian educational system is perceived to have suffered a decline in quality in all areas, with an adverse effect on the county's developmental progress towards prosperity and stability of its economy and other sectors. The problem is hinged on:

- Futile policy that guides the system;
- Resource management; and,
- Attitudes of the stakeholders, staff (both administrative and academic, students, and sponsors.

A lot of funds have been sunk into the sector, but it does not seem to make any positive change to the deteriorating situation (Osinubi, 2003, p. 301).

The university education system in Nigeria is structured in accordance with the 'gold standard' of British colonial universities that is based on participatory model of Senate and academic committees (Saint *et al.,* 2003, p. 276; Abdalla, 2010, p. 4). For political reasons, the system received a little re-orientation when part of the American structure was introduced in the 1980s. The change in the structure of the university educational

system coupled with adverse environmental issues such as economic depression, political and social factors caused distortion in the system (Abdalla, 2010, p. 4).

As a result, the system experienced degeneration of standards and dilapidation of facilities. The system is also facing a problem of continued high social and individual demand for free access to the universities at a time of growing constraints on public budgets (Abdalla, 2010, p. 5).

Despite the degenerating standard of the university educational system in Nigeria, university education to many Nigerians remains the major highway to prestigious jobs and social security (Abdalla, 2010, p. 6) in line with, Aigbavboa & Thwala (2012, p. 5)'s opinion that university education is believed to be a prerequisite for being successful. In 2012, student enrolment in the Nigerian universities was estimated to be 1,096, 312 of which 610,645 (56%) were enrolled at the federal universities, 448, 392 (41%) were enroled at the states' universities, and only about 37,275 (about 3%) were enroled at the private universities (Arowolo & Ogunboyede, 2013, p. 139).

Currently, all universities, regardless of ownership status, are faced with managerial challenges within a competitive environment. These challenges are in twofolds, first is the substantially weak economy and the second is a challenge of surviving within the increasing competitiveness that characterises Nigerian universities, most especially between the old and new ones (National Economic Empowerment Development Strategy (NEEDS), 2012, p.12 ; Arowolo & Ogunboyede, 2013, p.145).

University systems, that are regarded as responsive, adapt more business management-like strategies. The strategies strive for excellence in accountability, assurance of quality, innovation and performance management (Saint *et al.,* 2003, p.275). The Nigerian university system is still far from becoming a responsive one because of its complexity and an increasingly large federalism. The system lacks professional management manifested by the following:

i. Strategic planning is almost non-existence;
ii. Little innovative skills;

iii.   Weak information systems and institutional communications; and,

iv.   Rigid institutional management styles.

Oversight of the FGN has resulted in limited or poor accountability of management for a very long while and this is believed to be responsible for rigidity. The governance and management laxities created a stable ground for endemic corruption (Saint *et al.,* 2003, p.276). Therefore, a responsive and flexible management system of the universities must begin with changes in the governance tradition in the country and minimising corruption grip.

Alaka *et al.* (2012, p. 181) assert that universities are not only responsible for providing facilities to cater for academic (teaching and research) activities, but they are also saddled with the responsibility for ensuring that adequate facilities for living while studying, are provided for the students to stimulate their learning abilities. Furthermore, Aigbavboa and Thwala (2012, p. 2) advocate that, after dissemination of specialist knowledge, the provision of accommodation for students is the second most important service offered by universities. Parameswaran & Bowers (2012, p. 1) noted that most universities have long recognised the importance and contribution of on-campus hostels to the learning process. In view of the enormous responsibilities of the universities, Arowolo and Ogunboyede (2013, p. 140), maintain that universities require proper funding and good management to function effectively.

Educational facilities constitute the physical structure on campuses of institutions such as universities. They are support facilities for teaching and learning because they form the built environment that is the platform for educational activities. The provision and management of these physical structures are complex and capital intensive. In essence, maintaining a high standard of quality is an enormous challenge. The infrastructural development in higher institutions involves provision of buildings, classrooms, hostels, staff quarters, workshops laboratories, ICT centers, libraries, health centers and sports facilities (Uche, Okoli, & Ahunanya, 2011, p. 9).

Utility services and other infrastructural facilities on a university campus are very important to the university community. They make the environment habitable, decent

and comfortable for academic business. The types of facilities that are provided on some of the campuses of the Nigerian universities include: Electric power and water supply, road networks, Street Lighting and Illumination, landscaping, student centre, staff club, Gymnasium, sport centre, market/shopping centres, banks, eateries, security posts (NEEDS, 2012, p. 109).

In 2012, the NEEDS committee was assigned to conduct a general assessment of the public universities in the country. The findings revealed that the basic physical infrastructure provided at the campuses of most universities includes the following: Lecture auditoria, classrooms, laboratories, Workshops/Studios/Gymnasia, libraries and staff offices. NEEDS discovered that there are 701 Physical development projects across the universities in the country. When completed, the institutions hope the pressure on the existing facilities would be reduced. Out of the 701 projects, 23% are abandoned, some for over 15 years. The on-going projects account for about 76% of the projects.

2.4 On-campus Student Hostels at Universities

There is a link between university education as an instrument for rapid development of individuals for social and economic advancement and the initiative of providing students' hostels on universities' campuses. On-campus accommodation for students has been in existence since the 14th Century, for instance, the Al-Azhar University in Cairo, Egypt (established in 969 AD) was one of the pioneering universities that provided a living and learning environment for their students (Hassanian, 2008, p. 213). Students' hostels are in the category of dynamic facilities (Lee & Scott, 2009a, p. 26) because they represent transient accommodation (Thomsen & Eikemo, 2010, p. 275).

On-campus hostels are custom-made, and offer supervised accommodation for the student occupants, with the prime objective of providing a living-learning environment that would enable their social interaction, notwithstanding their different backgrounds (Najib & Osman, 2011, p. 1200). This type of housing offers a platform for developments such as; the formation of good character, behavioural patterns and active imagination, enabling students to attain certain desirable levels of intellectual

competence (Hassanain, 2008, p. 212). In addition, Najib & Osman (2011, p. 1200) opine that on-campus hostels provide security to the lives and property of students and that their accommodation rental fees are normally affordable. The range of advantages enables students residing on campus to excel academically in comparison with those residing off campus (Araujo & Murray, 2010, p. 10; Araujo, 2010, p. 57).

2.4.1 Management and Maintenance situations of the On-campus Hostels at Nigerian Universities

There are only 109,509 bed spaces in the existing hostels at the public universities in the country and these bed spaces can accommodate only about 10% of the number of students that are enroled at the universities across the country. Less than 1% of the hostels are provided by public, private partnerships (NEEDS, 2012, p. 86). The accommodation fee at the FGN-owned universities for the whole session is only ninety naira (₦90.00) per bed space with maintenance fee varying between ₦5,000.00 and ₦20,000.00. Some of the SGs-owned universities charge the same accommodation fee per session as their FGN-owned counterparts but with an average maintenance fee of ₦6,000. Other SG-owned universities charge higher amounts for bed spaces in their hostels (*Ibid*).

In the last two decades, public universities in Nigerian have experienced an astronomical rise in student enrolment. There is no commensurate expansion in accommodation spaces for the upsurge in student population. The universities have failed over the years to provide alternative means of housing their students. The students are forced to share the limited facilities of the hostels and the resulting overcrowding of the building spaces. The cause of hostel accommodation problems at the public universities is hinged on ineffective management strategies in place at most of the universities (NEEDS, 2012, p. 84).

2.5 Conclusive Remarks

Chapter 2 has presented a literature review on the system of education in Nigeria and the management of the Nigerian universities. Furthermore, the chapter has discussed the views held about on-campus hostels at universities and the management and

maintenance situations of the on-campus hostels at the Nigerian universities. The next chapter provides a theoretical and conceptual basis of maintenance management that provided a scaffold for the research investigations.

Chapter 3: The Theoretical and Conceptual Frameworks

3.1 Introduction

There is a growing number of research approaches that are used in the social sciences. The research approach is focused on understanding research problems from multidisplinary perspectives by relating such problems to theories developed in other disciplines (Frodeman, 2010).

Theories, which are used in researches are products of established principles about nature and reality of occurring events. They are established from rigorous observations, testing of facts and hypotheses. The emerging theories provide explanations to a phenomenon (Ennis, 1999, p. 132). Establishing a theoretical framework for a research reveals relationships and patterns that guide anticipations and perceptions about a phenomenon.

The chapter begins with a discussion of building facilities, their deterioration pattern and common defects and building condition assessment. The purpose of building maintenance is also discussed under this section. Section 3.3 presents the evolution of maintenance of plant and equipment in the manufacturing industry. The components and functions of building maintenance management are discussed in section 3.4. The theoretical framework of the research is described in section 3.5. The conceptual framework of the research is presented in section 3.6.

3.2 The Building Facility and its Composition

Buildings are fabricated structures composed of several discrete but interrelated components (Mc Duling, Harok & Cloete, 2004, p. 4; Adenuga, 2010, p. 102). The building system derives its form and utility from two major components: the building shell and building services (Odediran *et al.*, 2012, p. 262). The building shell includes all architectural and structural components comprising of all exterior coverings of the building (façade or envelope) that shield the interior from harsh weather and pollution. It also provides thermal and sound Insulation. The materials used in the construction of

elements that form the façades must be durable and stable with some ability to resist fire, without compromising aesthetics (Chew, 2010, p. 95). Mechanical and Electrical (M&E) components are the building services. The mechanical services are, sanitary/plumbing, while electrical services include all artificial power and lighting. Other components, which may be categorised under M&E in buildings are fire protection systems, mechanised transport systems, Heating, Ventilation and Air Conditioning (HVAC) (Chew, 2010, p. 267)

The life cycle of a building as an entity is in three broad phases. It starts with the design and construction phase, moves to the joint operation and maintenance phase and lastly the deconstruction phase (Buys, 2004, p. 14; Chan, 2014, p. 19). Each element in a building has different durability and maintenance characteristics (Mclean, 2009, p. 5). The aggregate life span of the components of a building is a major determinant of its life expectancy (Adenuga *et al.*, 2010, p. 95), and the lifespan of each component depends largely on:

• specification and installation at the construction phase;
• compatibility of the components with each other and other materials;
• operation/use of the facilities; and,
• adequacy of the maintenance standard.

3.2.1 Deterioration and Common Defects in Building

The basic function of a building is to provide structurally sound, safe and environmentally controlled places to accommodate various human functions (Idrus, Khamidi & Abdul Lateef, 2009, p. 127; Adenuga *et al.,* 2010, p.102; Abdul Lateef, Khamidi & Idrus, 2011, p. 417; Waziri & Vanduhe, 2013, p.19). For the building to serve its designed function it must meet certain qualities of durability, reliability with other occupants/users requirements (Abdul Lateef *et al.,* 2011, p. 417). However, gradual deterioration and depreciation of the built facilities is inevitable but the speed, at which it proceeds, could be minimised with a proper maintenance strategy.

Building components are products of naturally occurring materials, such as clay, sand, wood and stone (Adinarayana, 2011, p. 1). These materials deteriorate over time

whether the building is in use or has never been used. Weathering due to several factors is responsible for the deterioration in buildings.

Deterioration processes of materials involve different chemical, mechanical and biological reactions. Symptoms of deterioration include wear, tear, soiling, fading, peeling, cracking and corrosion (Iyagba, 2005, p. 22; Straub, 2009, p. 27). According to the Queensland Department of Housing and Public Works (2012, p. 16), defects in buildings refer to the degree of physical deterioration of building elements and services, including a decline in operational effectiveness, aesthetic appearance and decayed materials that present a hazard to occupants/users.

Improper use, inappropriate maintenance strategies and ignorance of the appropriate use of building facilities are the major factors responsible for the acceleration and intensity of deterioration (Davatakovic & Radojevic, 2007, p. 127). Common factors responsible for the process are ageing, wear and tear coupled with the impact of artificial and natural environmental conditions (Iyagba, 2005, p.22).

In cases of rapid structural deterioration, Adenuga *et al.* (2010, p.95) identified factors that are likely to be responsible as follows:
- faulty or inappropriate design;
- faulty or inappropriate choice of materials and components;
- poor workmanship;
- inadequate maintenance strategy; and,
- inappropriate use (ignorance or abuse).

According to Saghatforoush, Trigunarsyah & Too (2012, p. 3), there are five categories of maintenance, generators as presented in Table 3.1

Table 3.1 Maintenance generators

Factors	Maintenance Generators
Technical	• faulty design or construction or both can result in defects in the building • poor quality of material and workmanship during initial construction phase • building facilities are subjected to wear and tear when in use • ageing is inevitable, whether the building is in use or not, therefore, there are defects or deterioration that are related to the age of the building • poor quality of material and workmanship when undertaking maintenance works; supported by Adenuga *et al.* (2010, p. 95)
Managerial	• lack of maintenance policies • inadequate maintenance programmes • In cases where the maintenance policies and programmes are available, there may be a problem of implementation • Delay of maintenance works (a stitch in time saves nine) • Inadequate budgeting for maintenance works • Insufficient resources for maintenance, creating a maintenance backlog • Poor information and communication technology in the organisation • Lack of strategic plans for maintenance management of the building
Environmental	• Biological (termites) • chemical reactions (oxidation) • The weather and climatic conditions, such as flood, the wind • *Force majeure*, such as fire
Political	• Legal constraints • Lack of political consistency • Government Policies
Socio-cultural	• Dominant maintenance culture of the occupants/users of the building • Ignorance of the occupants/users on the operation of the components • Misuse of the building • Exceeding the designed performance capability and capacity of the building • Vandalism; also identified by Davatakovic & Radojevic (2007, p. 127) and Adenuga, *et al.*, (2010, p. 84).

3.2.2 Building Condition Assessment

The conditions of buildings are key indicators of development and the quality of life in a community, because the prosperity, social values and behaviours are reflected in the buildings (Akinsola *et al.,* 2012, p. 506; Odediran *et al.*, 2012, p. 262). Users/occupants of buildings may have simple or complex requirements, but the building is expected to meet most of these requirements (Idrus *et al.*, 2009, p. 129). Maintenance management

practices have an impact on the condition performance and the service lives of facilities (Zawawi, Kamaruzzaman, Ithnin, Zulkarnain, 2011, p. 110).

Quantifying the maintenance requirements of a facility necessitates an understanding of the gap between the desired condition and the current condition of the facility (Abbott, Mc Duling, Parsons & Schoeman, 2007, p. 657).

Condition assessment is the most common method for measuring building performance and identifying maintenance needs of facilities. In the process, the efficiency of the current maintenance management strategies is determined (Abbott *et al.*, 2007, p. 650). Central to achieving the goal of creating a global framework is the development of performance measurement tools such as the condition rating instrument (Abbott *et al.*, 2007, p. 650). The global trend currently is that condition assessment tools are custom-made to suit the building type, environment and purpose of the survey (Loy & Coleman, 2006, p. 161).

Condition assessment of buildings provides 'face value' infromation about the relative state of facilities. It also provides essential data for building management to priotise and plan a mitigation schedule and remedial actions in line with the core objectives of the organisation and user requrement (Loy & Coleman, 2006, p. 161).

3.2.3 Purpose of Building Maintenance

The well-being of buildings is not only important for their economic life expectancy but is even more important for the well-being of the occupants/users (Iyagba, 2005, p. 67). In line with this, maintaining buildings is an optimum initiative and intervention for preserving and supporting the values of the built environment and the citizens (Dann, Hills & Worthing, 2005, p. 24; Idrus *et al.*, 2009, p. 128).

Therefore, maintenance is a key support function in building performance and it has taken strategic position (Abdul Lateef, Khamidi & Idrus, 2010, p. 86; Olanrewaju, 2013, p. 7) because it ensures that the functional, structural and aesthetic conditions of the buildings are upheld throughout their service life (Waziri & Vanduhe, 2013, p. 23). In so doing, safety would be enhanced, and the quality of life for the users/occupants would be improved (Buildings Department, 2005).

Maintenance management is an essential function in the life of every built facility irrespective of its type, size, function and complexity. The expectation is that with available resources; maintenance would keep or restore a facility within acceptable standards (Lee & Scott, 2009a, p. 27).

Maintenance management processes coordinate all measures geared towards retaining the desired characteristics of a facility that will support the optimum performance of its functional life (Odediran *et al.,* 2012, p. 262). The processes may be complicated and demanding, but are nonetheless unavoidable because of their importance in protecting the lives of occupants/users of the premises concerned; in addition to sustaining the economic value for owners of the properties (Suffian, 2013; p. 102).

3.2.4 A General Overview of the Practice of Building Maintenance

aintenance has a major influence on the reliability and safety of buildings (Abdul Lateef *et al.*, 2010; p. 76), well-defined strategies are vital for maintaining all facilities in the best condition possible (Buys & Nkado, 2006, p. 997). Despite the importance of maintenance, it does not receive the desired attention in the construction industry because the activities involved are not attractive and they are considered inferior to new construction projects (Cloete, 2002, p. 4; Wood, 2003, p. 78; Lee & Scott, 2008, p.81; Lee & Scott, 2009a, p. 26).

Maintenance tasks are considered avoidable because they are believed to waste limited resources that could be expended on a better cause (Adenuga *et al.*, 2010, p. 93). The consequences of neglecting maintenance in the built environment are less visible in the short-term, and as a result, management groups short-sightedly cut down maintenance budgets (Mc Duling *et al.*, 2004, p. 2).

In the United Kingdom (UK), Chanter & Swallow (2007, p. 40) have observed a decline in the condition of built assets of educational institutions since the early 1980s, which they hinged on resource constraints. According to Adenuga *et al.* (2010, p. 94) the United Nations (UN) Centre for Human Settlements found that many Developing

Countries (DCs) lack effective maintenance management systems for the efficient utilisation of available resources.

In addition, Bowazi & Buys (2009, p. 681) observed that these DCs lack adequate maintenance policies to guide the maintenance operations of their built environments. Cloete (2002, p. 1) also found that information on the current condition and maintenance requirements is inaccurate and unreliable. Furthermore, maintenance management is not a strategic issue at most tertiary educational institutions in South Africa (Buys & Nkado, 2006, p. 1004).

3.2.4.1 Consequences of Neglecting Building Maintenance in Nigeria

In Nigeria, building maintenance has been long neglected and in fact is currently regarded as the 'Cinderella' of the construction industry (Iyagba, 2005, p. 67). Lack of maintenance has been identified as a major factor responsible for infrastructure failure in the country (Omoregie, Ebohon, & Radford, 2005, p. 121). Numerous studies have reported the generally poor maintenance of the built the environment (Adejimi, 2006, p. 111; Adenuga *et al.*, 2010; Ilesanmi, 2010, p.160). Abigo *et al.* (2010, p. 371, 373)'s study concluded that public buildings in Nigeria are continually becoming less safe for occupants/users. Their study compared the conditions of public buildings in the UK and Nigeria, which revealed that:

- 41% of respondents in Nigeria considered that their buildings were at least in good condition, compared with 95% of UK respondents.
- 12% of Nigerian respondents affirmed their application of a maintenance model, as against 88% in the UK who stated that their respective organisations had adopted and implemented models for maintenance.

3.3 The Evolution of the Concept of Maintenance in Manufacturing

Maintenance evolved from a non-core but integral production function in manufacturing to a strategic management function (Pintelon & Parodi-Herz, 2008, p. 21). The evolution has been influenced by changes in the perception of maintenance and its importance to productivity in an organisation; Figure 3.1 depicts the decennial changes in organisations' conception of maintenance.
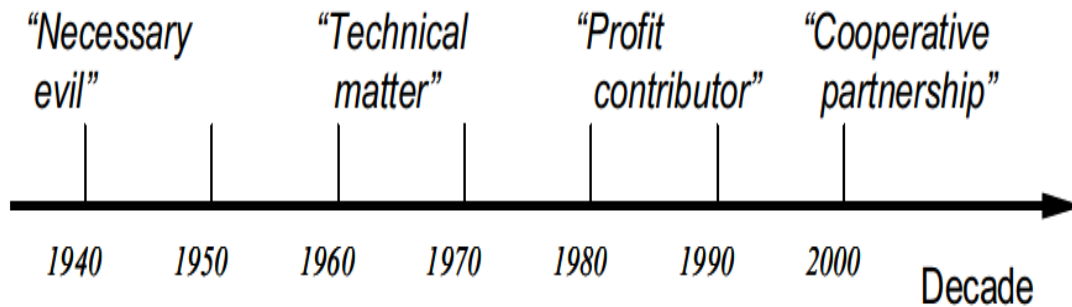
Figure 3.1 Maintenance Timeline (Source: Pintelon & Parodi-Herz, 2008, p. 26)

Maintenance functions are realistically perceived and valued in manufacturing processes that are closely related to production, for example, plant and machinery in a textile factory. Maintenance management is no longer viewed as an underdog function but is considered as an internal or external partner for success (Pintelon & Parodi-Herz, 2008, p. 26). In Table 3.2, Dunn (2003) describes perceptions reflecting an organisation's expectations of maintenance during the four periods identified on the generational timeline.

Table 3.2 Perceptions and expectation of maintenance (extracted from Dunn, 2003)

Generation	Perception	Expectation
the 1940s "Necessary evil"	"Fix after it breaks"	"All wear out."
1960s "Technical matter"	" Fix before it breaks" predict, plan, conscious of cost	• Higher equipment availability • Lower equipment life • Lower maintenance cost
1980-1990s "Important for production"	" Improve it" Value focus (minimise defects, improve precision, redesign)	• Higher equipment availability & reliability • Safety, product quality • longer equipment life & cost efficiency
2000 "Strategic issue"	"Optimisation" Maintenance management (align vision, integrate skills, improve performance)	Excellence

3.4 The Functions and Components of Maintenance Management

The term 'maintenance management' combines two important and distinct functions viz. operational and managerial. The range of skills required for operational functions is very different from those required for managerial input. The operational aspect requires purely technical skills, while the managerial deals with decision making, precisely "*what and how to decide*" (Pintelon & Parodi-Herz, 2008, p. 22). Accurate perception of the mission and vision of an organisation supports its ability to set appropriate maintenance standards and policy for the maintenance operations of its facilities.

However, maintenance personnel are more concerned with technical issues and less concerned with strategic plans of the maintenance department and the strategic goals of an organisation (Lee & Scott, 2009b, p. 277). Therefore, an understanding of the relationship between executive management at a strategic level and maintenance personnel at an operational level is important for effective management of building maintenance operations.

3.4.1 Operational Function

This function consists of various tasks to be executed in accordance with a maintenance policy (Marquez & Gupta, 2006, p. 317). This is necessary for achieving the maintenance objectives as set by an organisation for maintaining a facility and its associated services (Abdul Lateef *et al.,* 2010, p. 87).

The basic tasks in this process are corrective or preventive operations; where the former refers to all activities undertaken *after* the occurrence of a failure, while the latter refers to activities in anticipation of a failure occurring (McLean, 2009, p. 1). The execution of maintenance tasks involves one or a combination of the following activities: Service, rectification or replacement (Buys, 2004, p. 19; Olagunju, 2011, p.21).
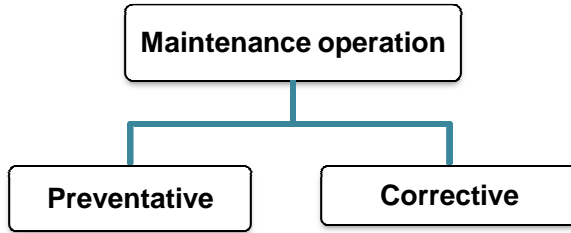
Figure 3.2 Types of maintenance

1. *Preventative maintenance***:** the function of the facility must be clearly defined in addition to the likely failure pattern when planning this type of maintenance. Applicable tasks must be set based on safety and cost effectiveness (Crespo Márquez, Moreu de León,Gómez Fernández, Parra Márquez, González, 2009, p. 672).

The following opinions confirm the nature of preventative maintenance:

- scheduled and executed in anticipation of a breakdown (Waziri & Vanduhe, 2013, p. 19);
- pre-scheduled service is involved, aimed at reducing the probability or prevention of failure before it happens (Akin & Gürsel, 2005, p. 1; Olagunju, 2011, p. 17);
- time-based, requiring identification of potential problems through inspection and early detection, followed by resolution ofproblems through actions such as cleaning activities, testing, lubrication efforts, and other scheduled services (Overveen, 2011, p. 7).

2. *Corrective maintenance*: Unlike preventative maintenance, this type of maintenance operation is undertaken after a failure has occurred (Pintelon & Parodi-Herz, 2008, p. 27)and is also referred to as "run-to-failure"," breakdown" or "failure based" because it is undertaken after a failure has occurred (Akin & Gürsel, 2005, p. 1; Lind & Muyingo, 2011, p. 15; Olagunju, 2011, p. 18). The activities required are mainly repairs or replacements which rectify a failure to restore a defective system to resume its normal functions (Pintelon & Parodi-Herz, 2008, p. 27).

3.4.2 Maintenance Managerial Process

Management deals with strategic planning of maintenance strategies based on goals set by an organisation relative to maintenance objectives/standards. This function employs basic management principles (planning, controlling, co-ordinating and organising) to harness the various loose maintenance components through sub-functions (such as developing programmes, communication, budgeting). This aspect is also concerned with achieving efficient allocation and utilisation of resources (Zulkarnain, Zawawi, Rahman, & Mustafa, 2011).

3.4.3 Maintenance Policy

A maintenance policy is a written document that provides a framework for maintaining a facility in accordance with the goal/s of an organisation (Lee & Scott, 2009a, p. 29-30). It provides the ground rules, practices, guidelines and operational procedures for the utilisation of resources amongst alternative types of operations available to managers.

According to Lee & Scott (2009b, p. 270) basic factors to be considered in formulating a maintenance policy include the:

- aims and objectives of maintenance in an organisation, which spell out limits of authority and responsibilities that would regulate and guide the maintenance operatives concerned;
- maintenance standards set by management;
- statutory requirements of local authorities;
- cost objectives; and,
- methods of executing maintenance works.

A policy enables management to define its potential maintenance strategy clearly and to coordinate maintenance activities in order to achieve the best performance within available resources (Lee & Scott, 2009a, p. 30).

3.4.3.1 Types of Maintenance Policies

The types of policies for maintenance are in two categories, those designed for single units and those for multi-unit systems. Wang (2002) identified and described these

policies in detail, but a brief summary is presented. Five types of the single unit policy are:

i. **Age-dependent preventive maintenance policy**: A unit or component undergoes maintenance at a predetermined period 'T'. In case failure occurs before the predetermined time, maintenance works are carried out.

ii. **Failure limit policy:** Maintenance operations are undertaken only when the failure rate or other reliability indices of a unit reach a predetermined level.

iii. **Sequential preventive maintenance policy:** Maintained at unequal time intervals. The interval time gets shorter after every operation.

iv. **Repair limit policy:** This policy is based on cost efficiency of repairs as compared to replacement of a component.

v. **Repair number counting and reference time policy:** combines the logic of counting the number of repairs and recording the elapsed time.

The basic assumption for the multi-unit system policies is that there is virtually infinite number of disposable identical units with different life spans; salvage values for all units are negligible. Therefore, the maintenance operation for a given subsystem at any point in time depends on the conditions of other interrelated subsystems. The failure of one sub-unit may result in the possible opportunity to maintain the other sub-units.

A main type of maintenance policy for multi-units is the group maintenance policy. There are three categories of this policy.

i. T-Age group maintenance policy that is similar to the age-dependent policy of the single unit.

ii. M-failure group replacement policy: demands system inspection after 'M' failures and repairs.

iii. (M, T) group replacement policy combines the T-age and M-failure policies.

3.4.4 Maintenance Strategies

Strategies are required at every level in an organisation. They may be broad / long-term, formulated for corporate goals or specific/short-term to meet the needs of a

functional unit (Nickols, 2011, p. 4). Developing an effective strategy is associated with challenges such as resource constraints (Tse, 2010, p. 4) but the benefits compel many managers to engage in strategic planning exercises (Nickols, 2012, p. 1).

Maintenance managers usually devise strategies for carrying out maintenance activities. The effectiveness and efficiency of a maintenance strategy are reflected in the operational functions, user satisfaction and maintenance backlog of the facilities to which they apply (Abdul Lateef, 2010, p. 79). A strategically planned maintenance approach for a facility is a proactive strategy because the entire maintenance process is planned according to pre-determined criteria for best practice, and the activities are guided by the maintenance policy of the organisation concerned.

A reactive strategy is not pre-conceived, and its implementation usually lacks proper planning. A proactive maintenance strategy, on the other hand, follows a pre-determined programme of necessary tasks in response to a specific event. The activities are co-ordinated, and the use of resources is controlled. Unlike a proactive maintenance strategy, a reactive strategy is unplanned and lacks a formal policy to guide its activities. It is driven by unscheduled events with little or no co-ordination of activities and little control of resources. As a result, a reactive strategy may turn out to be ineffective. Furthermore, the operations become frustrating to the maintenance workforce, and organisational resources are wasted (Bigdeli & Safi, 2005, p. 2).

A proactive strategy adopts a variety of techniques to optimise the life of a facility and minimise rate of failure (Khazraei & Deuse, 2011). The strategic objectives, standards and resources of an organisation, are amongst key factors that determine its in-house maintenance strategy (Lee & Scott, 2008, p. 85).

Other determinants include the type of the building, such as residential, educational, recreational or hospitality (Lee & Scott, 2008, p. 83) and the resources available, e.g. time, funds, quality material and labour (Lee & Scott, 2009b, p. 271).

3.4.5 Maintenance Objectives

According to Abdul Lateef *et al.* (2011), maintenance objectives that stem from owner-organisational value systems and user requirements, are important tools for managing maintenance both strategically and operationally. From an asset value perspective, this dual advantage supports the vested interests of senior management of owner organisations in building performance (Lee & Scott, 2009a, p. 28). The objectives of maintenance are fundamental elements in understanding the purpose, scope and aim of maintenance management and their relationships with the strategic aims of an organisation (Lee & Scott, 2008, p. 94).

The choice of a maintenance strategy and its policy formulation are influenced by maintenance objectives. Maintenance objectives for facilities take the following into account:

    i. Avoidance of health and life-threatening hazards caused by dangerous materials and equipment or failure of structural elements and components;

    ii. Satisfying specific and personal preferences regarding the use of a facility (design, finishes, fittings).

    iii. Retention or enhancement of property value;

    iv. Compliance with statutory requirements and contractual obligations;

    v. Prevention of local area slum development;

    vi. Prolonging or perpetuating the useful life of a property;

    vii. Minimising the level of inconvenience or discomfort;

    viii. Avoidance of vacancies or disuse in the functional life of a property;

    ix. Ensuring that facilities are in the best functional condition, to promote focus on core activities of the users and owner organisation;

    x. Maintenance of aesthetic values of a property and its environment (Abdul Lateef *et al.*, 2010, p. 77; Overveen, 2011, p. 7; Olagunju, 2011, p. 15)

3.4.6 Maintenance Standards

The quality of maintenance service invested in a building enables it to attain certain acceptable physical, functional and economic standards set by the owner organisation as part of its policy (Abdul Lateef *et al.,* 2010, p. 77; Olagunju, 2011, p. 1).

A standard is simply an acceptable level of quality or an instrument for measuring actual attainments or performance (Olagunju, 2011, p. 1). Criteria or indicators act as instruments for measuring maintenance standards. The levels of performance of maintenance operations are gauged by the set criteria that act as indicators for achieving maintenance. They describe the conditions, which exist after maintenance tasks, are completed (Overveen, 2011, p. 7).

The technological, economic, social and political environments in which an organisation finds itself affect the standards it sets for maintaining its built environment and these standards are based on (but not limited to) the following factors:

- **Financial**: available financial resources;
- **Functional**: use of the building; and,
- **Environmental**: availability and quality of infrastructure.

According to Olagunju (2011, p. 14) maintenance standards may differ or change based on the type of utility and its value. For instance, the maintenance standard of a hotel will obviously be different from that of a students' hostel or hospital, although all these buildings are categorised as hospitality structures. Thus, residential building's function, public image, commercial value and even its status in terms of national prestige all exercise great influence on the standards of maintenance to be applied to ensure its preservation.

It is difficult for management to reach agreement about standards as not only do perceptions differ, but also they are subjective (Lee & Scott, 2009a, p. 30). Nevertheless, in setting standards, a clear understanding of the objectives for procuring and maintaining a building is essential.

The status of a maintenance department within an organisation is dependent on the strategic objectives of that organisation and the importance it attaches to the condition

of its buildings (Chanter & Swallow, 2007, p. 55). Building maintenance management is no longer an isolated function in Public and Private Sector organisations that understand its importance to their strategic goals. Such organisations consider the maintenance management of their built assets to be a strategic issue.

Research that focuses on the managerial functions of maintenance management (such as strategic decisions on maintenance planning, implementing the formulated plans and resource allocations) is important in articulating the theoretical concept of building maintenance management (Lee & Scott, 2008, p. 94).

The condition of a specifically identified built environment is a key indicator of development and the quality of life in a community, because the prosperity, social values and behaviours are reflected in the quality and conditions of their built assets (Akinsola *et al.,* 2012, p. 506; Odediran *et al.*, 2012, p. 262). Users/occupants of buildings may have simple or complex requirements and the premises they occupy are expected to meet most of these requirements (Idrus *et al.*, 2009, p. 129), because the well-being of buildings is not only important for their economic life expectancy but is even more important for the well-being of their occupants/users (Iyagba, 2005, p. 67). Accordingly, maintaining buildings is an optimum initiative and intervention for preserving and supporting the values of the built environment and its citizens (Dann *et al.*, 2005, p. 24; Idrus *et al.*, 2009, p. 128).

3.5 Theoretical Framework of Maintenance Management

As an economic function, the core objective of maintenance management relates to asset value. The main goal of the function is *"total asset life cycle optimisation"* (Pintelon & Parodi-Herz, 2008, p. 22). It deploys managerial principles to support the technical operations of either retaining a facility in its functional state; or restoring it in the case of dilapidation, severe defect or failure (Marquez & Gupta, 2006, p. 313).

The complex nature of the maintenance management process necessitates awareness and understanding of certain internal and external forces such as technology, management, operations, logistics, behavioural and cultural considerations. These

factors exert pressure on an organisation and in turn, determine the maintainability of a facility (Pintelon & Parodi-Herz, 2008; Olanrewaju, 2010). Figure 3.3 depicts the management framework within which the complex and dynamic activities of maintenance have to be co-ordinated and therefore an organisation needs to consider the environment in which it exists and its related strategic plans for maintenance management of its facilities.
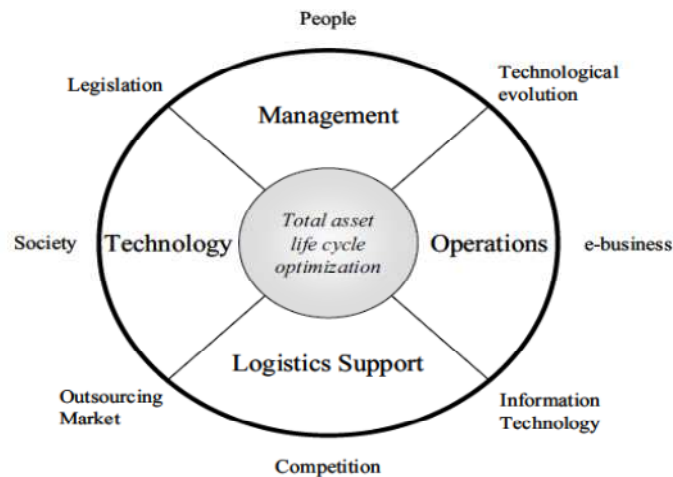
Figure 3.3 Maintenance management framework
Adapted from Pintelon & Parodi-Herz (2008, p. 22)

3.5.1 Interrelationshipof Maintenance Management with other Major Managerial Aspects

The complexity and comparatively demanding nature of maintenance management necessitate a well-structured strategy to support the core business of an organisation (Lee & Scott, 2009a, p. 26). Strategic and operational efforts of an organisation towards maintenance of its built environment assets manifest in many forms such as the condition of the buildings and their ability to remain functional through their useful lives.

Maintenance management, therefore, is a key support function in building performance because; it ensures that the functional, structural and aesthetic conditions of the buildings are upheld throughout their service life (Waziri & Vanduhe, 2013, p. 23). It deserves to be ranked as a strategic factor (Abdul Lateef *et al.*, 2010, p. 86; Olanrewaju, 2013, p. 7). In so doing, the safety and quality of life of the users/occupants are enhanced (Buildings Department, 2005).

Major aspects, which require understanding and consideration in the maintenance management of buildings are facilities, strategic and performance management, and maintenance policy/strategy (Lee & Scott, 2009a, p. 29).
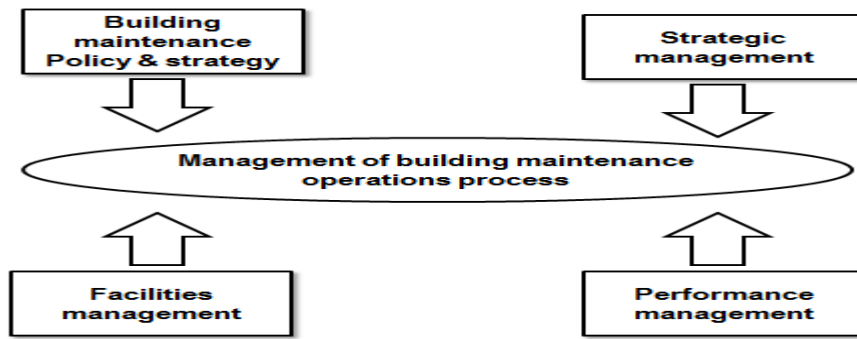
Figure 3.4 Aspects of building maintenance (Source: Lee & Scott, 2009a, p. 29)

A critical review of Lee & Scott (2009a, p. 29)'s concept gives this study a different perspective, because maintenance policy and strategy (like maintenance objectives and standards) are the managerial functions of the maintenance management process. In support of this argument, Marquez and Gupta (2006, p. 313) defined maintenance management as " ……*all activities of management that determine the maintenance objectives or priorities, strategies and responsibilities……..*"

This study merges maintenance policy and strategy with maintenance management and operation processes. Figure 3.5 presents this concept.
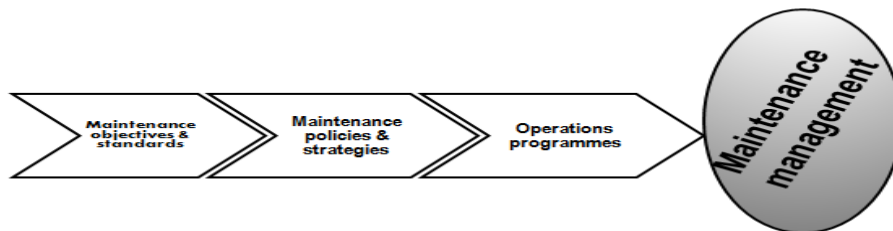
Figure 3.5 Concept of maintenance management process (researcher's construct)

3.5.2 Facilities Management

The British Institute of Facilities Management (BIFM) defines facilities management as a discipline that integrates several processes within an organisation with a view to maintaining and further developing all services that support and improve the effectiveness of the primary activities of the organisation (Waheed & Fernie, 2009, p.259). Facilities Management (FM) as a multidisciplinary function encompasses all functions that relate to asset management (Lee & Scott, 2008, p. 88). It is a key function in the management of resources, support services and the built and work environment, acting as a major support function for the core business of an organisation. It has a major impact on the success of the organisation, because it covers a wide range of services and management (Chotipanich, 2004, p. 364).

FM deals with various strategic issues; it, therefore, incorporates strategic management at the executive management level of an organisation (Lee & Scott, 2009a, p.32). It also deals with building performance issues; hence, performance management is a core function in the context of facilities management (Lee & Scott, 2009a, p. 32). FM is a major function that encompasses all property related functions and supporting activities of which maintenance, performance and strategic management are three of the numerous functions (Lee & Scott, 2008, p. 88; Lee & Scott, 2009a, p. 31).
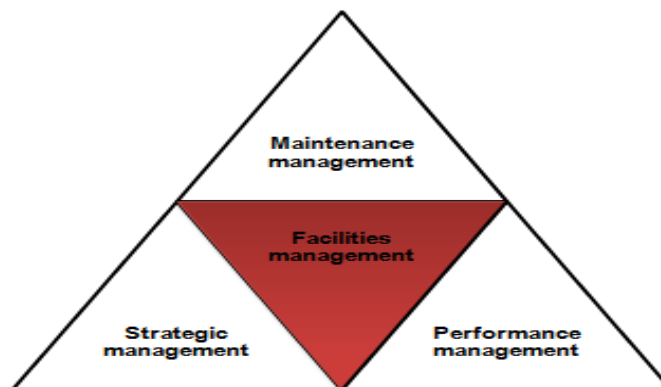
Figure 3.6 Maintenance management in the context of facilities management (Researcher's construct)

This study contends that maintenance, strategic, and performance management are major functions within the context of facilities management as depicted in Figure 3.6

3.5.3 Strategic Management as a Support Function of Maintenance Management

According to Tse (2010, p. 2) "Strategic management is a process that includes top management's analysis of the environment in which the organisation operates prior to formulating a strategy, as well as the plan for implementation and control of the strategy". Strategic management is in the domain of executive management of an organisation. Its main function in relation to maintenance management is the formulation of maintenance policies that will guide maintenance managers in preparing programmes and choice of maintenance strategy (Lee & Scott, 2009a, p. 31).

A strategy is insufficient and has little or no value to an organisation without a strategic plan for deployment and implementation of resources and operations (Wells, 2000, p. 4). A strategic plan provides an approach to bridging gaps between available means and desired ends in an organisation (Khazraei & Deuse, 2011, p. 99; Nickols, 2012, p. 1). This concept is illustrated in Figure 3.7.

Figure 3.7 Concept of strategy Adapted from Nickols (2012, p. 1)

'Means' are the resources available to achieve desired 'ends' (goals, targets, aims, objectives). Implementing strategic decisions and plans are the necessary actions that will bridge the gap between the two aspects (Nickols, 2011, p. 4). Strategic Management (SM) is a universally sought-after emerging skill because it contributes to coherence and direction of organisational affairs (Horwatt, 2006, p. 1).

The perceptions of the term 'strategic management' includes:

(i) A game plan for business operations built on the theory of 'strategy science', (Khazraei & Deuse, 2011, p. 99) that integrates both science and art in its development (Horwatt, 2006, p. 1);

(ii) An iterative process that uses a systems approach to identifying a need for change, make necessary changes and measures performance of all aspects in line with the vision of an organisation;

(iii) A means of drawing the attention and focus of senior management to any unit or process that requires strategic direction (Wells, 2000, p. 3&4);

(iv) A process that frequently generates contests or debate over significant ideas and controversial opinions; creating disagreements and conflicts among decision makers. Strategic decisions are extremely sensitive tasks that can make or mar an organisation (Pitt, 2012, p. 6) because the decisions have major consequences on an enterprise (David, 2011, p. 6).

(v) Most strategists are executive managers because they have better orientation and understanding of the business goal and vision (Pitt, 2012, p. 6; David, 2011, p. 6).

Strategy formulation, implementation and evaluation are the main stages of an SM process (David, 2011, p. 6).

3.5.3.1 Strategy Formulation

A long-term plan is developed at this stage for the effective management of environmental opportunities and threats, in light of corporate strengths and weaknesses. It includes defining the corporate mission, specifying achievable objectives, developing strategies, and setting policy guidelines (Hunger, 2011, p. 23).

An effective strategic plan maintains consistency with core mission and goals of an organisation (Tse, 2010, p. 4). Formulating alternative strategies give managers comparative advantage of strategies for their business operations (David, 2011, p. 6). It is important to provide an operations programme and evaluate any strategic plan before implementation (Tse, 2010, p. 4).

3.5.3.2 Strategy Implementation

The developed and evaluated strategic plans are executed at this stage. The implementation process involves carefully allocating roles and responsibilities among managers (typically through the design of the organisational structure), allocating resources, setting short-term objectives, and designing the organisation's control and reward systems (Tse, 2010, p. 2; Hills & Jones, 2009, p. 7).

Strategy implementation includes developing a strategy-supportive culture, creating an effective organisational structure, redirecting marketing efforts, preparing budgets, developing and utilising information systems, and linking employee compensation to organisational performance (David, 2011, p. 6).

3.5.3.3 Strategy Evaluation

At this stage, effectiveness of the strategy is evaluated to locate shortfalls of the plan for necessary adjustment or change where the desired results are not achieved (Tse, 2010, p. 4)

3.5.4 Performance management as a support function of maintenance management

Performance management (PM) concerns itself with creating an enabling environment for optimal operation and functioning in an organisation (ACCOSCA, 2013, p. 2). It ensures that the goals are achieved consistently in the best efficient and effective manner by linking individual performances and objectives to overall mission and goals of the organisation (Aguinis, 2011, p. 1/2).

PM does not focus only on individual or team (employers and employees) performance in an organisation; it deals with various departments/units; all processes and programmes aimed at achieving optimum success in the business of the organisation as an entity (Mirani, 2004, p. 5). The PM process starts with the strategic aims and objectives of the organisation. It studies and aligns missions and visions of respective departments or units within an organisation (ACCOSCA, 2013, p. 3). According to Fraser (2007, p. 2) PM focuses on three key functions to improve efficiency and they

are; establishing links between corporate planning, setting budgets, service planning and monitoring (Aguinis, 2013, p. 2).

3.5.4.1 Importance of Performance Management

PM is a strong change facilitator in an organisation; it enables better understanding of employees (subordinates) that furnishes employers with ideas on boosting their employees' self-esteem, develop their competencies and motivation to perform.

Secondly, organisational vision and goals become clearer to all workers, from the top down to the last level in the hierarchy of the organisation; as a result, there will be better understanding of job definitions by the workforce.

Thirdly, identifying appropriate administrative actions is easier with the aid of performance evaluation for review and subsequent implementation (Aguinis, 2013, p. 4). As a fundamental principle of management, performance measurement is crucial in the PM process. It provides an important link between strategies and management actions and supports the development of performance indicators that are instrumental in the evaluation of performance (Munchiri, Pintelon, Gelders & Martin 2011, p. 296).

Another important function of PM is benchmarking; a multiple step process that allows an organisation to:

- compare the aspects of performance and identify the differences;
- seek out alternative approaches;
- assess opportunities for improvement; and,
- implement change, and monitor outcomes (Róka-Madarász, 2011, p. 161).

Other important functions of PM include setting goals and objectives, observing performance, education and training, receiving feedback and conducting reviews (Aguinis, 2013, p. 4).

Performance management of buildings deals mainly with health and efficiency issues such as, degree of hygiene, safety, indoor air quality, thermal comfort, the building facilities management and energy efficiency (Lee & Scott, 2009a, p. 31).

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Within the domain of performance management, performance evaluation provides an understanding of the physical and functional conditions of existing buildings (Okolie, 2011, p. 4). Monitoring the progress of maintenance operations is an important activity in performance management and the tasks involve a critical appraisal of resource input and the expected outcomes in relation to the strategic objectives of the organisation (Munchiri *et al.,* 2011, p. 295).

3.5.5 Influence of Strategic and Performance Management on Maintenance Functions

Maintenance management has evolved from a stand-alone technical function to a multi-functional process that involves key management units (strategic and performance managements) of an organisation (Yahya & Ibrahim, 2010, p. 1):

- SM has a major influence on maintenance management processes in an organisation because the maintenance objectives must align with the main objectives of the organisation (Yahya & Ibrahim, 2010, p. 6)

- The position of a maintenance department within an organisation is dependent on the strategic objectives of that organisation and the importance it attaches to the condition of its buildings (Chanter & Swallow, 2007, p. 55).

- SM guides the formulation of maintenance policy, determines the strategic direction, approves the budget and other necessary resources for maintenance management (Lee & Scott, 2009b, p. 270)

- PM measures performance and the quality of the maintenance activities and identifies areas that require improvement (Yahya & Ibrahim, 2010, p. 6)

Effective and efficient maintenance depends on available information on the criteria that influences user satisfaction, nature of defects and maintenance performance metrics (Abdul Lateef *et al.*, 2010, p. 78). The effectiveness and efficiency of the maintenance management system developed from the criteria described are reflected in the service delivery and the amount of maintenance backlogs (Abdul Lateef *et al.*, 2010, p. 78).

3.6 Conceptual Framework of Maintenance Management

Conceptual framework in research refers to the vision and plans of the researcher that is developed from the established theoretical framework. The conceptual framework provides rationale and the scaffolds for undertaking the next stage of a research process, i.e. the methodology.

The literature reviewed in this research provides an understanding that the functions of strategic, performance and maintenance management in organisations have a major influence on the maintenance management systems (referring to section 3.5). Furthermore, it has been revealed that interrelations between the three aspects are important for effective maintenance management. In essence, none of the individual management aspects can do without the other in providing an effective maintenance system for a built facility.

Therefore, understanding the management strategies of the universities will provide an understanding of maintenance practices for students' hostels in the institutions. Based on the concepts emanating from the theoretical aspects of maintenance management, which are central to this study, Figure 3.8 presents a conceptual framework to guide the method of investigation for the internal environment of the universities as they relate to the maintenance management of the hostel buildings.
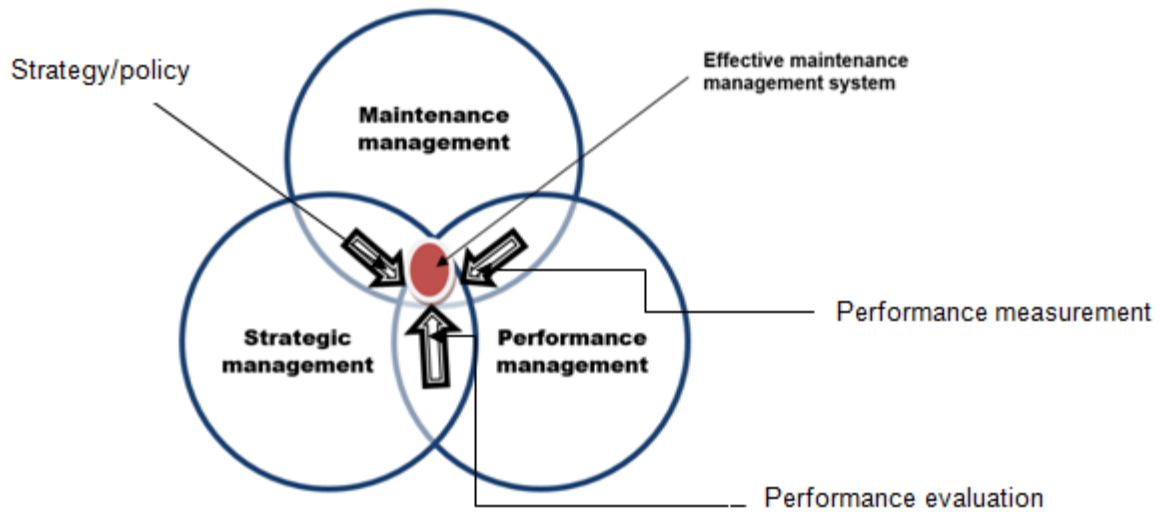
Figure 3.8 The concept of an effective maintenance management system (researcher's construct)

The public organisations are constantly under social, political and economic pressure, which has a major influence on their internal affairs and success in achieving their set goals (Chanter & Swallow, 2007, p. 56).

The environmental analysis of the Nigerian universities (referring to section 1.3) reveals that the behaviours of the EEF during the four prominent historical periods in the country had a major influence on the establishment of its universities. This in turn had influenced the design and construction of the on-campus hostels that are key factors that determine the maintainability of the buildings. Therefore, the conceptual framework of this research is mindful of the EEF. Thus, the conceptual framework includes the hovering factors around the internal framework as presented in Figure 3.9.
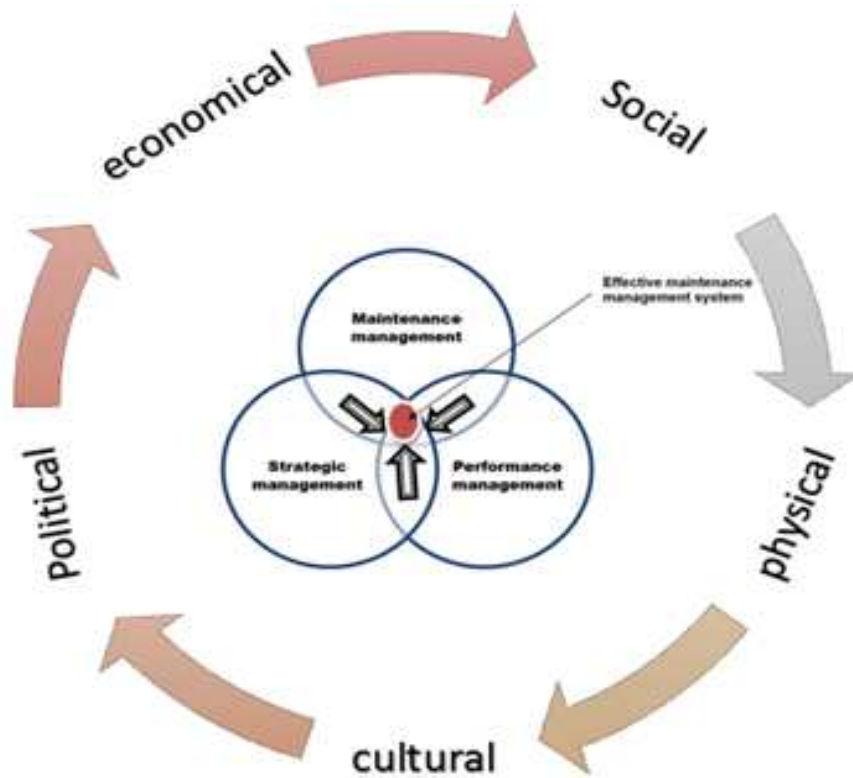
Figure 3.9 Conceptual framework for this research (researcher's construct)

Figure 3.9 depicts the conceptual framework of the study. The framework encompasses both the external and internal environment of a typical institution to be studied. The conceptual framework provides the scaffolds on which the research methodology hangs.

3.7 Conclusive Remarks

This chapter has presented the underpinning theories of maintenance management and has discussed its interrelationships with strategic and performance management. The association of three management aspects (Maintenance, strategic and performance) with facilities management are also clarified. The chapter further presents the conceptual framework that guides the research inquiry. The next chapter presents a theoretical understanding of methodology and describes the approach adopted for this research.

Chapter 4: The Research Methodology

4.1 Introduction

This chapter demonstrates the researcher's articulation of basic concepts and principles of conducting academic research. It begins with the general approaches to the specific methodology adopted in this research. The philosophy and paradigm of the research are clarified in this chapter. The data type and sources; population and samples used in the study are discussed. The chapter concludes with the ethical considerations of the research.

4.1.1 Research Design

Research methodology is the design or framework that provides the layout of the study from inception to completion. The basic constituents of methodology are assumptions, postulations, regulations and actions. The research design empowers a researcher to choose a research method that suits the type of investigation a study requires (Schensul, 2008, p. 516).

The development of a research design is based on the purpose of the research and nature of the research questions because they provide important insights about the problem under investigation (Wahyuni, 2012, p. 72). Therefore, the design of this research is based on a main research question that is stated as, 'What are the current strategies used in the maintenance of on-campus hostel buildings in public and private universities in Nigeria?'

Designs in research are strategies that span decisions from broad assumptions to detailed methods of data collection and analysis (Creswell, 2009, p. 3). A research design enables resolution of an identified research problem by providing the researcher with a definite strategy (Leedy & Ormrod, 2013, p. 74). The problem identified in this research (section 1.5) is that there is little understanding of the on-campus students' hostels maintenance management strategies in the Nigerian universities.

The strategy for the investigation of the problem began with an articulation of the background of the establishment of Nigerian universities and their on-campus students'

hostels. Secondly, a theoretical framework of building maintenance management was articulated which, paved way for establishing the conceptual framework that will guide the choices of and scaffolding of the proposed research method.
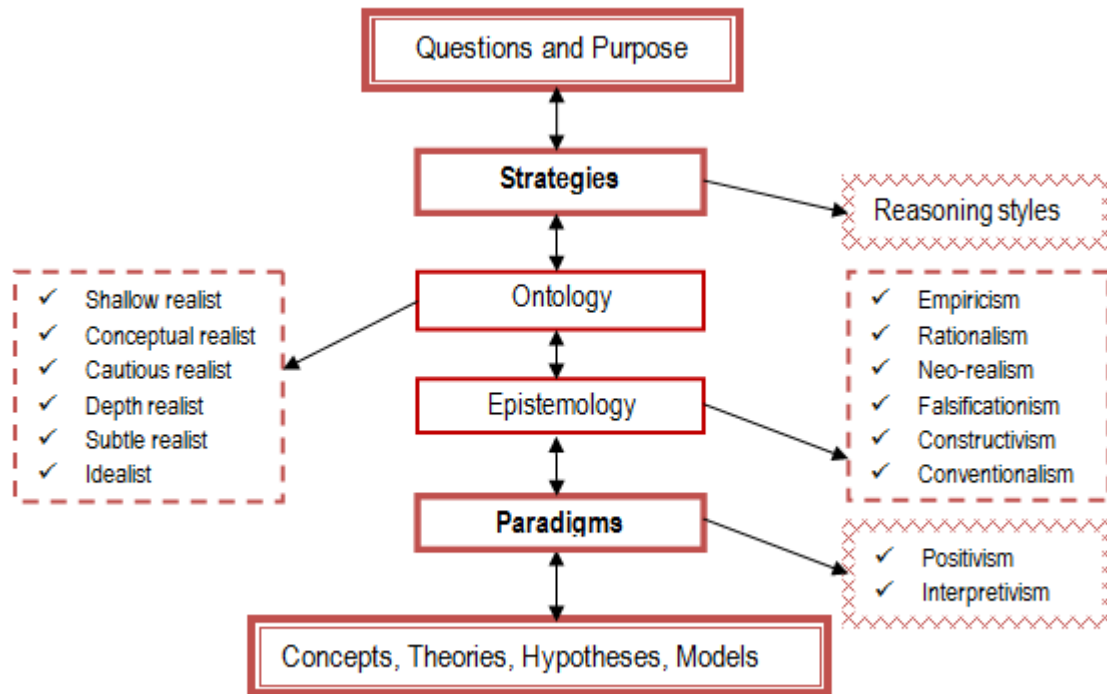
Figure 4.1 A research framework (Source: Blaikie, 2010, p. 81)

A research design is influenced by certain philosophies and paradigms because it is difficult and almost impossible to separate a researcher's assumptions, beliefs and perceptions from the manner in which the research is approached. Therefore, the philosophical underpinning and paradigm of the research, the research reasoning and the data are discussed in the following sections.

4.2 The Research Philosophy

Philosophical positions often inform the choice of research design and subsequent methods of undertaking research. The philosophical positions are often rooted in people's sociological backgrounds. However, in undertaking an academic research, the nature and type of the problem that a research identifies and seeks to resolve determines the philosophical position of the research and the method that must be adopted (Shakantu, 2004, p. 160).

The two major philosophical backgrounds that an academic research needs to consider are the ontological and epistemological dimensions (Wahyuni, 2012, p. 69). These backgrounds describe certain assumptions, perceptions and basic knowledge of reality that have tendencies of influencing the way that a research is approached. An understanding and clear discussion of these philosophical stances is necessary to enable the selection of appropriate approaches that are congruent to research investigation. In addition, measures are taken to expose and minimise the biases of a research (Flowers, 2009, p. 1).

4.2.1 The Ontological Background of Research

Ontology in research is described as the study of the concepts of reality and it concerns itself with the reality of being; it asks questions about what really exists and the origin of reality (Neumann, 2011, p. 92; Eriksson & Kovalainen, 2008, p. 13). The perceptions, beliefs and assumptions in ontology make claims about the existence of certain social phenomena, the circumstances surrounding the existing phenomena, and the interrelationships (Blackie, 2010, p. 92).

Ontology deals specifically with the objectivity or subjectivity of the nature of reality that is created in people's minds (Flowers, 2009, p. 2). An aspect of ontology draws the line between what is considered objective and what is subjective.

Objectivism assumes that reality exists independent of the knowledge seekers, while subjectivism (constructionism) assumes that reality of the social world is created from social interactions of the actors (Eriksson & Kovalainen, 2008, p. 13).

The ontological background in research has a close relationship with the epistemology, and every ontological position has a corresponding epistemological position (Eriksson & Kovalainen, 2008, p. 13). Therefore, an equal articulation of the underlying concepts of epistemology is necessary for this research.

4.2.2 The Epistemological Background of Research

Epistemology in research is all about knowledge, that is, the concept, sources and the extent of knowledge, it further concerns itself with the rationale and justification of knowledge (Stone, 2008, p. 264). To a large extent, the epistemological aspect of philosophy in research deals with the creation of knowledge and the arguments surrounding the possibilities of knowing (Eriksson & Kovalainen, 2008, p. 14).

Epistemology also holds its views about objectivism and subjectivism. The objectivist assumes that knowledge about the external world is accessible with little or no manipulations. A subjectivist, on the other hand, assumes that it is possible to acquire knowledge about the external world by observing and interpreting (Eriksson & Kovalainen, 2008, p. 14).

4.2.3 Combination of Ontological and Epistemological Assumptions

The epistemological and ontological assumptions in research are not taken independently. Ontological positions, that are assumed in the research, have appropriate epistemological perspectives (Blaikie, 2010, p. 95).

However, there is a realist ontology known as the 'subtle realist' that cannot be combined with any of the epistemology. In the same way, there is an epistemological position referred to as 'conventionalism' that cannot be in combination with any of the ontological positions. Therefore, they are alternatives and could be adopted as variations to others (Blaikie, 2010, p. 94).

The likely or common combination of these assumptions are presented on Table 4.1

Table 4.1 Common Combinations between Ontology and Epistemology
Extracted from Blaikie (2010, p. 94)

Ontology	Epistemology
Shallow realist - Researchers study phenomena that exist independently of the researcher - only the observed is true and relevant - there are patterns or sequences in observable phenomena, and the challenge for science is to discover and describe them.	**Empiricism** - Knowledge is a product of and verified by the use of human sense. - A neutral, trained observer, who has undistorted contact with reality, can arrive at reliable knowledge - Concerned about the accuracy of Knowledge about the external world.
Conceptual realist - Reality has an existence independent of human minds - It is not the property of any individual or the construction of social community - It is a collective consciousness, or structure of ideas, and is not directly observable.	**Rationalism** - Knowledge is a product of the direct examination of the composition of the human mind. - Logistics is the standard for judging claims about knowledge.
Cautious realist - reality has an independent existence - however, because of imperfections in human senses, and the fact that the act of observing is an interpretive process, it cannot be observed directly or accurately. - Hence, a cautious and critical attitude must be adopted.	**Falsificationism** - Knowledge is created through trial and error in which theories are proposed and tested against empirical evidence. - Reality cannot be observed directly. Therefore, theories are rather tested to falsify than confirm - It is impossible to establish the truth about knowledge. Therefore, it must be open to review.
Depth realist - Therefore, reality is stratified and has ontological depth. - There are three basic domains of reality: empirical, actual and real. - Social world does not exist independently of the activities they influence or social actors' conceptions of what they are doing in these activities.	**Neo-realism** - About a phenomenon is derived from the Knowledge structure that produced it. - Postulation may be necessary to enable the discovery of the structure that produces knowledge.
Idealist - Reality is a product of the human mind. - Consists of shared interpretations that are produced and reproduced by the actors.	**Constructionism** - Knowledge is created from the interpretations that observers make about their experiences of the social world. - The mode of inquiry about the social world reflects the true assumptions of the knower. - The criteria to ascertain the truth about knowledge has tendencies of changing at any time

4.2.4 The Philosophical position of the research

This research aimed at establishing an understanding of the maintenance management systems in place for the on-campus student hostels at the Nigerian universities. The nature of the problem suggests an in-depth study of the phenomena. Therefore, the idealist ontology is assumed that is in combination with the constructionist epistemological position.

4.3 Research Paradigms

A research paradigm, in the social sciences, describes the broad framework of reasoning and organising of observations in research (Babbie, 2007, p. 31). Paradigms are assumptions and perceptual orientations shared by academic researchers. Paradigms define the perceptions of the researchers with regards to phenomena and that determine the procedures that should be employed to study those phenomena (Donmoyer, 2008, p. 591).

Positivism and phenomenology are two extremes of research paradigms, and each paradigm is based on the two assumptions (ontology and epistemology) discussed under section 4.2. The following subsections (4.3.1 and 4.3.2) present the researcher's understanding of the arguments around the two paradigms,

4.3.1 Positivist Paradigm

The positivist paradigm is one of objectivism, because the observer and the observed phenomenon are separate entities. Positivists believe that a researcher's approach to inquiry must be unbiased. The positivist suggests that the generation of discernible and measurable scientific data that should employ absolute senses, by so doing, subjectivity is minimised or eliminated (Okolie, 2011, p. 127)

Positivism is concerned first with empiricism (a view that knowledge can only be derived from experience) and secondly the use of logical analysis (Paley, 2008, p. 647).The positivist view of the researchprocess is represented in Figure 4.2.

Figure 4.2 The positivist approach to research (Raddon, 2007, p. 13)

An advantage of positivism is that the researcher has a clear theoretical focus of the research at an early stage of the research process. For this reason, control of the research process is much easier. However, the research approach is weak in providing in-depth understanding of social phenomena. It is also difficult to explore the meanings attached to social phenomena (Raddon, 2007, p. 7).

4.3.2 Phenomenology/Interpretivist Paradigm

The interpretivists assume that focusing on the meanings and interpretations of a phenomenon enable the researcher to explore and gain understanding of the phenomena under study from which knowledge is produced. The meaning and interpretations of the researcher are established on the views and experiences of the research participants (Ormston, Spencer, Barnard & Snape, 2013, p. 12).

Interpretivism argues that theories in the social world are derivable from concepts and meanings that the social actors provide to researchers. In essence, social reality can be regarded as the product of the people that live in the social world under study (Blackie, 2010, p. 99). Reality is not produced from individual acts, rather, by complex but organised behavioural patterns (Eriksson & Kovalainen, 2008, p. 20). The research process according to the interpretivist stance is presented in Figure 4.3.
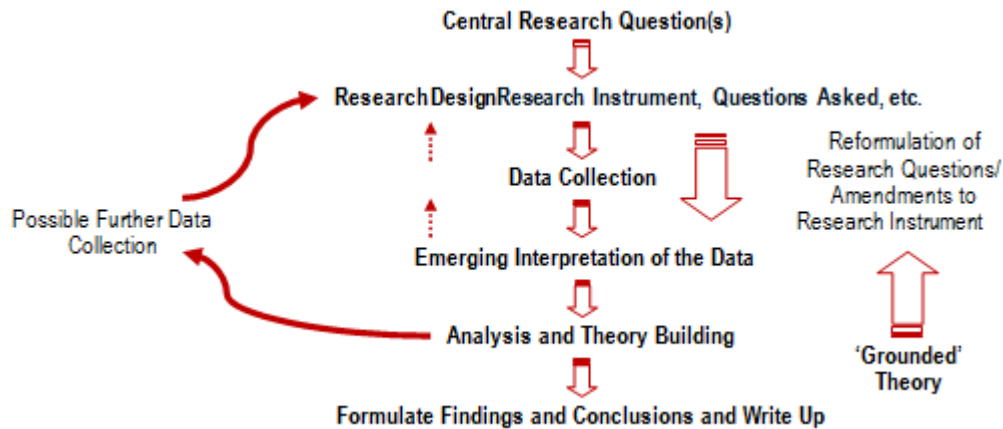
Figure 4.3 The Interpretivist approach to research (Raddon, 2007, p. 14)

Interpretivism provides an in-depth understanding of the 'how' and 'why' in research. Therefore, the researcher gains deeper understanding of the social phenomena. The approach gives room for contextual factors and allowances for complexity, hence the high degree of flexibility of the research process when compared to the positivist approach (Raddon, 2007, p. 7).

4.4 Research Reasoning

The term reasoning in academic research refers to the logic of undertaking research. It deals with the strategies that researchers adopt to produce or reproduce knowledge. The two major strategies are the deductive and inductive reasoning. The deductive reasoning is strongly influenced by the positivist views while the inductive is influenced by the interpretivist views (Okolie, 2004, p. 122; Eriksson & Kovalainen, 2008, p. 21). The two major reasoning styles are discussed in sections 4.4.1 and 4.4.2. The reasoning strategy adopted in this study is presented in section 4.4.3.

4.4.1 Deductive Reasoning

The deductive reasoning approach in academic research is a strategy that a researcher can adopt in studying a phenomenon. The researcher begins with the broad and general information related to the study and gradually narrows to more specific issues.

The deductive strategy is also referred to as the "top-down" approach (Aqil Burney, 2008, p. 4).

An example of this style of reasoning in research is a study that starts with an existing theory and narrows down to more specific hypotheses. The hypotheses developed are further narrowed down when observations are made to enable the testing of the hypotheses. The specific data, that are generated during the course of the research, are used to test the hypotheses that lead to a decision on whether to confirm the original theory (Cossman, 2012, p. 1). Conclusions are reached logically from available facts (Aqil Burney, 2008, p. 4).

The 'why' questions, which are asked in any social research seek answers that can only be found when detailed explanations of observed behaviours are provided. The 'why' questions are answered in deductive reasoning with the aid of existing theories or by developing new ones (Blaikie, 2010, p. 85).

The steps involved in deductive reasoning are outlined as follows:
  i.   Generate tentative hypotheses that form a theory
  ii. Deduce likely conclusions emanating from the hypotheses
  iii. Elucidate the conclusions and the logic of the surrounding arguments
  iv. Test the conclusion by gathering appropriate data and analysing the data systematically; and,
  v.   The result of the test validates the theory (Blaikie, 2010, p. 85).

The important point is that a theory has to be created or adopted. The theory must be expressed as a deductive argument, and the theoretical ideas that lead to the conclusion provide the explanation (Blaikie, 2010, p. 86).

4.4.2 Inductive Reasoning

Inductive reasoning is an inverse of the deductive reasoning. The researcher moves from specific observations to broader generalisations and theories. This is an approach sometimes referred to a "bottom up". The process involves detecting patterns and

regularities, formulating tentative hypotheses that will be explored, and finally conclusions are drawn and theories developed (Cossman, 2012, p. 1).

The inductive reasoning is used in pursuit of understanding and knowledge, establishing a relationship between observations and theory. Science applies inductive reasoning to establish theories, the purpose of which is to remove the need for continual observation so as to make statements about reality, using past experience to generalise with reasonable levels of certainty about the future (Fox, 2008, p. 430).

Inductive strategies apply less structured methodology to generate rich in-depth information thereby providing clearer insight about a phenomenon (Sutrisna, 2009, p. 9) In an attempt to provide answers to the phenomena in question, inductive researchers try to keep their minds open for any possible results while proposing further steps for data collection. In the social sciences, qualitative research methods adapt inductive reasoning because the reasoning strategy supports extending existing theory into a new setting or to develop understanding and theory where none currently exists (Fox, 2008, p. 430).The inductive strategy involves a higher degree of uncertainties than the deductive (Aqil Burney, 2008, p. 5).

4.4.3 Reasoning Strategy

The peculiarities of the research inquiry necessitated the adoption of the inductive reasoning strategy. The inductive reasoning was used because it allows the in-depth investigations that provide deeper understanding of phenomena which is the main goal of this research.

4.5   Research Methods

The discipline of research or body of knowledge utilises certain established techniques in conducting scientific research. The principles and procedures of the techniques are the research methods (Kinash, 2008, p. 3). There are two major types of methods in research, the quantitative and the qualitative methods. A third one is the mixed method. As the name implies, the mixed method combines both qualitative and quantitative approaches when investigating a phenomenon.

4.5.1 The Quantitative Method

The procedure involves a systematic collection and analysis of data in numerical forms (Donmoyer, 2008, p. 718). There are different levels for measuring data empirically; they are nominal, ordinal, interval and ratio. The nominal scale is commonly used because values can be assigned to objects, people and events in terms of the characteristics they share (Blaikie, 2010, p. 206).

4.5.2 The Qualitative Method

The qualitative method is inductive and the flexible. The nature of this method proffers a unique ability to probe into responses or observations as required therefore it enables the researcher to obtain more detailed descriptions and explanations of experiences, behaviours, and beliefs (Guest, Namey & Mitchell, 2013, p. 21).

Table 4.2 presents a summary of the methods as they are applied in scientific research.

Table 4.2 The Research Methods: how they are utilised (Source: Cresswell, 2003)

	Quantitative Method	Qualitative Method	Mixed Method
Mode of Approach	**Predetermined** - Tests or validates theories - Identifies variables to study - Relates variables to hypotheses - uses standards of reliability and validity - Observes and measures information numerically	**Emerging** - Focuses on a single phenomenon to enable in-depth study - Brings personal values into the study - studies the context or setting of participants - collaborates with the participants	**Both predetermined and emerging** - Employs both quantitative and qualitative procedures - Develops a rationale for combining the two procedures - Integrates data at different stages of enquiry
Questionnaire design	Structured questions	Unstructured	Both structured and unstructured
Types of data	- performance - Attitude - Observational - Census	- Interviews - Document - Audiovisual	Multiple forms drawing on all possibilities
Analysis	Statistical	Text and image	Combines both statistics, and text, could use the image if it needs be
Inquiry Strategies	- Experimental - Non-experimental	- Narratives - Ethnographies - Grounded theory - Case studies	- Sequential - Concurrent - Transformative

4.6 The Methodology of this Research

This research sought understanding of the multifaceted nature of maintenance management practices at the selected campuses of Nigerian universities. The research paradigm is phenomenology because the study involved discovering the existing and underlying facts about the maintenance strategies and the current condition of the on-campus hostels. The ontological position of the research is idealist because, the mode of inquiry involves intensive or in-depth study of selected universities; whilst the epistemological position is constructionism that is usually used in combination with the idealist ontology (Cresswell, 2009, Blaikie, 2010, p.94; p. 13; Struwig & Stead, 2013, p. 7).

This research adapted the qualitative method that is rooted in the phenomenological paradigm. There are several types of qualitative methods, for instance, ethnography, grounded theory, case study. The requirements of a particular research determine the choice of a method or a combination (Cresswell, 2009, p. 12).

The case study approach was used because it allowed in-depth study of the selected universities. Moreover, the emphasis in a typical case study is on comprehensive description and understanding of the phenomenon (Struwig & Stead, 2013, p. 7). The method is suitable for understanding a shady system under investigation by taking detailed records about the context surrounding the case.

In essence, the case study approach was instrumental in providing an understanding of the maintenance systems in the selected universities which are the purpose of the study. Furthermore, information about the physical environment and any historical, economic and social factors that have a bearing on the maintenance situation were obtained through observations, interviews, visual materials and other documented information (Leedy & Ormrod, 2013, p. 141).

4.6.1 Sources of Data

An exploratory research investigates a phenomenon of which little is known; it aids in gathering a lot of information from a small sample (Struwig & Stead, 2013, P. 6).The exploratory nature of the study indicated that the emphasis is on discovering the

maintenance management strategies by the maintenance management departments/units of selected universities' students' hostels in the nine case studies identified. Data for the study were solicited from both secondary and primary sources.

4.6.1.1 Secondary Sources

The secondary data for this research were sourced from an intensive literature search with the purpose of articulating the relevant theories, concepts and principles of maintenance management of students' hostels at the universities. Published and unpublished sources were consulted for this exercise. The sources include relevant periodicals, conference papers, textbooks, dissertations and theses from research institutions, with the aid of library reference services.

4.6.1.2 Primary Sources

Primary data are original, unprocessed data collected or observed by the researcher (Babbie, 2007). Two types of data were generated and used in this research. They are recorded unstructured and semi-structured in-depth interviews with stakeholders at the various case study areas and condition surveys of the buildings through direct observations, inspections and photographs that provided evidence to support the research aim.

4.6.1.3 Observations

Observations in qualitative research capture data in true-life context because the observer does not tamper with the natural setting of the environment; the exercise may require walk-through and inspections (Struwig & Stead, 2013, p. 104).

Personal on-site observation of on-campus hostels was carried out with the aid of cameras. This captured data on the types and nature of the hostels and magnitude of problems in terms of the deterioration rate, operational state, spaces, comfort and hygienic sanitation. The condition survey instrument developed followed the concepts of Abbott, *et al.* (2007) and Straub, (2009). A pilot survey of the buildings was carried out to acertain the nature of the facilities. Various components were observed and their conditions were described thereby informing the categories of defects. The instrument was tested for efficacy and to train research assistants for the main exercise.

4.6.1.4 Interviews

An interview is a method of data sourcing that permits the researcher to discuss with participants issues that relate to the research problem (Litchtman, 2010, p. 139). Group discussion may be appropriate if all members of the group have experience of the issue under study.

Group interviews provide broad information about a social issue within a community, giving in-depth understanding of how the decisions about social contexts are formed and how such decisions drive the system (Brikci & Green, 2007, p. 16). There are two types of group interviews described in Table 4.3

Table 4.3 Types of group interviews (Source: Brikci & Green, 2007, p. 16)

Group Interview Type	Features
Focus groups	- Participants are selected to meet sampling criteria - Seeks broad range of ideas on an open-ended topic - Formal, controlled, pre-arranged time and place - Usually audio-taped and transcribed for analysis
Natural group	- Group exists independently of the research study - Formal or informal format - Interview guide loosely followed - Often recorded by written notes

The interviews, which were conducted, included questions related to the impact that the condition of the facilities has on the students' living and learning that cannot be accurately determined by observation. The participants were stakeholders such as staff of maintenance departments/units (particularly those associated with student hostels) and the staff of the SADs at the respective universities. The interviews solicited opinions about the maintenance systems used on their hostel buildings.

4.6.2 Population and Sample

The term population refers to the whole set of entities with members that share certain properties or have similar characteristics. In the context of research methods, the population constitutes of every entity that fits the criteria (broad or narrow) laid by the research.

A very small group may constitute a population provided the research criteria set for belonging to the group are tightly defined (Saumure & Given, 2008, p. 644). The decision to study a whole population or a sample (fraction) of the population will depend on the best feasible approach that will address the research questions appropriately (Saumure & Given, 2008, p. 644). A sample constitutes a set of data drawn from a population of potential data sources. Selecting a sample begins with defining the population that is eligible for inclusion in the study (Morgan, 2008, p. 797).

The research population of the study is universities in Nigeria, from which a sample of ten universities out of nineteen universities in the North-central region was selected for the study. This sample was composed of on-campus hostel buildings and the opinions of on-campus hostel managers of the institutions, and was based on a purposive sampling technique.

According to Blaikie (2010, p. 178), a purposive sampling technique is a non-probability method that is used to select cases for a study based on the researcher's judgement of the appropriate cases, for instance, selecting a variety of types of cases for in-depth investigation. Therefore, the purposive sampling technique was adopted because it is the most appropriate technique for the in-depth study.

4.6.3 Treatment/analysis of Data

The data that were generated were sorted, coded and re-organised according to cases and questions to identify patterns and relationships between categories. Observations were presented with the aid of bar charts (for the condition ratings), and pictures were presented as figures and interpreted directly. Recorded interviews were transcribed and interpreted as appropriate.

4.6.4 Validity/Reliability

Validity is an essential indicator of research quality, which will in turn determine the extent to which the findings can be trusted (Miller, 2008, p. 910). The selection of the participants was purposeful; therefore only relevant participants were involved. The findings were verified by cross-checking with the participants and self-reflections. This

exercise ensured that all results, which emanated from the study are true evidence that provided convincing conclusions.

4.6.5 Ethical Considerations

Addressing ethical issues such as rights and protection of participants and obtaining their consent and the need to emphasise voluntary participation are very important in conducting research (Blumberg, Cooper & Schindler, 2011, p. 114-115, Fox & Bayat, 2012, p. 148). In addition, confidentiality and anonymity of participants are essential ethical considerations in a research study (Blumberg *et al.*, 2011, p. 114-115). Therefore, this research was conducted with the following ethical issues in mind:

- *Plagiarism*: the research acknowledges the work of others used as materials in the research work. All sources of information are identified and appropriately referenced. The authors of research articles accessed through both the electronic and print media are also referenced.

- *Informed consent*: the language used during the interviews were reasonably understood by the research participants – their appropriate and informed consent was obtained and documented;

- *Confidentiality and anonymity*: responses from the interviews were treated with absolute confidentiality, and the generated data were used for academic research purposes only. The identities and other confidential interests of the participants are not going to be disclosed.

- *Compliance with law and standards*: the research was undertaken within the permitted rules and regulations of the Nelson Mandela Metropolitan University about research.

- *Honesty and trust*: the research is presented as it is. All data-collection conditionality were observed.

- *Harm and risk*: the principle of non-malevolence (no harm) takes precedence in this research work.

4.7 Conclusive Remarks

The chapter discussed the research philosophy, paradigm, reasoning strategy and the method of investigation adopted. It elaborates on the type of data collected; sources of the data; and the collection techniques. In the next chapter, the data are presented, analysed and discussed.

Chapter 5: Case Studies, Data Presentation and Results

5. 1 Introduction

This chapter presents the three categories of cases studied (universities). A section is devoted to each university. Each section begins with an overview of the university and structures of the student hostels on the campuses. Secondly, pictographic presentations of the on-campus hostels are provided to support the physical condition evaluations of the hostel facilities. Condition evaluation results of the various components within the buildings are presented on bar charts and discussed appropriately. Thirdly, the results of the exploratory interviews that sought understanding of the maintenance management systems of each university studied are also reported.

A letter was sent to each case study organisation that is included in this research report requesting permission to conduct research on the maintenance management systems of their on-campus student hostels. In each case, a response to the letter from the management of the university, granting approval to conduct research, was received before condition surveys and interviews were conducted.

The cases A1, A2 and A3 are the FGN-owned universities; The SGs-owned universities studied are cases B1, B2, B3 and B4. Cases C1, C2 and C3 are the private universities.

5.2 Case A1

University A1 is a conventional university with a vision of becoming excellent and Nigeria's leading university that will be recognised for excellence in capacity building and service delivery. It was established in 1988 with skeletal administrative activities on the "mini-campus" located in a town, 60km away from the capital city of Nigeria.

The University has a vision to develop an institution of higher learning that combines academic excellence with the pursuit of the unity of Nigeria. Its mission is to provide instructional, research, and public service programmes that guarantee academic excellence. It has a secondary objective of operating a strong and virile distance-learning component that ensures equal educational access to a large constituency.

The several objectives of the University are outlined in section 1 (3) of the university's Act – 106 (1992) cap U2 LFN (2004). The key objectives are:

- To proffer the opportunity of acquiring higher liberal education to all candidates that meet the admission requirements for any programme offered by the university without distinction of race, creed, sex or political conviction.
- To provide courses of instruction and other facilities for the pursuit of learning in all its branches, and to make those facilities available to such persons as are equipped to benefit from them;
- To relate its activities to the social, cultural and economic needs of the people of Nigeria;
- To proffer distance learning and continuing education in various disciplines to cater for the interest of the working class or those who cannot benefit from the full-time university education.

The University runs several programmes under ten faculties; the student population is approximately 10,000. In addition, there is a school of graduate studies, which runs postgraduate programmes in several disciplines. A Centre for distance learning and Continuing Education, located in the heart of the city of Abuja, provides educational opportunities for workers and other mature students.

The institution commenced full academic activities on the mini-campus in 1990.The available building structures include administrative buildings, staff offices, lecture halls, laboratories and hostels for students. In the same year, the University was allocated over 11,800 hectares of land closer to the capital city along the road to the international airport road for developing a main campus.

The development was to meet a pressing need of accommodating the rapidly increasing population of staff and students, as well as provide for a better-equipped and more conducive academic environment. In 2005, most administrative and academic activities moved to the main campus of the University.

5.2.1 The student hostels on the campuses of Case A1

The university has provided hostels for students on its two campuses. On the "mini-campus", there are 60 blocks of 4 rooms for the female students; 21 blocks of 8 rooms and one block of 17 rooms for the male students. On the main campus, there is a block of about 100 rooms for the female students and a similar block for the male students.

The existing hostels on both campuses accommodate about 6000 students comfortably. Many students reside off-campus. The Figures 5.1 to 5.7 show the hostels on the main campus as discussed on the previous paragraph

Figure 5.1 Hostel building for female students on the main campus at Case A1

Figure 5.2 Views of the male students' hostel on the main campus at case A1

A new female hostel block of about 16 rooms has just been completed, but yet to be commissioned. Management has proposed construction of more on-campus hostels when the FGN releases the annual Education Trust Fund (ETF) allocations for capital projects. The university has no need for off-campus hostels because the campus can

accommodate as many structures as it desires comfortably without distorting the master plan.

Figure 5.3 New hostel building for female students at Case A1

5.2.2 Physical Condition of the Hostels

The current conditions of both female and malestudent hostel blocks on the main campus are presented with the aid of photographs and bar charts.

5.2.2.1 The Conditions of the Female Hostel Block

Figure 5.4 depicts two views of the open spaces within the female hostel block. The picture on the left shows the poor condition of courtyard and the plumbing defect that has affected the walls of the building. A typical corridor on the ground floor is shown on the right.

Figure 5.4 Views of the courtyard and a corridor at the female hostel block at Case A1

Figure 5.5 An open laundry space in the female hostel at Case A1
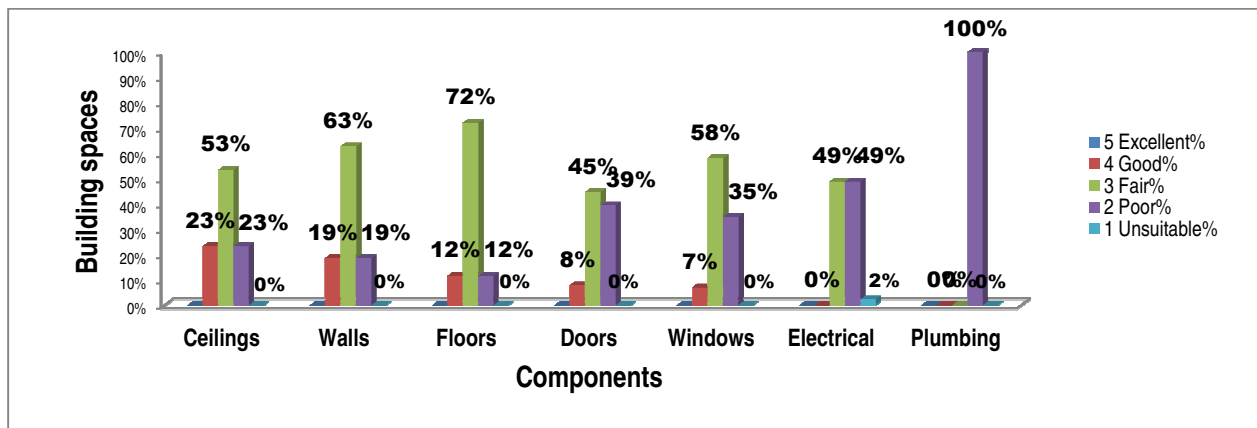
Figure 5.6 Bar Chart showing conditions of rooms at a female hostel at Case A1

Figure 5.6 shows results of the condition survey of forty-three building spaces at the female hostel block on the main campus. The spaces considered are thirty of the student bedrooms including a porters' office and a common room; eight lavatories, three kitchens and two laundry rooms.

Majority of the components evaluated in the rooms were rated "fair", with a high of 72% of the floor and 63% of the walls. There is no component in an excellent condition. Some of the ceilings, walls, floors, doors and windows are in good condition (23%, 19%, and 12%, 8% and 7% respectively). Only 2% of the spaces had unsuitable electrical connections, but 49% are in poor condition. All (100%) the plumbing services of the washrooms and kitchens are in poor condition. The result implies that most of the

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building services (electrical and plumbing) are not serving design purposes and are unsafe for use by the occupants.

Figure 5.7 A lavatory area in the female hostel block at Case A1

Pictures of one of the lavatories evaluated in the female hostel are presented on Figure 5.7.
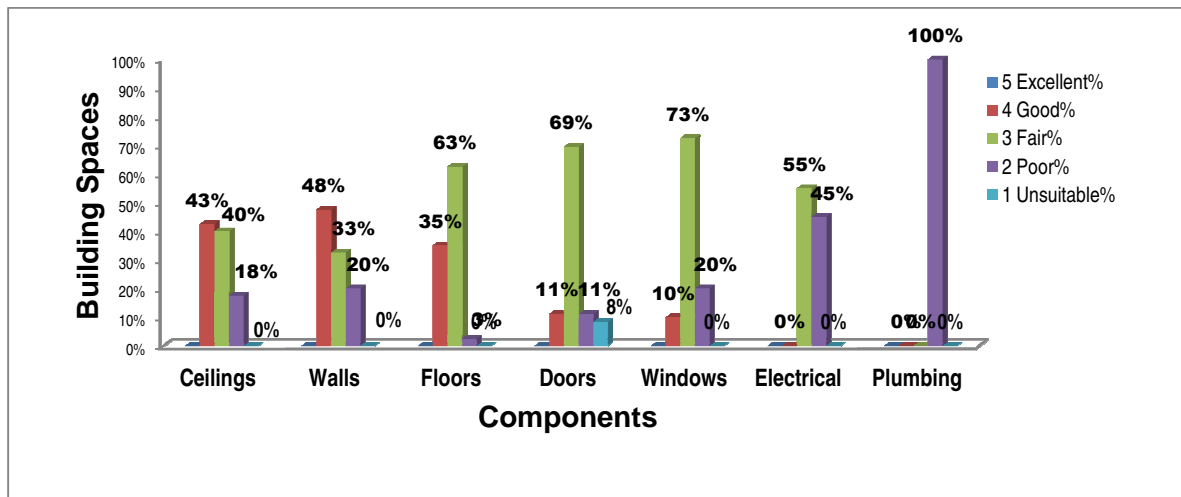
Figure 5.8 Physical conditions of rooms at the male hostel block at Case A1

The physical condition evaluation result of the male hostel block on the main campus of this university is as presented on Figure 5.8. A total of forty buildings spaces in the hostel were evaluated. They are twenty-eight bedrooms (including the common room and the porters' office), eight lavatories, two kitchens and two laundries.

The majority of the doors, windows and electrical fittings (over 60%) in the spaces evaluated are rated 'fair'. Notable percentages of the ceilings, walls and floors (43%, 48%, and 35%) of the spaces are in good condition. All (100%) plumbing and up to 45% of electrical services are in poor condition. Only 8% of the doors are unsuitable.

5.2.3 Interview

The interview in this case was conducted on the 9th day of October 2014 at the maintenance department office on the main campus of the institution. The interviewee was the head of the maintenance department of the University, who holds a Bachelor of Science degree in Civil Engineering and has over five years experience of work as a maintenance staff of the University.

The interview commenced at about two o'clock in the afternoon and lasted for about 35 minutes. It was a semi-structured interview with the discussions focused on the experience of the maintenance management of the on-campus hostels of the university.

5.2.3.1 Maintenance Management Strategies

i.   Maintenance administration

The university operates a central maintenance system for its built environment, and the maintenance department is saddled with the responsibility of managing the maintenance system. The built facilities of the university that the department maintains includes all hostels on the various campuses; a study centre in the city, staff quarters, and a teaching hospital. There are several other properties that are located off the campuses of the University. The maintenance department has zone offices on the two other campuses of the institution and officers from the department are assigned to manage the other facilities off the campuses.

ii.   Structure of the maintenance department

The maintenance department of the institution is relatively new. It was carved out of the department of physical development and management five years ago, and it does not have a standard departmental structure as the older departments in the university do.

However, the officer in charge of maintenance is the current head of the department, and three different unit heads (buildings, services, parks and gardens) assist him in coordinating the maintenance affairs in the university.

iii. Maintenance plan

The objective of maintenance of on-campus student hostels is to ensure that the students live in a safe and healthy environment, secondly to preserve the assets of the university.

The university has no maintenance policy for the hostels or any building facility under the care of the maintenance department.

The department is not in possession of a maintenance manual for any facility it maintains. Even as built drawings from the physical development department has not been handed over to the department.

According to the interviewee, the drawings are important to the department because they would guide maintenance operations. For instance, the maintenance works of mechanical and electrical services may involve working on underground cables or pipes that are not visible.

Most paper documents of previous works are available in the archives. Once the work is completed, and all payments are cleared, reasons to refer to the document hardly arise.

iv. Maintenance budget and funding

The budget for the department considers personnel costs, goods and services, materials required to maintain the facilities all building facilities for a session. A budget is prepared every academic session.

The members of the department meet to consider the budget before forwarding to the bursar. Heads of departments are usually invited to defend their budgets before a budget committee chaired by the Vice-Chancellor.

The allocations for a period (session) never meet the financial needs of the department. There is never enough for maintenance in any government organisation. The

department has no alternative source of finance because it is the responsibility of the FGN to provide adequate funding for effective management of all its universities. Therefore, the department utilises the resources it has for works that require urgent attention.

v. *Maintenance operation strategies*

Most works are undertaken in response to failures of facilities; i.e. those reported and those the maintenance officers detect during the course of their duties. Minor operations are carried out in-house, but works that are beyond the expertise and available resources of the department are outsourced.

There are artisans for various construction trades (electricians, carpenters, plumbers, gardeners) deployed to the department. There is still need for more workers because the staff strength has not been able to handle the workload.

vi. *Communication*

New students are advised to use all facilities of the University in responsible ways during sessional orientations. Secondly, the hall administrators and maintenance staff deployed to the hostels walk through the hostels regularly to identify problems and to further remind the students the need to use the facilities responsibly.

There is a maintenance officer assigned to every hostel that works with the porters and hall administrators in collating all maintenance problems in the hostel buildings daily. The resident students report their complaints to the porter's offices and other issues are identified by the maintenance officers or the porters during their routine checks of the hostels.

vii. Building performance evaluation
- Inspections of the hostels are carried out by the maintenance department at the end of every semester
- The data generated during the inspections informs the department of the maintenance operations required. At the end of the session general renovation works are carried out during vacation periods in preparation for the new occupants in thenew session.

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5.2.3.2 Interrelationship between Maintenance Management and Other Management Aspects

Maintenance of the hostels is the responsibility of the maintenance department. The student affairs department is responsible for managing all other aspects of student accommodation. The responsibilities include allocating students to the hostels and cleaning services for the hostels, the hall administrators and potters of the hostels are direct staff of the student affairs department.

The maintenance department works in collaboration with the student affairs department. Workers from the maintenance department are deployed to the hostel areas, and they work with hall administrators to compile all maintenance issues that they report daily to the department.

Performance evaluation

The department has never carried out any form of evaluation of its activities, but the establishment unit that is under the registrar's office evaluates staff performance annually. The evaluation exercise is based on submitted Annual Performance Evaluation Report (APER) forms that are completed by all non-academic employees in the university.

Staff motivation

- There are overtime allowances, especially for those that are in the category called " essential services staff" that are called upon at any time to rectify electric power problems. There are those operating and servicing electric power plants. The department recommends this category of workers to management for formal recognition at some social functions of the institution.
- Employees in the department receive grants occasionally to attend skill-enhancing workshops that would improve their performance.
- The head of the department recommends employees with outstanding performance to the establishment unit for promotions.
- The department operates an open door policy; the relationships amongst members of the department are very cordial; every member understands the

goals of the department and feels important and accepted. Both administrative and operations employees approach each other freely to offer suggestions that are given serious consideration by the Head of the department.

Relationship with the strategic management
- The department recognises the vision of the University; i.e. producing quality graduates; and the purpose of providing the facilities for living and learning. The objectives of the maintenance department are to ensure that the built environment of the institution remains conducive for staff and students. However, the department is not close to achieving its objectives due majorly to resource shortfall.

- The importance of maintenance has not been clearly communicated to the executive council of the university. The managers at the level of the executive council do not understand why maintenance is capital intensive and difficult to estimate. The head of the maintenance department is a member of the senior management but not the executive council of the university that makes the final decision.

- Maintenance has never received the desired attention in the university as in most government organisations in the country. New construction works were overshadowing the maintenance when the department was a single entity (the physical development and management department). The department was further neglected and was an underdog, even after it was separated from physical development five years ago.

- The department is in need of professionals such as Architects, Quantity Surveyors, Building Engineers and Construction Managers that should be engaged in strategic planning of activities. Most of the professionals are under the physical development department that deals with new construction works.

- The new executive management of the University (that came into office barely three months ago) are concerned about the running of some departments in the

university. These departments include the maintenance department and students' affairs division, with emphasis on aspects that relate to the student hostels management.

5.2.3.3 Impact of the External Environmental Factors on the Maintenance of On-campus Student Hostels

- Due to financial constraints, the planned maintenance works do not receive the attention within the proposed time.

- The hostel facilities experience more pressure in terms of usage than other facilities the department maintains for the university. For instance, the ablution facilities in the hostels fail very often, and the soakaways require evacuation more often compared to the ablutions in other buildings on campus.

- The population of the students has an overbearing pressure on the facilities, especially the sanitary facilities. For instance, a hostel block that is designed for 64 students now accommodates over a 100 students officially.The students share the same lavatories, kitchenettes and laundry.

- A frequent interruption of power supply that is experienced nationwide affects the electric cables and other fittings very often.

- Students fiddle with electrical connections in the hostels thereby generating more maintenance works and breakdown of the power generating plants that supplement power in the university.

- There is a problem of overloading the electric power supply because the students insist on using electric powered stoves and water boilers, the use of which is prohibited in the hostels.

- Water supply is a general problem in the country; there are boreholes for the university community on the main and mini campuses. The boreholes do not provide sufficient water to meet the daily requirement of the hostels; water trucks make trips to the water board stations.

- The efforts to provide water for use in the hostels are frustrated by the students, because they misuse the water. As a result, the taps and storage cisterns in the washrooms are dry especially in the evenings.

- The female hostels are very difficult to maintain because some of the ladies do not use the bathrooms and laundries; they wash on the pavements in the courtyard. They also dispose of their sanitary towels and hair extensions in the water closet toilets thereby causing frequent blockages of the waste pipes in their hostels.

- For the male hostels, the major problems are tampering with electrical connections and doing their laundries on the corridors.

- A general problem with the hostels is that students deface the walls of the hostels, they also vandalise the doors and windows frequently.

- There are many problems related to the initial construction of the hostels. For instance, all rooms that are adjacent to lavatories experience dampness on the walls. Roof leakages are experienced every year during the rainy seasons.

- The 2004 government policies regarding student housing were never implemented in this institution. The prospective organisations that the university endeavoured to collaborate with on this venture were only after profit and not necessarily concerned with students' welfare. Others saw an opportunity to exploit the FGN disbursements to the universities, but to their disappointment, the university could not make offers close to their demands.

5.3 Case A2

This university is one of the seven specialised universities established for the development of skills in the sectors of technology and agriculture. It was established in 1988 with the aim of producing socially mature persons with the capacity to improve various disciplines of agriculture that would contribute to the scientific transformation of agriculture in Nigeria. The programmes offered place emphasis on planning, adaptive, technical, maintenance, developmental and productive skills in agriculture, agricultural engineering and allied professional disciplines. The objectives set by the institution towards achieving this aim include:

- Holding out to all persons without distinction of race, creed, sex or political conviction, the opportunity of acquiring a higher education in their desired programme.

- Encouraging the advancement of learning by acting as agents and catalysts, through postgraduate training; research and innovation for effective and economic utilisation; exploitation and conservation of Nigeria's natural, agricultural, economic and human resources;

- Offering a form of public service to the general public through the results of training and research in agriculture and allied disciplines and to foster the practical application of those results;

- Identifying the agricultural problems and needs of Nigeria and to find solutions to them within the context of overall national development; and,

- Providing and promoting sound basic scientific training as a foundation for the development of agriculture and allied disciplines, taking into account indigenous culture. The need to enhance national unity, the need to vastly increase the practical content of student training, and adequate preparation of graduates for self- employment in agriculture and allied professions.

The university operates on one campus located on a vast land in the outskirts of the host state capital, surrounded by little villages. All structural facilities are provided on campus, including residences for both staff and students. However, only a third of the staff are accommodated on campus due to an insufficient number of the staff houses available. Similarly, not all the students reside on campus because of the insufficient number of bed spaces available in the existing hostels.

5.3.1 The Student Hostels on the Campuses of Case A2

The university has only one campus, and there are only four identical hostel blocks, two of the hostels are for the male students and the other two for the female students. There are over 15,000 students, but the hostels can accommodate only 2,000 students with priority given to first and final year students. Figure 5.9 shows the front view of one of the female hostels.

Students that are not able to secure a place in the hostels are forced to seek for any available accommodation in the neighbouring rural communities. The nearest suburb to the campus is quite a distance from the campus and transportation is a challenge especially for students that rely on public transport systems available.

The university has no communal bus service that would ease movement for students to and from the campus. Public transport to the campus is not readily available, and the cost of transportation from the suburbs to the campus is not affordable for many of the students. The room occupancy ratio was changed by the management to provide more bed spaces for the students, but more than half of the population of the students does not have bed spaces in the hostels.

5.3.2 Physical Conditions of the Hostel Building Facilities

Figure 5.9 Front and rear views of a typical hostel block on the campus at Case A2

Figure 5.10 Poor conditions of inspection chambers and soakaways behind hostels at Case A2

Figure 5.11 Pictures show interior of one of the hostel blocks at Case A2

Figure 5.12 Decaying wall and door of a bathroom at Case A2

Figure 5.13 Dilapidated ceilings in some of the rooms at a hostel block at Case A2

The disrepair states of the external wall, floors and ceilings of the buildings are revealed in Figure 5.11, 5.12 and 5.13. Ageing, misuse and inadequate maintenance are evident on the facilities.

5.3.2.1 Condition Survey of Building Components

A condition survey of the facilities of the two hostel blocks on the main campus of the University was carried out. Spaces/rooms that were accessible by the researcher for the condition survey are the building spaces considered in each block. Forty-four bedrooms and seven lavatories were surveyed at the female hostel block. At the male hostel block, forty-seven bedrooms and four lavatories were surveyed. Results of the survey are presented in Figures 5.14 and 5.15 and discussed appropriately.
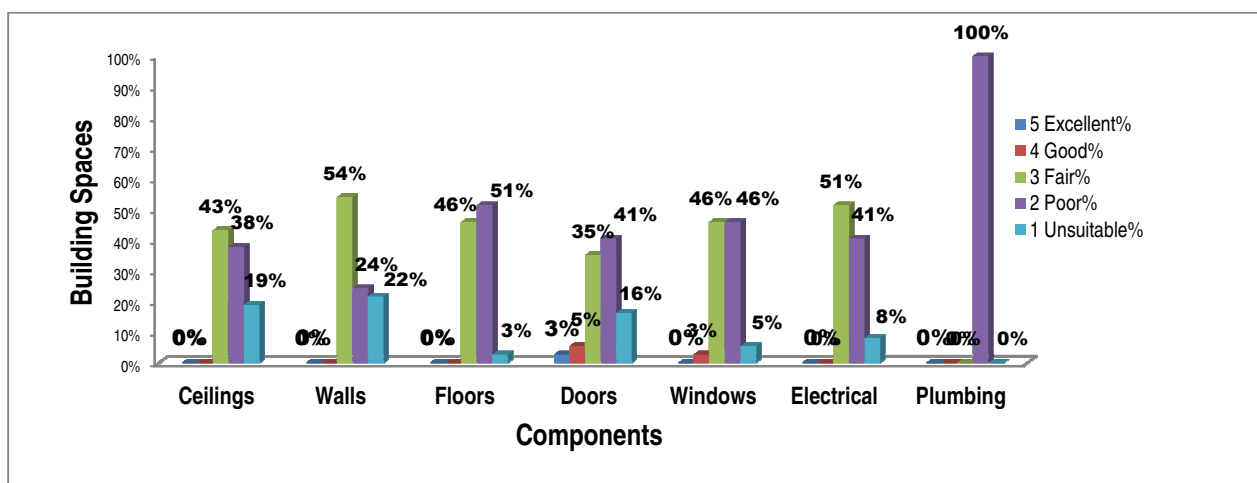
Figure 5.14 Condition rating of a female hostel block at Case A2

All components of the building are in states of disrepair, with every component at different stages of deterioration. All plumbing works, and over 50% of the floors are in poor conditions. Over 50% of the spaces surveyed in the hostel have components that are rated unsuitable for occupants. However, some rooms have percentages of the components in fair conditions. During the survey, the researcher observed that one wing of the hostel block is not as affected by dampness and algae as the other wings. The survey revealed the general state of critical structural disrepair of the hostel facilities.
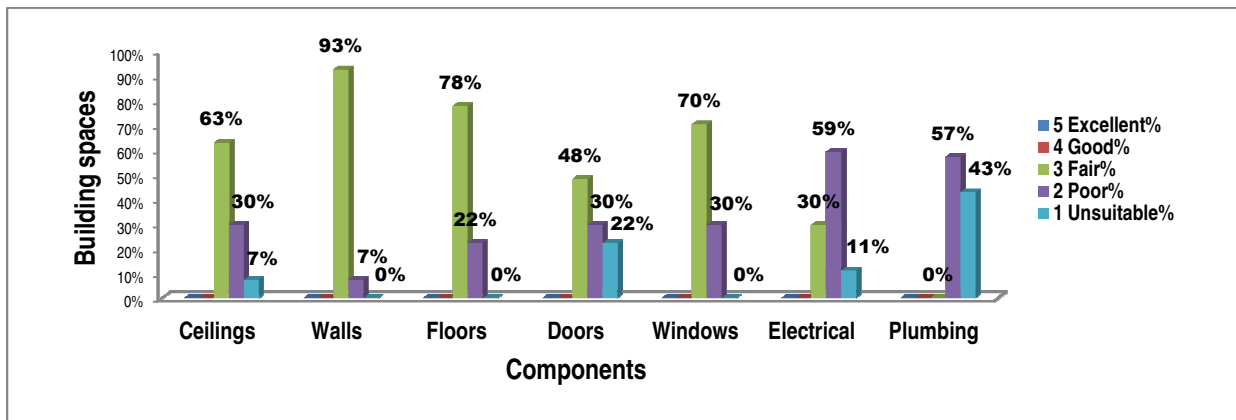
Figure 5.15 Condition rating of a male hostel block at Case A2

Most of the ceilings, walls, floors and windows of the male hostel block evaluated are in fair conditions and up to 93% of the spaces have walls in fair condition. The majority (57%) of the plumbing services in the lavatories are in poor condition, and the other 43% are in condition unsuitable for the users. Many of the bedrooms are still in habitable condition with defects that can be attributed to aged facilities and lack of adequate maintenance.

5.3.3 Interview

An interview to solicit information about the maintenance management system for on-campus hostels in this case university was conducted on the 24th day of September 2014 at the office of the Dean, SAD. The interview took the form of a group discussion with the major officers involved in the hostel management. In attendance were the Dean and Deputy Dean of the student affairs, the hall administrator, a representative from the

maintenance department and the cleaning contractor. The findings from the discussion are presented in the following sections:

5.3.3.1 Maintenance Management Strategies

i. On-campus hostels management

The university has a Directorate of works and maintenance that is responsible for maintenance operations for all facilities in the university, but the student affairs department is fully responsible for the maintenance of the hostels. The maintenance aspect of the hostels was initially managed by the Directorate of works and maintenance, but was transferred to the student affairs department. The cleaning services are outsourced.

ii. Maintenance budget and funding

The maintenance budget is prepared annually based on submissions from all departments in the university. The allocations to the Maintenance Department are usually a lump sum with no specific allocation for any department or the maintenance of particular facilities in the university. The expenses on maintenance works in the hostels depend on whatever is available centrally for maintenance works in the university. The funds are usually not sufficient to meet the maintenance requirements.

The university outsources the cleaning services of the whole campus to a contracting organisation that is paid monthly directly from the bursary unit. The maintenance department is only responsible for supervision and evaluation of the contractor's work for a month, based on which an attestation must be written by the director of works to the Bursar before payments are made.

iii. Maintenance operation strategies

Artisans (carpenters, plumbers, electricians) were deployed to the student affairs department for minor maintenance works that frequently arise in the hostels. Major works are outsourced. The student affairs department can only handle the maintenance issues that arise in the hostels with the resources available with the cooperation of the central maintenance unit of the University.

Once a complaint reaches the student affairs office, an appropriate artisan is assigned to examine the problem and report to the office of the Dean or the Deputy Dean of the SAD. However, addressing the problem will depend on the urgency, intensity of damage and availability of resources required to remedy defects.

iv. Communication

All students that are accommodated in the hostels are in possession of a booklet that outlines the rules and regulation of residing in any of the university's hostels. There are penalties for defaulters, but no student has ever been reported or penalised for damage.

When there is a maintenance issue in any of the hostels, the students report to the porters.The porters forward the complaints to the hall administrator, who compiles and brings it to the office of the Deputy Dean or the Dean. Sometimes the students take the liberty to report directly to the Deputy Dean or the Dean and are allowed to even call them on their cell phones.

The Dean of Student Affairs writes the management concerning maintenance problems that the Directorate of Maintenance cannot handle and requests the engagement of specialist contractors. Sometimes approvals are given, and a contractor is engaged. On several occasions the requests are informed to be KIV (keep in view),implying that the university does not have the funds at the period to commit to the project. As a result, there is a backlog of maintenance works in the hostels.

5.3.3.2 Interrelationship between Maintenance Management and Other Management Aspects

The hostels on the university campus are managed by the SAD of the institution, including the maintenance of the hostel facilities. The maintenance aspect was managed by the Directorate of Works and Maintenance of the university initially, but barely three years ago, the maintenance aspect was transferred to the SAD.

Though there are a few (number not adequate for the workload in the hostels) artisans such as plumbers and electricians deployed to the SAD for minor maintenance works, the SAD still relates closely with the Directorate of Works and Maintenance that are

responsible for the maintenance of other built assets on the campus. The officers from the central maintenance department of the university assist the SAD with vetting estimates of outsourced maintenance works for the hostels and also supervise outsourced maintenance works.

The Dean of SAD relates directly with the strategic management of the university on issues that concern the welfare of the students including hostel management. Most times the resources required to address some of the problems especially the hostel maintenance are received late and sometimes are not sufficient, therefore, several maintenance issues are left unattended for a long time thereby compounding the situation and increasing the difficulties of managing the hostels.

5.3.4.2 Impact of the External Environmental Factors on the Maintenance of on-campus Student's Hostels

Basic infrastructure such as portable water and electricity are big issues facing the nation as a whole, and these are the major challenges of most institutions that provide and manage student hostels. There has never been enough supply of water to the hostels, especially for the lavatories. It is impossible to maintain wet areas such as the lavatories, that have high water usage without an adequate supply of water. On a general note, maintaining mechanical and electrical services are the major challenges of maintenance of the student hostels.

The University is mindful of the general problem of inadequate water supply in the region. Therefore, a "mini water-works" was provided on-campus to serve the university community. Regrettably, the facility was not built with foresight; because water supplied by the waterworks is grossly inadequate for the current population of the students

'Squatting' that is, sharing spaces has been part of the Nigerian university system for a very long time. It is not going to be an easy task for most of the institutions to stop that culture or habit. Some students share bed spaces with friends or relations, which contributes to the congestions that are being experienced in the hostels.

There is huge maintenance backlog in the hostels; the major items are damaged roofs of some hostels. In 2013 the Department proposed to carry out some of these major

repairs, and estimates of the proposed works were obtained from contractors and submitted to management. The proposed maintenance works have been suspended until a proposed general rehabilitation of hostels at all public universities will be executed.

The proposed general renovation of hostels was in response to one of the requests of the Academic Staff Union of Universities (ASUU) during a strike action in 2013.

At best, storage tanks are stationed at the hostels and efforts are made to pump water into these tanks at least three times in a day, but still the water need of the hostels cannot be met. The water works also require electric power to operate effectively.

The students do not conduct themselves well in these hostels; they vandalise the facilities provided for them in several ways. Most electric power points are overloaded by appliances (electric stoves, water boilers) of which the institution prohibits their use because of the poor voltage; most times they tamper with the electric cables.

5.4 Case A3

This university is one of the seven specialist universities that were created in the third generation. It was established in 1983 with a commitment to developing a skilled and innovative workforce. The development of skills is required so as to transform Nigeria's natural resources into goods and services. The drivers for this transformation to positively affect the economy and thus the quality of life of citizens of Nigeria are enterprenueurship and Information and Communication Technology.

At inception, the University acquired, on a permanent basis, the facilities of a former government teachers' college located at the centre of the capital city of the host state that is now serving as a small campus of the University. A permanent main campus was developed on 10,650 hectares of land to cater for the necessary, inevitable expansion envisaged.

The main campus is located adjacent to rural communities way out of the main town and about 14 kilometres away from the small campus in town. Most activities including the University senate were moved to the main campus in 2005 while the Directorate of postgraduate studies, school of sciences and centre for remedial studies remained on the small campus. The small campus also accommodates the university's elementary schools that offer primary and secondary education to children of both the university community members and the host communities.

For generating internal revenue to supplement government funds, the university established the business and consultancy outfit. An administrative office for this business arm was also created on the small campus. A Centre for Climate Change and Freshwater Resources (CCCFR); Centre for Human Settlements and Urban Development (CHSUD) and Centre for Remedial and Extra-mural Studies (CRES) also occupy built structures on the small campus for administering their respective ventures.

5.4.1 The Student Hostels on the Campuses of Case A3

The total population of students in the university is over 13,000. Both the small and the main campus have hostels for male and female students. Each campus has two identical three storey blocks for the male students. There are two single floor blocks enclosed in two separate hostels on the small campus for the female students. Two hostels for female students are provided on the main campus; a two storey block donated by a private organisation, the second encloses clusters of five single storey blocks.

(a) Back view   (b) Two adjacent blocks   (c) Front view

Figure 5.16 Exterior views of a male hostel at Case A3

(a) Courtyard   (b) Staircase   (c) Corridor approaching a room

Figure 5.17 Interior Views at Case A3

Figure 5.18 Deteriorated plumbing services at the hostels at Case A3

5.4.2 Condition Survey of the Hostel Facilities

The hostel facilities provided for the male and female students on the main campus of the university were evaluated. All eighty-two bedrooms of a male hostel block, four of six general lavatories, three kitchens and three laundries were considered. At the female blocks, seventy of the bedrooms with bathrooms enclosed were evaluated. Three general kitchens and three laundries were also evaluated, and all results are presented in Figures 5.19 and 5.20.
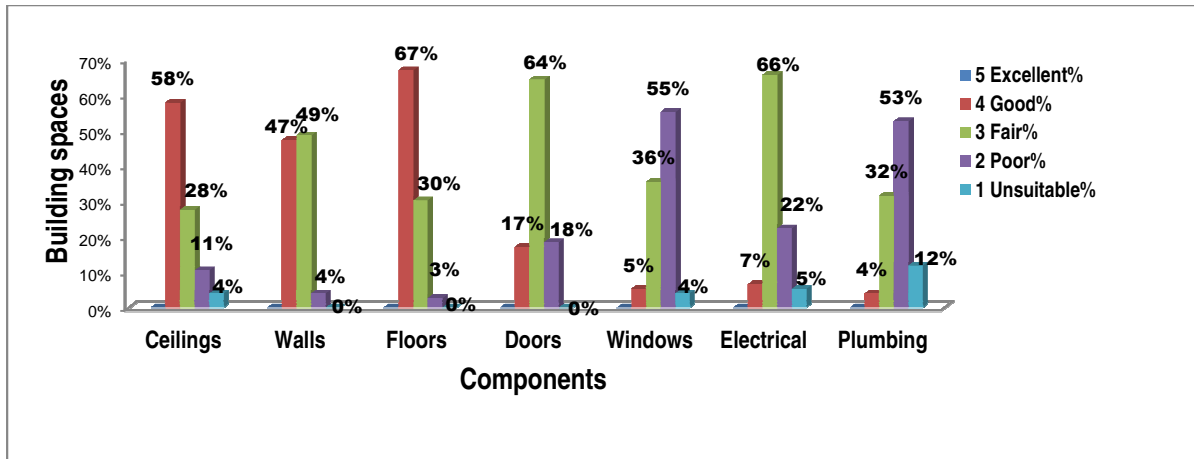
Figure 5.19 Condition rating results of the female hostel blocks at Case A3

The results shown in Figure 5.19 reveal that most of the floors (67%) and ceilings (58%) are in good condition; conditions of most electrical services (66%) and doors are fair. Conditions of the plumbing services (53%) in the hostel blocks are poor, and a notable 12% are unsuitable for use.
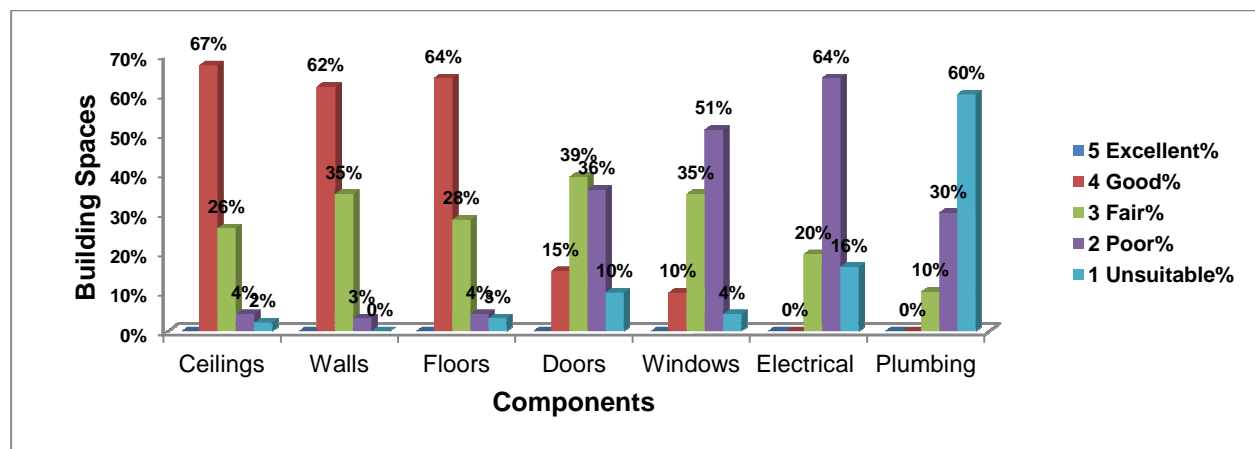
Figure 5.20 Male hostel block at Case A3

Figure 5.20 indicates that most of the building spaces have their ceilings (67%), walls (62%) and floors (64%) in good condition. However, most (64%) of the electrical services are poor and 16% are unsuitable for the occupants. Many doors (46%) and windows (55%) have major defects.

5.4.3 Interviews

Four interviews were conducted in an attempt to understand the maintenance management system of this case institution. The interviews began with the director of the works department of the University at his office on the 15th of October 2014. He holds a Masters of Technology degree in Building with over five years of experience as a lecturer in the university and another five years of experience in the Works and Maintenance Department of the University.

The hall administrators of the two campuses and the Dean of SAD were interviewed at their various offices on the 17th of October 2014. The hall administrators have been involved in hostel administration in the University for over ten years. The Dean of the SAD holds a PhD in Biochemistry and lectures in the University but has been involved in various committees under the student affairs for over eight years. Outcomes of the discussions are summarised under the different themes in the sections that follow:

5.4.3.1 The Central Works and Maintenance Department

The Works and Maintenance Department of the University has offices on both campuses. The university has no manual for maintenance of any of its facilities; there is no policy for building maintenance either. The department does not have the professional facilities managers that can develop policies and systems.

No priority is given to works from any department; all works are performed on a first in basis. Urgency and the availability of resources to carry out the works are also considered.

The highest number of complaints was received from the hostels before the maintenance of the hostel buildings was outsourced. However, there are always problems in the hostels that the students report to the department and the operations staff render whatever forms of assistance possible.

5.4.3.2 Hostel Management and Maintenance Strategies

The SAD manages student hostels administration, but there is a hostel management committee that is commissioned, exclusively for maintenance of the hostels. The Dean

of SAD chairs the committee and there are other members, including both academic and non-academic staff, with experience in managing student hostel administration.

i.   Maintenance plan

On the current strategy, a general and intensive maintenance work is proposed at the end of every session. Once the students vacate the hostels, the hall administrators in the company of other subordinates under them undertake an inspection exercise. The artisans (electricians, plumbers, and carpenters) for the major trades are also members of the inspection team. The defects observed are documented and submitted to the hostel committee.

There are no records of the hostel facilities or the previous maintenance works carried out and no inventory of facilities handed over by the previous managers of the hostel.

The committee meets to deliberate on the maintenance requirements of the hostels and decide on the maintenance approach, and financial implications of the operations required. The same committee reports to the university management for approval and release of funds for the maintenance operations. However, the protocols for rectifying a fault do not apply in all cases. The SAD makes all efforts to tackle any defect or failure that is an emergency.

The proposed maintenance plan includes:

- Taking inventory of all facilities provided in a room by the porter in the presence of the students that are allocated to the room. At the end of the session, the porters will repeat the same exercise with the students before they are cleared.
- The hall officers ensure that students abide by the rules and regulations of the hostels as contained in the student handbook. The handbooks are revised every year and issued to all students. All students must sign an undertaking of good behaviour before he/she is admitted into the hostels.
- There are penalties for students who disobey the rules.
- All maintenance works are closely supervised, especially the works that are outsourced to ensure quality workmanship.

ii.   *Maintenance budget and funding*

When the works department managed the maintenance of hostels, the budget for the department was prepared based on the previous year's budget, but a certain percentage was usually added in anticipation of change in prices and wages for casual workers.

The allocation for the department is never sufficient, however the budget for the department can be described as an "elastic budget" because some maintenance issues are unforeseen and difficult to forecast.

The SAD took over hostel management in the middle of a financial year. However, a holistic approach towards the maintenance of the hostels is proposed for this period until the maintenance system is normalised. The approach would be to engage various contractors that would survey and carry out intensive refurbishment of the hostels when the students are on vacation.

The new hostel management committee proposes that the budget preparation for the maintenance of the hostels will commence in the next session. Estimates will be prepared and attached to a report that should convince the management to release funds for proposed major renovation works. The maintenance management budget for the hostels will be built into the main budget of the SAD in the next financial year. The budget preparation will be based on needs such as water and electric power, and the maintenance problems we envisaged. There are also expenses such as subscriptions for the televisions.

iii.   *Maintenance operation strategies*

The SAD handles minor works that arise while, the Works and Maintenance Department are engaged in the major works. Specialist works that the Works and Maintenance Department cannot handle are outsourced, but the staff from the works department usually undertake the supervision.

The porters run three shifts (morning, afternoon, and night); they do rounds in the rooms and other spaces regularly to check on the activities of the occupants. The students can

report any emergency to them; in turn, the porters report to hall administrators immediately.

Some minor works are managed by the Hall administrator by assigning the artisans deployed to the hostels. Maintenance works that require resources that are beyond the reach of the hall administrator or works that require specialists are reported to the Dean.

The hall management committee plans to inspect the hostels at the end of the session so as to compile the general maintenance requirements of the hostels. This information will guide the renovation exercise that will be carried out when students are on vacation.

All housekeeping workers were disengaged when the hostel management was outsourced. With the new development of hostel maintenance in the university, cleaners are employed on a casual basis and are paid weekly. The problem with this category of workers is the lack of experience on cleaning some of the hostel facilities such as the lavatories

Basic public infrastructure (water, power) provided is poor; therefore, the building facilities are not operated/used properly, and routine maintenance cannot be carried out efficiently.

iv.   Communication

Complaint forms are made available at all times for the students to report any fault in their rooms or any defective facility in the hostels. The completed forms are submitted to potters and the potters compile and deliver to the hall administrators. It is the responsibility of the hall administrators to sort the complaints; they attend to minor operations that do not require materials by instructing the artisans assigned to the hostels to carry out the repairs. Other complaints are submitted to the Dean.

During the orientation week for new students at the beginning of every session, there are lectures on maintenance culture and advise on the right use of facilities on the campus; this includes the hostels.

5.4.3.3 Interrelationship between Maintenance Management and other Management Aspects

Maintenance of the student hostels in this university has over the years moved from SAD, then partly to Works and Maintenance Department of the institution. At another time, it was outsourced to a contracting firm, later withdrawn and handed over to a business enterprise that is owned by the University. At the beginning of the 2012/2013 session, management took a decision to return the hostel management under the SAD.

The attention of management was drawn to the degenerating condition of the hostels and the impact on the well-being of the students. One of the incidences that drew the attention of management to the hostel management was a finding of the SERVICOM unit (an FGN establishment for monitoring the service delivery in all government organisations).

The officers of the SERVICOM unit in the University paid a visit to the university health service where it was brought to their notice the rising number of student patients diagnosed with ailments that are related to a poor living environment.

The management came to the conclusion that only the SAD can maintain the hostels effectively because the goal of the department is centred on the welfare of the students, whereas, profit making is the central goal of the previous managers. Prior to instituting the hostel management committee, a survey of about five universities in the zone was carried out. The exercise was to gain hostel management skills and ideas that may be useful in developing a strategy for maintenance of hostels in the institution.

The new Vice-Chancellor was once a dean of student affairs in a Federal University, and he was a Vice-Chancellor at a private university. His wealth of experience facilitates his understanding of the need for more attention to student affairs and that it cannot be separated from the maintenance management of the on-campus hostels provided to accommodate the students.

In response to the need for managing the hostels optimally, the university management has transferred the hostels to SAD. All necessary support possible to the division is

given to enable an effective strategy for maintaining the hostels. The Vice-Chancellor currently operates an open door policy for student affairs.

The hostel management committee is divided into two sub-committees. A sub-committee is in charge of the allocation of bed spaces and monitoring students' behaviours in the hostels. The other sub-committee takes charge of the maintenance management aspects.

Members of the hostel management committee include the Personal Adviser to the Vice-Chancellor, representatives from the bursary unit, works department and the registry and establishment division. Other members of the committee include a Quantity Surveyor, Building Services Engineers from the academic departments.

5.4.3.4 Impact of the External Environmental Factors on the Maintenance Management of the On-campus Student Hostels

There have been several changes in the hostel administration over the years. The changes were influenced by government policies and changes in the decisions of management at different periods.

The maintenance of student hostels was part of the duties of the student affairs at inception of the institution. In 2005, all aspects of hostel administration and management were outsourced following a government policy on deregulation of student hostels at all public universities. In 2008, a new management disengaged the private managers, and the services were transferred to a business arm of the university.

The major lapses of the previous managers of the hostels include:

- Delay in responding to a maintenance problem, it took them at least three days before a minor problem could be rectified;
- The students were not guided by rules and regulations while residing in the hostels;
- Maintenance problems were not properly diagnosed. As a result, appropriate strategies were not be adopted in resolving the problems; and

- Many faulty facilities that did not receive maintenance attention when due are damaged completely, while other facilities were affected by delays in maintenance action.

Maintenance of the female hostel poses more challenges than the male hostel. Many female students use the pavements in the courtyard as bath space late at night or early hours of the morning when they cannot be caught. Secondly, the female students block the toilets often with sanitary towels and their synthetic hair extensions.

No strategy has been devised to curb these negative habits other than regular checks by the potters to scold and further advise the students of the need to stop the unethical behaviour.

The major maintenance generator in the hostels is the misuse of the facilities by the students. The university must organise more orientation sessions for the students on how to conduct themselves in the hostels.

Managing student hostels in Nigeria has been a big challenge for most public institutions. The problem is aggravated by the upsurge of students every year that these institutions experience and the downturn in the economy of the country that began in the early 1980s as a result of the crash in oil prices.

The subvention to the education sector has dropped drastically. Management in the public institutions are faced with a difficult task of running the institutions within very tight budgets. The FGN insists on regulating and subsidising fees of students without any substantial increase in funds especially for capital projects. There is no corresponding expansion of hostel facilities to meet the annual increase in the number of students.

The facilities are under pressure; especially at the female hostels; partly due to the high population of students in some of the hostels that is beyond the designed capacity of the structures and the services.

The hostels have degenerated due to lack of adequate maintenance for over a decade. There was no form of discipline; therefore, the students lived as they pleased. The

students shared their bed spaces; they furtively use all forms of illegal items in the hostels and vandalise the hostel facilities. Some students sell their bed-space at an exorbitant amount to other students that are desperately in need of accommodation on campus but were not able to secure one. Although sharing bed spaces is illegal, the practice cannot be stopped because the university has no alternative accommodation for the students.

Inadequate water supply has always been a problem. The water board pipe routes have not reached this rural area. The University drilled boreholes at strategic areas on campus, but the boreholes did not reach a good water table. Therefore, the boreholes are not able to serve the university community efficiently. The boreholes operate for about one or two hours in the morning. There are two water trucks dedicated to the supply of water to the hostels; the tankers make at least two trips to the water board hydrants located in the town centre to enable them to supply water in the afternoon.

The hostels were well constructed with quality facilities. Most of the defects and deteriorated facilities that are evident in some of the hostels are a result of misuse by the student occupants. The services (mechanical and electrical) are the facilities that the students vandalise very often. In the male hostels, students meddle with the electrical cables and fittings especially in their rooms. However, there are worse issues to deal with at the female hostels. To begin with the services; there are serious plumbing problems at all the female hostels because of frequent blockage of the waste pipes. It has been discovered that students dump sanitary towels and synthetic hair in the water closet toilets. Therefore, the major complaints from the female hostels are blocked drains.

Secondly, students are caught several times cooking in their rooms with kerosene stoves. Apart from the unhealthy and unsafe conditions they subject their roommates and themselves, the fumes degrade the interior surfaces of the rooms.

Maintenance problems experienced are seasonal. During the peak of the hot, humid season (April-May) most complaints are of breakdown of electrical facilities in the buildings, because of the intensity of the heat and the increase in usage of the facilities

(air conditioners and fans). During the rainy season (June-September) the complaints about leaking roofs take over. The water level drops drastically during the dry season (November-March). As a result, the buildings experience failures with the plumbing and the department is pre-occupied with supplementing water supply to the university community.

5.4.3.5 Other Challenges of the Department

Some buildings are poorly constructed; some are difficult to maintain because of the nature of the design and lack of adequate tools and equipment. Sometimes access to quality materials or components to carry out maintenance operations is a problem. The workers make use of the available and affordable resources, but there is no guarantee that the remedial work would last.

For peaceful co-existence with the neighbouring rural communities, the heads of the communities demand that the university should provide job opening for the indigenes. In response to this demand, the university management instructed that all unskilled labour such as cleaning would be sourced from the surrounding areas.

5.5 Case B1

This case institution was established in 2002 under the State Law No. 2 of 2001 passed in the House of Assembly of the state that owns the University. Establishing the University was aimed at proffering a platform (particularly for indigenous population of the state) for developing diverse skills that would spearhead the developments in the state and the country at large. Establishing the University is believed to be one of the great historical milestones that the state has achieved in its educational evolution.

The vision of the university is:

 "To be a World Class Centre of Excellence for the development of the individual and the society"

Its values are excellence, creativity, productivity and freedom of conscience for the advancement of the individual and humanity.

The University operates on three campuses; the main and one of the small campuses that are located within the same town. The administrative building and six faculties operate on the main campus. The school of remedial studies operates on the smaller campus. A third campus housing the Faculty of Agriculture is located in the capital city of the owner-state.

5.5.1 Physical Conditions of the Hostel Buildings

The pictures in Figures 5.21-5.26 reveal the physical structures of the hostels on the main campus of the University. Both external areas that are visible to the public and the condition of the facilities within the building that may only be known to the occupants and the hostel officers are shown in the pictures.

(a) Entrance and offices   (b) End view of hostel block   (c) Entrance to the hostel

Figure 5.21 Exterior views at Case B1

(d) Back view   (e) Courtyard view   (f) Close view of windows

Figure 5.22 Interior Views at Case B1

(g) Floor   (h) Ceiling   (i) External wall of a room

Figure 5.23 Views of hostel corridors at Case B1

Figure 5.24 Views of the lavatories at Case B1

Figure 5. 25 Poor condition of a stair well at Case B1

Figure 5.26 Samples of unsuitable conditions of windows and wall in a bedroom at Case B1

5.5.2 Condition Survey of Hostels

The results of a condition survey of the hostel facilities on the main campus of the University are presented in Figures 5.27 and 5.28. At the female hostel block, forty-four bedrooms and seven lavatories were surveyed. A total of forty-seven bedrooms and four lavatories were surveyed at the male hostel block. The hostels were not designed with kitchens or laundries.
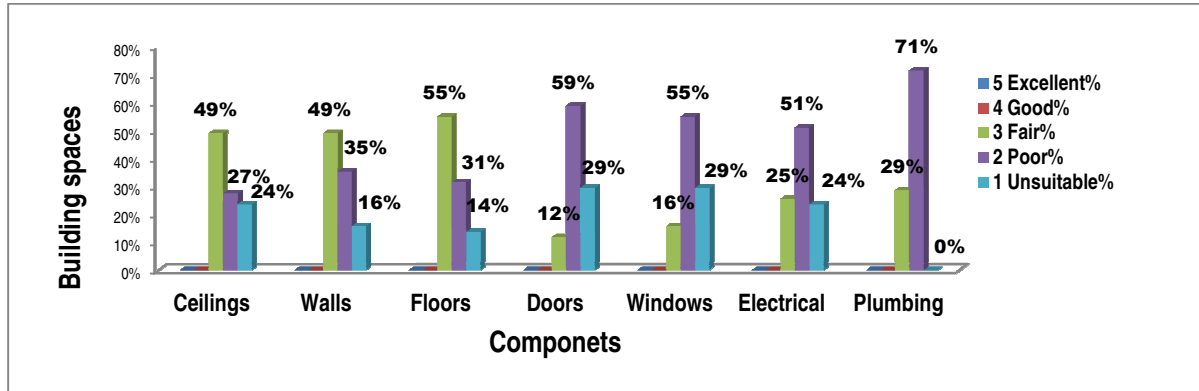
Figure 5.27 Female hostel block at Case B1

There were no elements found in excellent or good conditions, but a high of 55% of the floors are fair and 49% of the ceilings and walls are also in fair condition. Over 50% of doors, windows and the building services are in poor condition. Several components in the spaces surveyed are in conditions unsuitable for use (29% of doors and windows, 24% of ceilings and electrical services).
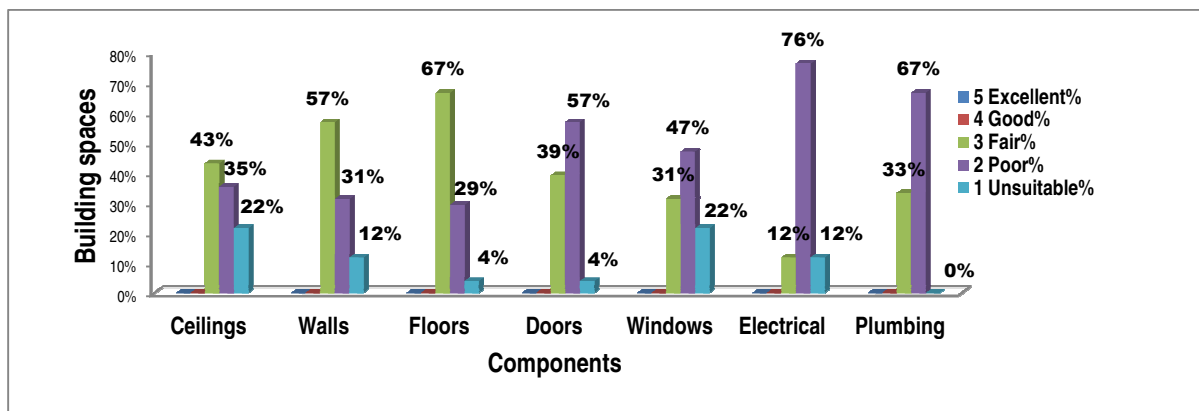
Figure 5.28 Male hostel block at Case B1

Similar to the other female hostel blocks in cases A1 to A3 most of the building services are in critical conditions (electrical 76% and plumbing 67%). Of the fifty-one spaces surveyed, 22% are unsuitable for occupants/users because of the deterioration states of the ceilings and windows. However, up to 67% and 57% of floors and walls respectively are in fair condition.

5.5.3 Interview

The hostels maintenance officer of the University was interviewed on the 29th of September 2014 at his office in the female hostel block on the main campus. In about forty minutes, he furnished the researcher with information about the maintenance management system of the hostels on the campuses of the institution.

The interviewee holds a diploma in business administration and has been a staff of the university since August, 2005 when he began work as an administrative staff of the Works and Maintenance Department of the institution. In 2008, he was appointed as the officer in charge of maintenance of the hostels. He is a staff of the SAD but attached to the Works and Maintenance Department.

5.5.3.1 Maintenance Management Strategies

Hostels are provided for both male and female students on all the university campuses. The existing structures of the hostels on the main campus are over thirty years old. The main campus is located on the site of a former college of education. The many structures are the inherited ones from the former college, and the hostels are part of the inherited buildings.

i.   Structure of the Student Affairs Division (SAD)

The management of student hostels is a key function of the SAD. The division is under the office of the Vice-Chancellor that is responsible for the general welfare of students in the university. There are over thirty employees that are assigned to different units of the division. The Dean is the head of the SAD; the student affairs officer, and the senior registrar are the direct subordinates of the Dean. The hostel management unit manages the allocation of rooms to the students, supervision of the use of the hostel facilities and the routine maintenance works.

ii. Maintenance plan

The hostel management unit does not have a maintenance policy for the hostels; the workers use their discretion to maintain the hostels within the available resources.

There is no inventory of the facilities in the hostel, but the maintenance department files documents of all major works that have been carried out on the buildings.

iii. Maintenance budget and funding

The budgets for maintenance of the hostels are built into the annual budgets of the Works and Maintenance Department. The hostel management unit of the university prepares the budget for maintenance of the hostels and submits to the Dean of SAD, who forwards to the Director of the Works Department.

The allocation to the Works and Maintenance Department is always in bulk. Therefore, all maintenance works in the university draws from the available resources of the Works and Maintenance Department.

The students pay only a thousand Naira (₦1,000.00K) per bed space for the whole session that is built into the fees they pay during registration. The unit had advised the management to charge each student at least three thousand naira (₦3,000.00K) that may be used to carry out some minor maintenance works. No response to the request has been received.

iv. Maintenance operation strategies

The hostel management unit liaises with the Works and Maintenance Department of the university to maintain the facilities in the hostels. But routine maintenance such as cleaning and other general housekeeping activities are outsourced to a private company.

No protocol is observed when the maintenance issue is an emergency (major electric power faults). Urgent problems are copied on a memo and sent to the Works and Maintenance Department immediately, and a lot of pressure must be mounted to enable prompt action.

The SAD organises orientation for new students at the beginning of every session. The rules and regulations that are meant to guide residency on campus are printed behind all accommodation slips of every student that gets a bed space in the hostels.

When a malfunction or defects are observed, the students report to the porters on duty in the hostels. Other complaints that require the attention of the Works and Maintenance Department are compiled weekly and the hall administrators forward to the Works and Maintenance Department. It takes at least one week to get any response to a maintenance need because the Works and Maintenance Department has to compile and sort complaints lodged from all departments, and make a request for resources from the Director.

5.5.3.2 Interrelationships between Maintenance Management and other Management Aspects

Policies change with every new executive management. The unit has not received the desired attention because the management does not understand the challenges of maintaining hostels and the importance of maintenance is not appreciated in the university. It is difficult to relate the goals of the university with the objectives of maintenance of the hostels.

The buildings are very old and have never been fully renovated since the university commenced on this campus. The services have deteriorated, and some are beyond repair, it is not economical maintaining such old structures that has never been renovated.

5.5.3.3 Impact of the External Environmental Factors on the Maintenance Management of the On-campus student Hostels

The population of students in the university is over 15,000, the number increases every session with no plans of expanding the facilities. Only 100 level and 500 level students are officially entitled to bed spaces in the hostels because each hostel cannot accommodate more than 1,500 students comfortably. Originally, the rooms were

designed to accommodate only three students but the management was forced to introduce double bunks to create space for more students due to the population upsurge.

However, the students share bed spaces with friends or relations; several times the porters report that they find up to eight students in a room that is officially allocated to six students. These conditions overstretch the aged hostels and aggravate the deterioration and intensify the difficulties faced by the maintenance managers.

The FGN earlier in the last year (2014) embarked on the construction of student hostels on campuses of most public (federal and state) universities in the country. Progress on the construction of the new hostels is about 30%. The university also partnered with private developers to build some hostels on the main campus and about 55% of the construction has been completed. There is hope that the existing hostels will be relieved of congestion as soon as the new hostels are completed.

Many students lack orientation on the proper use of facilities in the hostels; they cause frequent breakdown of the facilities. In addition, the population of students that use the facilities is more than the carrying capacity of the building, contributing to the failure rate of facilities.

The voltage supply of electric power to the hostel is too low for appliances such as electric stoves and water boilers. As a result, the use of such electric appliances in the hostels affects the wiring system. The hostels area often experience power failure and rectifying such faults may take more than a week.

The hostels have no provision for kitchens or cooking areas for the students. There are no restaurants on campus; therefore, the students prepare their meals on the corridor spaces in front of their rooms. Some cook in the bedrooms when the porters are off duty for the day.

5.6. Case B2

The University studied in this case was established in the year 1991 by its host state. The state government had a vision of providing a centre of excellence for the development of human capital capable of responding to the cultural, social, political and economic needs of the environment and setting an agenda for change.

The successful establishment of the university was a culmination of decades of sustained efforts by successive administrations to address the educational imbalance since the creation of the state in 1976. The institution is one of the prides of the state located in a strategic position in the capital city of the state on a large land area of about 180,494 hectares. The land area allocated to the university included the premises of a Government Technical Training School, a Government Day Secondary School, and a Government Girl's Secondary School. All existing structures (offices, classrooms, hostels) on the schools' premises were taken over by the university.

The objectives outlined to achieve the aim include:

- To encourage and promote advancement of knowledge and to hold out to all persons without discrimination of race, creed or political conviction, the opportunity of acquiring University education;
- To encourage the effective application of higher education to the needs of the State through research and extension and consultancy;
- To provide ready and easy access for the State citizens to higher education for self-reliance; and,
- To promote, preserve and propagate the social and cultural heritage of the diverse people of the state.

The population of the students has increased from 700 at inception in 1992 admitted into four faculties to a total of 21,448 students in 2014. There are 18,383 undergraduate students in eight faculties; 346 students enroled in the College of Health Science, 1,150 are postgraduate students. Sub-degree programmes account for 1,569 students, but the

sub-degree programmes operate on two study centre located in two separate towns outside the state capital city.

A major challenge facing the university is inadequate learning facilities to match the growing population of students and soaring demand for admissions. Such critical needs include an ultra-modern library complex, standard Information and Communication Technology (ICT) centre as well as large lecture halls. There is also a need for expansion of hostel facilities that support the students' academic pursuit. The University also needs a Central (Senate) building to improve on the offices for staff. Although some organizations such as the Education Trust Fund (ETF) and Petroleum Technology Development Fund (PTDF) as well as Association of Local Government of Nigeria (ALGON) have contributed by building some offices and laboratories.

Figure 5.29 A building project on-campus sponsored by ETF in 2002 for offices and laboratories

5.6.1 Physical Conditions of Hostel Buildings

(a) Right end   (b) Left   (c) Rear

Figure 5.30 Exterior views of the hostel at Case B2

The structure and condition of the external environment of the hostel blocks on the main campus are presented in Figure 5.30 (a), (b) and (c).

(d) Entrance　　　　　　(e) Reception/porter's space　　　　(f) Corridor between bedrooms

Figure 5.31 Entrance and corridor views at Case B2

The entrance to the female hostel block is shown in Figure 5.31 (d), the sanitary condition is poor and the gate frame is rusty and defaced with posters. The reception area is shown in Figure 5.31 (e) approaching the staircase is dark and stuffy.

Most of the corridors within the hostels are narrow and lack ventilation; the few light bulbs do not provide sufficient illumination even during the day. The corridors also serve as cooking areas especially in the female blocks because kitchens are not provided. Maintainability of the building is a major challenge.

(g) Ceiling and wall of a room　　　(h) Bedroom　　　　　　(i) Laundry

Figure 5.32 Views of spaces within the hostel at Case B2

Figure (g) shows the ceiling and wall of a room in good condition, (h) gives a glimpse of a typical bedroom that is designed to accommodate two students now congested with four students, the door barely opening. A deserted laundry area is shown in Figure 5.32 (i) because of the poor water supply.

5.6.2 Condition Survey of Hostel Facilities

There are two identical hostel blocks on the main section of the campus. One of the blocks accommodates the female students while the other, the male students. The researcher had access to only the female block, therefore, five wings in the block. Four

wings have two floors each, and the fifth wing has three floors. There are 360 bedrooms in the block but for the purpose of the survey, forty-nine bedrooms and seven lavatories were evaluated.
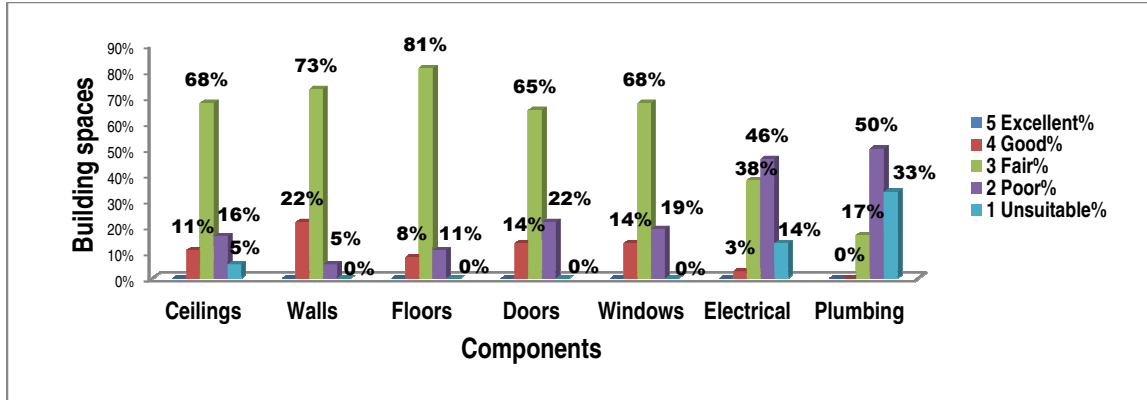
Figure 5. 33 Female hostel block at Case B2

Most of the components are in fair conditions with a high (81%) for floors. There are up to 22% of the wall in the spaces in good condition. However, 33% of the plumbing services in the lavatories are unsuitable for users.

5.6.3 Interview

Information about the maintenance management system of the hostels provided for students in this institution was generated from an interview with the maintenance coordinator. The interview was conducted on the 25th of September 2014 at the maintenance unit office. The interviewee heads the maintenance unit; he is an experienced building services engineer and holds a PhD. in Building Services. The outcome of the discussion on the subject matter is presented in the following sections under appropriate themes.

5.6.3.1 Maintenance Management Strategies

The maintenance management of all buildings on the campus is the responsibility of the maintenance department of the university. The department gives priority to the maintenance of the hostels than any other building.

The hostels are given maintenance priority because the university revolves around the student, and it is important to pay more attention to where they reside. Negligence or

lack of adequate maintenance of the hostels can result into accidents or disease outbreaks. Such problems affect smooth running of academic activities, which are the main purpose of establishing the institution. Secondly, poor conditions of hostels could expose the unhealthy living conditions of students that would tarnish the image and reputation of the university.

i. *Maintenance plan*

The maintenance policy in the university is simply that whenever a building facility on the campus requires maintenance attention, the maintenance department should provide the desired attention without unnecessary delay. There is no policy in the form of a document for maintenance in the department.

The department keeps records of all maintenance operations. The department does not have an inventory of any facility it maintains; every department is supposed to keep records of its facilities. The SAD has inventory of the hostel facilities; every staff has a tight schedule, therefore, there is no time to update any record.

ii. *Maintenance budget and funding*

The maintenance budget is prepared based on experience and works that have been identified and proposed to be executed during the next period. The university provides all resources for the department; no other source of funding is available. A representative of the department at budget meetings always struggles to defend the department's submission due to several competing departments.

iii. *Maintenance operation strategies*

Most works are done in-house except for major specialist works that the department does not have the required expertise and resources. Urgent works are outsourced when workload is high in the department.

The cleaning services are outsourced in accordance with a government policy in that instructs public universities to outsource hostel management services.

iv.   Communication

The student union office and the student affairs make efforts to educate the students about maintenance culture and right use of facilities. They use mediums such as organising talks with the students and placing the rules of occupancy on notice boards provided within the hostels and other strategic buildings on campus.

The maintenance office receives complaints daily from the hostels. Students, porters, hall administrators and security officers report problems directly to the maintenance office. The appropriate operation officers are assigned to resolve as many complaints as they can handle within the available resources.

Ideally, students are supposed to communicate any complaints about facilities in the hostels to the student affairs office; the student affairs office compiles and forwards complaints weekly. The maintenance office receives complaints that the students report directly to the office without going through the formal procedure because of delays experienced due to a slow bureaucracy.

v.   Performance evaluation

Visual inspections of the hostels are carried out at least quarterly to identify failure or facilities that require maintenance attention.

5.6.3.2 Interrelationship between Maintenance Management and other Management Aspects

The maintenance unit has an interrelationship with all departments on the campus because the maintenance of all building facilities is the responsibility of the unit. The SAD manages the hostel buildings. Therefore the maintenance office relates with the division for the maintenance management of the hostel facilities.

The senior managers of the university make all strategic decisions in the university. The members are the Vice-Chancellor, the two Deputy Vice-Chancellors, the Bursar, Registrar and the Chief Librarian. All other managers make suggestions to the senior management on their various visions and plans of their respective departments.

According to the organogram of the university, the maintenance unit is directly under the office of the Vice-Chancellor. The maintenance coordinator heads the unit, assisted by the Chief Engineer. There are sub-units for buildings, electrical and plumbing services; the unit heads supervise the artisans in their sub-units. A unit secretary oversees office administration and directs the clerical staff.

When the department is desperately in need of personnel in specific areas, the maintenance coordinator places a request to the senior management. There must be persistent follow-ups before the request is granted.

For other normal employment, vacancies are compiled from all departments, sections and units in the university. Management advertise the positions and candidates called for interviews; unfortunately, appointments are based on paper qualifications; not test of skills; and that does not favour a highly technical department.

Senior management takes strategic decisions; departments can only submit reports and hope that the needs of the departments are clear to the members of the executive managers of the university.

Motivation of employees in thedepartment is very important because they make a lot of sacrifices that are not easy to recognise by the management, secondly they are made to work within very tight resources. Motivating maintenance workers takes more than the bonus or an allowance but devising ways of making everyone feel accepted and recognised. The modes of motivation include writing strong recommendations when a staff is due for promotion to his/her next rank. The employees are given free reign to organise the materials they require for works rather than the department inviting suppliers. All workers feel free to make suggestions and contributions at meetings.

5.6.3.3 The Impact of the External Environmental Factors on the Maintenance Management of the On-campus Hostels

The hostels are overcrowded, because the number of occupants in a room is double the designed capacity currently (increased from 4 to 8 students in a room). The students compete for the same existing facilities in the hostels causing frequent breakdown.

A major challenge of the maintenance management in the university is inadequate or sub-standard infrastructure. The state water board supplies water once or twice in a week for about two to three hours only. The university depends on its old 'water works' that is still not sufficient because the water pumps are powered by electric power that is also inadequately supplied. The management never considers expanding the water reservoirs when they take decisions to increase the number of students every session.

The public electric power supply is not regular and most of the times the voltage is too low for use. A power generating plant is provided to supplement power; the maintenance unit operates the plant. The high cost of running the plant and water supply consume a large part of the department's resources.

On weather and climatic impact on the buildings, strong winds often destroy the roofs. Most roof coverings have to be replaced. This has caused a setback to the department because there are other aged roofs that plans were underway to carry out repairs, which have have had to be suspended.

The students vandalise the facilities very often, some misuse the facilities out of either ignorance or careless attitudes. No one has ever been penalised for misuse of vandalising the facilities because they carry out their deeds when the porters are out of sight. The diverse cultural beliefs, and traditions of the students manifest in their behaviours and the way the live and use the facilities. Students with bad characters do not take ownership of the facilities provided for public use; they misuse and vandalise the hostels without thinking of other users. They also corrupt students with upright characters.

5.7 Case B3

This university was established in 2005, it has a vision "*to be a world-class centre of excellence driven by people, partnership and technology*". Its mission states that the institution is *"committed to producing world-class graduates for the pursuit of all-round excellence through quality research, teaching and community service"*.

The philosophy of the university is national reforms in higher education rather than a mere quantitative expansion of facilities that already exist in other institutions across the country.

The university operates on three campuses in small towns all within the state. There are hostels for both the male and female students on all the campuses. However, the university believes it is not under obligation to provide residences for its students; therefore, it is a privilege for a student to be eligible for accommodation in any of the hostels.

5.7.1 Physical Conditions of the Hostel Buildings

(a) Front view   (b) Defaced wall   (c) Collapsed drainage

Figure 5.34 Exterior views of hostel buildings at Case B3

The pictures in Figure 5.34 show the conditions of the exterior parts of some hostel blocks. The view in (a) is the front of a male hostel block, in (b) is a defaced wall of a female hostel block caused by damaged waste pipes from lavatories in the building.

(d) Courtyard   (e) A view from the courtyard   (f) A typical stair area

Figure 5.35 Views of the courtyard in a hostel at Case B3

The figures in (d) and (e) depict the conditions of the interior part of a female hostel block and the view of a typical staircase.

Figure 5.36 A laundry room in a hostel block at Case B3

The pictures in Figure 5.36 show the poor maintenance workmanship in a laundry room and a damaged section of the floor finishing.

(g) Toilet   (h) Wash hand basin   (i) A bathroom with a geyser

Figure 5.37 Photos showing the conditions of lavatory facilities in a hostel at Case B3

In Figure 5.37 (g), an untidy maintenance work is visible on the toilet floor; the flush system of the water closet is not in a functional condition. The taps and drain of the washbasin in (h) are not operational and (i) shows a bathroom with the ceiling and light fittings in poor conditions while the geyser is still wrapped in plastic.

(j) Unsuitable ceiling   (k) Defaced wall in a bedroom   (l) soiled wall in a bedroom

Figure 5.38 Pictures of defective components in some bedrooms at Case B3

The photos in Figure 5.38 (j), (k), and (l) show deteriorated conditions of some of the bedrooms in the hostels. The ceiling condition in (j) is an example of components that were rated unsuitable. In (k), occupants deface the wall surfaces in the room with writings. The defaced walls in (k) are a result of students using their bedrooms as kitchens.

5.7.2 Condition Survey of Hostel Facilities

A male and a female student hostel block were evaluated. The results shown in Figure 5.39 are for forty-two bedrooms with toilets and washrooms enclosed; four kitchens and three laundries. The male hostel considered for the survey (Figure 5.40) has general lavatories at one both ends of the corridors on each floor and kitchen/laundry blocks centred in the courtyards. Thirty-five bedrooms including two common rooms; four of the general lavatories and three laundries were considered.
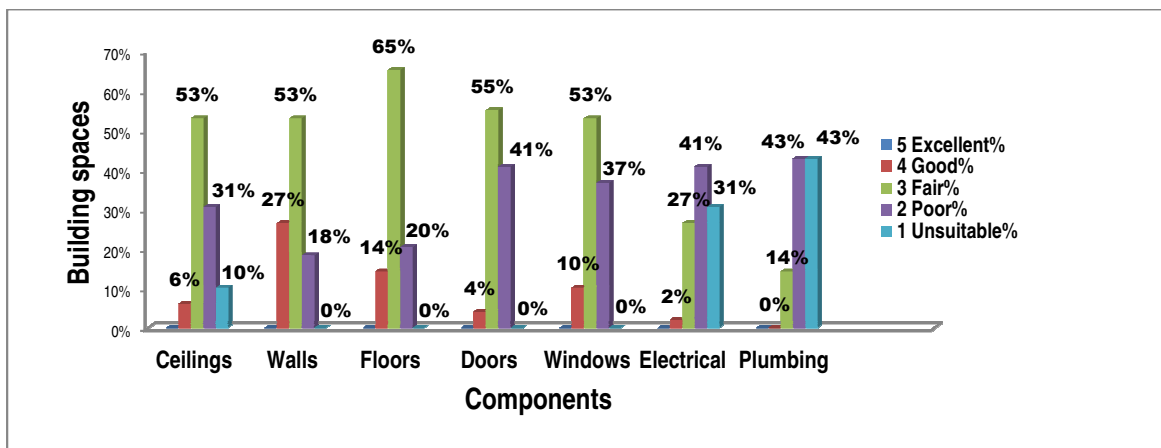
Figure 5.39 The female hostel block on the main campus at Case B3

Many building services (electrical 43% and plumbing 31%) are in critical condition and they were rated unsuitable for use in the hostel. Most components in the building are in fair conditions with some in good condition as a notable 27% of the walls.

120
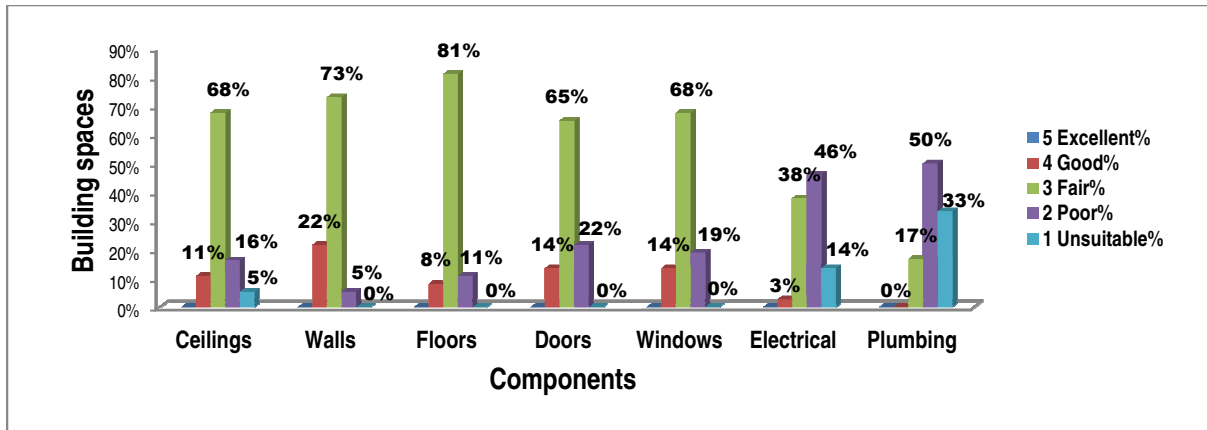
Figure 5.40 Male hostel block at Case B3

The results of the condition survey of facilities at the male hostel block depicted in Figure 5.40 are similar to the female hostel block in Figure 5.39. Majority of the services are poor or unsuitable for the users. Most of the other components are in fair condition and a few others in good condition.

5.7.3 Interview

An interview with two senior maintenance managers of the university was held on the 14th of September 2014. The discussions were centred on the maintenance management system for the on-campus hostels. The outcomes of the interview are presented in the next sections.

5.7.3.1 Maintenance Management Strategies

i. Maintenance plan

The goal of the department is to keep buildings in the best functional states that would support the academic activities of the university. The standard is simply to restore to operational states as possible all facilities within the available means.

There is no maintenance policy for any building in the university; operations are carried out at the discretion of the maintenance officers. The maintenance unit gives preference to the hostels than other buildings of the university because any delays may provoke the students to revolt, which they do by vandalising the university's buildings. Therefore,

only complains that the resources required are not readily available are suspended but not without an explanation to the student union leaders.

ii. Maintenance operation strategies

The maintenance strategy is mainly corrective because all works carried out in the course of a session are in response of reported cases. When the maintenance office receives a report/complaint, the officer in charge of the facilities examines the defects, documents the operations and resources required to restore the facility to an operational state.

Only critical maintenance problems receive attention; other non-pressing issues wait for general maintenance works that are carried out at the end of every session. This system is adapted because allocations are never sufficient for the expenditure of a period. There are always works that are left undone in a period increasing the backlog because the department has no other source of funding works besides the university management.

Most works are in-house; outsourcing is an alternative for critical works that cannot be undertaken in-house due to resource (expertise, material, plant and equipment) constraints.

The workers are too few for the workload of the department. The department lacks a sufficient number of artisan; as a result, many works are delayed because they have to wait for the available operation officers. There are only three plumbers, two carpenters and three electricians in the department that undertake maintenance works for all building facilities on the campuses. The department hires plant and equipment when required. Working tools are not in sufficient number and some of the available ones either old or not in their best operational states.

Maintenance issues are highly unpredictable. Staff work during and after official working hours as needs arise. However, for normal duties every staff member has and understands his schedule. For instance, the hostel maintenance officer ensures water is supplied at appropriate periods. This is to enable the students to use and store some for use during the hours that water may not be available.

The department is not *au fait* with the conditions of the hostels at all times. Conditions are observed when a fault is reported, and officers are assigned to investigate or during the walk through inspections when students vacate the hostels at the end of the session.

The data generated during observations; and the major inspections form the basis for maintenance planning for the next period.

iii. Budget and funding

The department does not prepare a budget like other departments in the university do. Estimates are prepared based on the reports and quotations from maintenance officers in the department. The maintenance office funds minor works from the imprest account of the department. In the case of major works, the department writes to senior management through the Director of Physical Planning. The submissions are to request for the release of funds that would be required to carry out the major maintenance operations.

iv. Communication

New occupants (majority are the first-year students) are advised during orientation programmes at the beginning of the session. Rules and regulations for occupancy are placed on notice boards in the hostels. Maintenance problems identified in the hostels by the student occupants are communicated to the department via the hall administrators.

5.7.3.2 Interrelationship between maintenance Management and other Management Aspects

The maintenance unit works closely with the SAD in managing the hostels. The student affairs unit seeks the contribution of the maintenance officers every session when revising the rules guiding the occupancy of the hostels.

In 2012, management took a decision to provide funds for major works on a quarterly basis in a session. The department prepares a maintenance plan and estimates for the quarter that management considers before releasing funds for that quarter. The Director

of Physical Planning Department represents the physical planning and maintenance departments at meetings with the university management.

When the department is desperately in need of a member of staff (an artisan), a request is made directly to the Vice-Chancellor instead of waiting for the usual long process of employment.

5.7.3.3 The Impact of the External Environmental Factors on the Maintenance Management of the On-campus Hostels

A source of concern for maintenance is the unruly behaviour of the students in the hostels. There are many generators of maintenance: poor construction, use of inferior materials, but a major cause of maintenance in the hostels is misuse and vandalism by the students. The use of facilities of the hostels lacks adequate supervision strategies that would minimise the impact of occupants' misconduct.

For instance, the students misplace the keys to their rooms very often, and they break the door locks to gain access with no consideration of the security of other occupants. However, the maintenance department came up with a plan of replacing any damaged timber doors with metal doors.

5.8 Case B4

The university presented in this case is a conventional university established in 2005 and owned by the host State. The institution has a vision of developing the citizenry by proffering a platform for knowledge acquisition, promoting diligence and the rich and diverse cultures and values of the State. Although it is established on over 700 hectares of virgin land, its location (about 50 kilometres) away from the capital city deprives it access to basic infrastructure (water, electricity).

The lack of priority to completing on-going projects by succeeding administrators in the State had its negative impact on the development of the institution. As a result, the built facilities for academic activities on the campus are grossly inadequate.

There are only two major structures: a main building that houses administrative units and academic departments (includes classrooms and laboratories); a small hostels estate designed for only 700 student occupants. Construction works on the campus picked up in late 2013, therefore; academic buildings such as a lecture auditorium and departmental buildings are expected to be completed in a couple of years.

5.8.1 The Structures of the Student Hostels

This section presents the pictorial visuals of structures in the student residences on the university campus

(a) Aerial view   (b) Block of two chalets   (c) A Chalet
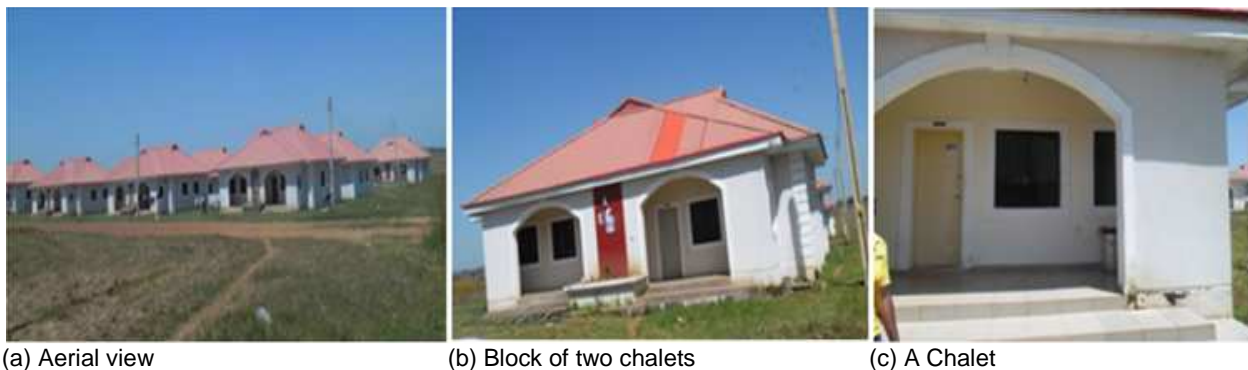
Figure 5.41 Photos of chalet structures

The photos in Figure 5.41 show the structure of the on campus accommodation provided for students of the university. Aerial view of the chalets is captured in (a); a close view of a block of chalets is shown in (b), while c is a close front view of a chalet.

(d) Entrance to a room   (e) Wall in a room   (f) Custom-made kitchen
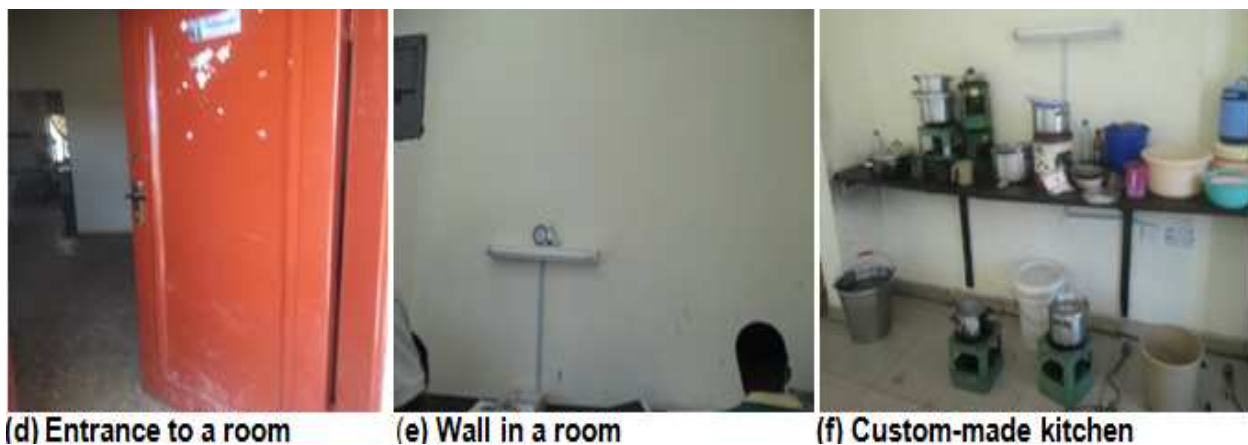
Figure 5.42 Views of the interiors of the chalets

The interiors of some rooms are presented in Figure 5.42 (d), (e) and (f).The picture in (f) shows a study corner that is used as a kitchen by the student occupants. This condition is common in chalets occupied by female students. Figure 5.43 (g, h and i) depicts the part of a stained ceiling at the entrance porch of a chalet (g); a typical toilet in a chalet (h) and a terrrazo floor finishing at a chalet.

(g) Ceiling   (h) A typical toilet   (i) Terrazzo floor in a room

Figure 5.43 Photos showing conditions of some facilities in the chalets

It was observed during the survey that the some of the chalets have terrazzo floor finishing while other chalets have ceramic tiled floors.

5.8.2 Condition Survey of Student On-campus Chalets

The physical conditions of the facilities in ten of the twin chalets occupied by female students and another ten occupied by the male students were surveyed. The result of the condition survey for the female chalets is presented on Figure 5.44, while the result for male chalets is displayed on Figure 5.45.
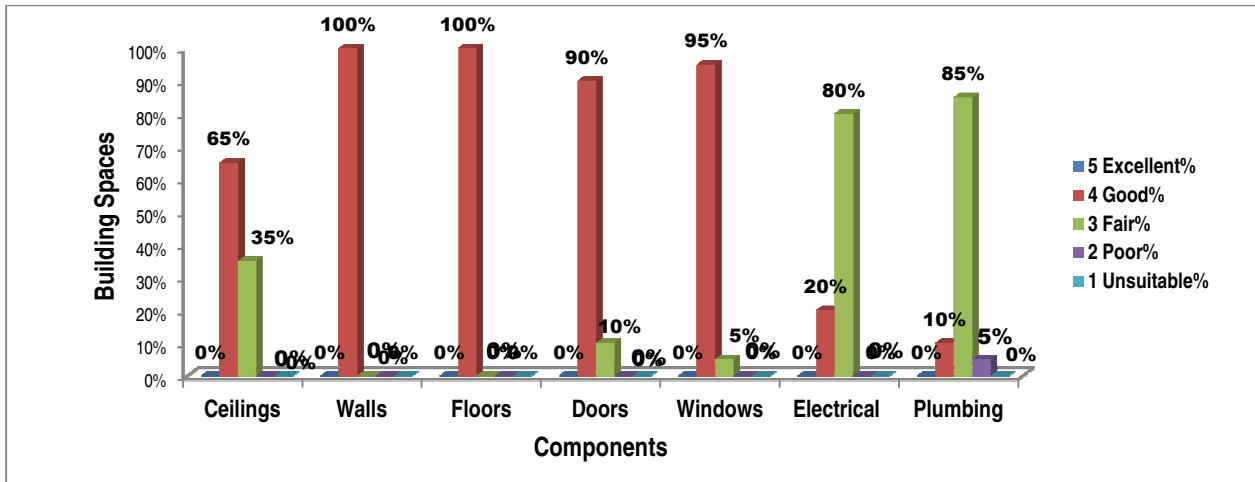
Figure 5. 44 Conditions of female student chalets on the campus at Case B4

All walls and floors (100%) of the building spaces surveyed are in good condition. Moreover, 95% of the spaces have windows in good condition. Most doors (90% of the spaces) are also rated 'good'. However, the rating of the condition of the services (plumbing and electrical) differs from other components in that only 20% of the spaces have electrical facilities in good condition and only 10% of the spaces have plumbing facilities in good condition. However, the majority (80% and 85%) of the spaces have their electrical and plumbing services in fair condition.
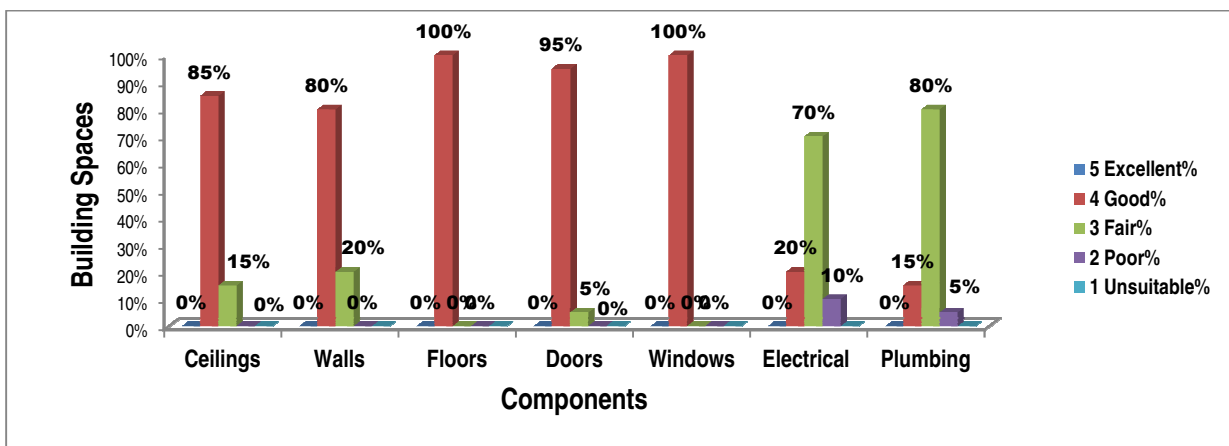
Figure 5. 45 Conditions of male student chalets on the campus at Case B4

Similar to the results of the chalets occupied by the female students, most of the facilities in the male chalets are in good condition. All (100%) of the floors and windows of the spaces assessed are rated 'good'. However, only 95% of the spaces have doors in good condition. The ceilings in 85% and walls in 80% of the spaces are also in good condition. The majority of the building services in the male chalets are also in fair condition, but 10% of the spaces have poor electrical services and plumbing services in 5% of the spaces are also poor.

5.8.3 Interview

The Director of Works is the head of the Maintenance and Physical Planning Department of this institution. He holds a Masters degree in mechanical technology. There are about 12 employees in the department. The Chief Maintenance Officer coordinates maintenance activities.

The Director of Works was engaged in a forty minutes interview on the 13th of October 2014 in his office at the university campus. The focus of the interview was on the maintenance management system of the existing chalets on the campus that are occupied by the students. The outcomes of the discussion are summarised in the sections that follow.

5.8.3.1 Maintenance Management Strategies

Very few structures house all the activities because development on the university site has been very slow. The existing structures for accommodating students are in flatlets that are called "chalets". The structures are not in the form of the conventional student hostels in most universities because they were designed for postgraduate candidates. The institution is yet to commence postgraduate programmes and currently runs few undergraduate programmes. They accommodate the undergraduates in the chalets pending the completion of the hostels underway for the undergraduates.

i. Maintenance plan

More attention is given to the chalets than other buildings on the campus (offices, classrooms) because the students deserve a homely accommodation that would support their academic pursuit. Therefore, the maintenance office makes efforts to

address all maintenance issues in the chalets within the available resources. There is no policy for maintenance, but works are carried out based on personal discretion of officers in charge and from experience and skill acquired from individual training.

The department has records of all maintenance works, but not in a systematic way that would make it easy to trace records of particular work. The maintenance office is temporary and lacks many administrative facilities that would enable proper organisation and coordination of activities.

ii.   Maintenance operation strategies

All maintenance works are corrective; preventative maintenance is not practicable due to several constraints such as workforce, finance and poor administrative structure. Maintenance works that cannot be handled in-house are outsourced. The environmental department is responsible for general sanitation of the campus, but the students clean their chalets.

The administrative duties in the office include are documenting reported cases, assigning workers to carry out in-house works or assigning supervisors to contractors engaged for outsourced works. Other duties include filing documents of completed works and writing reports annually for the activities of the department.

On staff development and training, employees attend workshops (usually sponsored by the university) that boost their skills and improve the maintenance activities in the university.

iii.   Maintenance budget and funding

Budget for maintenance is built in the annual budget of the works department. The Works Director releases funds for maintenance works as the need arises. The budget is prepared based on previous budget, and other maintenance needs that crop up during the course of the year are included.

The budget allocation for a period to the unit always falls short of the financial requirements of the unit; as such, there is always maintenance backlog.

The unit has no other source of funding and has no intention or plans to generate funds outside the allocations for works because the university is owned and fully sponsored by the State government.

iv. *Communication*

Students are provided with a booklet by the student affairs department that contains rules and regulations on the use of university facilities, particularly, the hostels. A maintenance officer is usually invited to give lectures to the students on maintenance culture during orientation week for fresh students.

Complaint forms designed by the department are made available to the student union representatives that reside in the chalets. There are maintenance officers assigned to the chalets. Students fill the forms when they have to report a fault; the forms must pass through student affairs office before they are brought to the maintenance office.

5.8.3.2 Interrelationship between maintenance Management and other Management Aspects

With regards to the interrelationships, the interviewee commented as follows:

"The maintenance department does not get the desired attention to be effective. The management does not understand the importance of maintenance as key support activity of educational activities".

"The unit has never received an 'imprest' (cash to cater for pressing needs that may arise) but of late the Vice-Chancellor realises that the need for imprest allocation for maintenance after visits to other universities".

There is a promise for the imprest allocations but until that becomes a reality the old system prevails.

A major challenge of the department is inadequate workforce; the few employees cannot meet the work demand and they are not adequately motivated. However, workers sometimes get permission to attend workshops and short training programmes that they believe would improve their skills.

5.8.3.3 The Impact of the External Environmental Factors on the Maintenance Management of the On-campus Hostels

The present population of the students is not a problem because the chalets can accommodate almost all students that prefer to live on campus. The student population is about 3000.

The campus has no connection to the national electric power grid yet because of its location in a rural community. The university runs on power generating plants the maintenance department is saddled with the responsibility of servicing and operating. The plants provide electric power to academic buildings during office hours and a few hours at night to the student residential area. The power plants are also used to pump water that serves the university community every day.

5.9 Case C1

This university was established and is owned by a Christian based religious, non-profit/non-government organisation in West Africa. The organisation believes that establishing a university in Nigeria is a noble cause that is consistent with its legacy of promoting education in Nigeria.

Other driving forces behind the establishment of the university include: a soaring need for quality tertiary institutions to supplement the existing public and private ones for the teeming populace. And a need for education that recognises and integrates moral and spiritual values in the face of degenerating social decadence in many Nigerian university campuses.

On meeting the NUC requirements for establishing a university, a license was issued and the university was established on the 5th of January 2005. Academic activities commencedin 2006 on a temporary site in Jos, Plateau State.

The core values of the institution are Christ-centeredness, people-orientated, excellence, purpose-driven life and adaption to a changing world that are rooted in the second and third verses of the book of Romans chapter twelve, in the Holy Bible.

The university does not operate the conventional student affairs unit/department like in other tertiary institutions in the country and beyond. A 24-hour Chaplaincy service with three chaplains assisted by some staff of the university is responsible for guidance and counseling of students.

A module in Bible study is a pre-requisite for all students enroled at the university. There are also compulsory Chapel hours on Mondays, Wednesdays, Sundays and most Saturdays. There are student groups with mentors (staff) assigned to each group. Students are also encouraged and supported to build prayer cells with their roommates. In addition, the Chaplains, assisted by some staff, conduct room-to-room evangelism once in a week to strengthen the faith and moral values of students.

The University operates strict disciplinary creeds that are contained in the student handbook. It prescribes behaviour and dress codes that guide living on campus. Violating the regulations of the institution attracts prescribed and appropriate sanctions such as suspension or even expulsion.

5.9.1 Structure of the University Campus

The university started with only 124 students in May 2006. In 2014 there were about 2000 students. In 2008, the university moved to its permanent site on 259.88 hectares of land located about 30 kilometres in the outskirts of Abuja (capital city of Nigeria).

Basic structural facilities for academic activities that include hostels for students were provided before the institution relocated to its permanent site. It is compulsory for all students to reside on campus. The hostels are not self-catering, but the management of the university outsourced supervised catering services for the university community. A comprehensive health centre that extends to the neighbouring community is also available.

Proposed priority construction projects of the institution in no particular order are additional staff offices for all faculties, radio station, teaching hospital, four hostel blocks each for male and female students that would accommodate 1000 students. Students pay between ₦465,000 and ₦830,000 for academic fees per session, depending on

their programme of study. The medical student accommodation fee is ₦90,000, while the other students pay ₦60,000 each for their accommodation.

5.9.2 Physical Conditions of the Hostels

(a) Front of a block   (b) Back view   (c) Entrance to a block

Figure 5. 46 Exterior views of hostels at Case C1

The pictures in Figure 5.46 show different views of a typical hostel block. Sub-standard plumbing work is evident in figure (b) and exposed electric power cables can be seen in figure (c).

(d) Corridor   (e) Typical toilet   (f) Bathroom

Figure 5. 47Corridor and wash areas in a hostel block at Case C1

The corridors in the hostels are in good condition with adequate light. Components of the lavatory areas are in good condition, but the buildings lack adequate water supply for use by the students and for cleaning purposes.

(g) Ceiling   (h) Wall   (i) Floor

Figure 5. 48 Conditions of a typical bedroom at Case C1

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Figures 5.47 and 5.48 depict the condition of components in the bedrooms that were evaluated during the condition survey.

5.9.3 Condition Survey of Hostel Facilities

The physical conditions of facilities at the female and male hostel blocks were evaluated; and the results are as presented in Figure 5.49 and 5.50. A total of forty-four bedrooms and four bathrooms/toilets/laundries were surveyed.
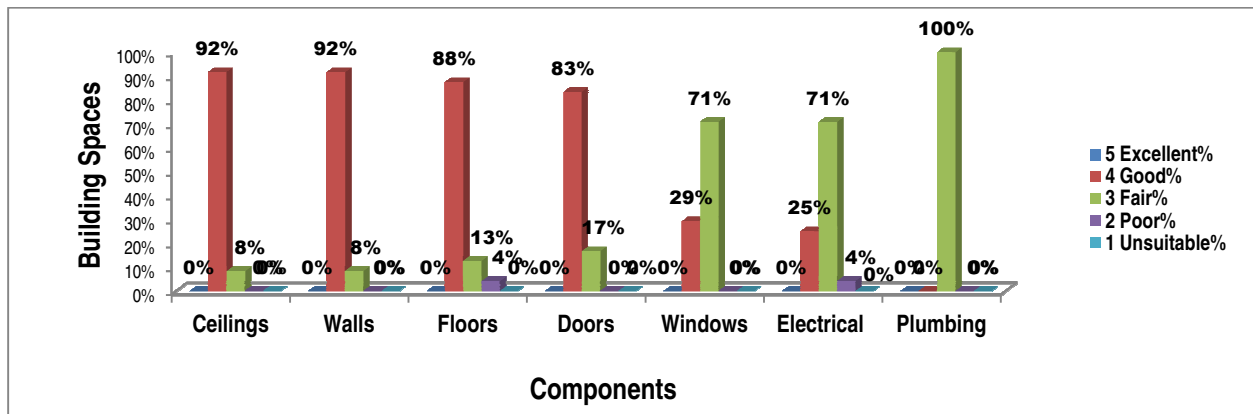
Figure 5. 49 Condition survey results of female hostel block at Case C1

Most of the building spaces have their ceilings (92%), walls (92%), floors (88%) and doors (83%) in good condition. However, 4% of the spaces have floors that were rated poor, but no (0%) space has components that are in excellent condition and none (0%) in unsuitable condition. All plumbing services assessed were rated 'fair' and 71% of the spaces also have electrical services in fair condition.
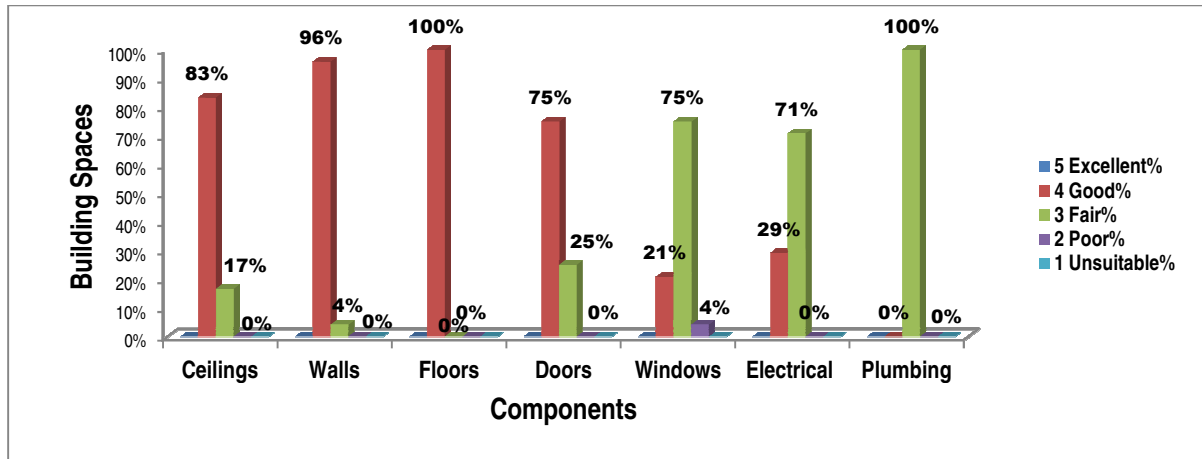
Figure 5. 50 Condition survey results of male hostel block at Case C1

All (100%) plumbing facilities provided at all spaces surveyed were rated 'fair'. All (100%) floors, 96% of walls and 83% of ceilings at the spaces are in good condition. Electrical services at 71% of the spaces were in fair condition and windows at 75% of the spaces surveyed are also in fair condition, but the windows at 4% of the spaces are in poor condition.

5.9.4 Interview

The interview with the maintenance director in the university took place on the 18th day of September 2014 at the office of the department on campus. Questions relating to the maintenance management system for the hostels on campus were asked. The information the questions were able to generate from the interviewee is presented in the following sections.

5.9.4.1 Structure of the Maintenance Department

Maintenance is a sub-section of the Physical Planning Department of the university. An Acting Director, a Chief Builder is the head of the Physical Planning Department. There are three units in the maintenance section, and each has a head (electrical, mechanical and buildings) that are direct subordinates of the Acting Director.

There are five carpenters under the supervision of the head of buildings unit; the head of mechanical directs three plumbers and three power plant mechanics; there are five electricians under the head of the electrical unit.

5.9.4.2 Maintenance Management Strategies

i. *Maintenance plan*

The university operates a central maintenance management system for the buildings. A maintenance policy has not been developed. Works are done at officers' discretion. No facility has a maintenance manual, but the mechanical maintenance sub-section is developing a catalogue for each of the power generating plants to keep records of all maintenance services carried out on the generators.

There are records of all previous maintenance works in the section and inventory of facilities provided in every commissioned building. The inventory has not been updated for a while because of the increase in the volume of work in the department.

ii. *Maintenance budget and funding*

Budgets are prepared based on previous budget annually. Sometimes the allocation for a period meets the planned expenditure contained in the budget. At times when the maintenance office is faced with critical deficits, the director mounts pressure on the management to source for funds that would enable quick interventions.

The university is faith-based and does not have any other source of funding besides what it generates from student fees and the little support it gets from the non-profit and non-governmental organisation that established the institution. The FGN does not provide any form of support to the private universities like it does to states universities from the Education Trust Funds (ETF). ETF is generated from the revenue the country makes from petroleum.

iii. *Maintenance operation strategies*

Minor works are handled in-house, but major works are outsourced because the staff strength and resources are inadequate. Most plant and equipment are hired when required. Basic tools and smaller equipment that are constantly used have been purchased though not in sufficient quantity due to resource constraints.

Once complains get to the maintenance office, the secretary sorts the problems and forwards to the respective units. The department has a policy of responding to any maintenance issue as soon as possible to avoid further damage of the facilities.

When there are frequent complaints or reports on the facility, the officers are forced to carry out thorough inspection. The maintenance crew cannot carry out routine checks on facilities in the hostels because of the restriction to the female hostels. The hostels are only fully accessible for the condition evaluation exercise when students vacate the buildings.

Employees of the department are afforded equal respect and are free to make suggestions that would improve administration. There are normal daily schedules for each officer. The workers relate cordially with one another; this enables transfer of viable knowledge and supports personal development.

iv. Communication

When there is a problem with a facility in the hostels, the students report it to the porters on duty who communicate to the hall officers. The hall officers write a daily report on the condition of the hostels and a copy is submitted to the maintenance office. In the case of an emergency, the hall officers call the attention of the maintenance director immediately.

Students are advised to care for all facilities they use in the university first during a welcome address at the beginning of the session. They are reminded of a fifty thousand naira fine if anyone vandalised a facility provided in the buildings. Subsequently, the chaplain gives talks on ethical behaviours during the weekly sermons at the university chapel. Rules and regulations are also placed on notice boards.

5.9.4.3 Interrelationships between Maintenance and Management of the University

The maintenance section is indirectly part of the student affairs section that is under the chaplaincy. The two sections are under different departments, but they cannot be separated because of the nature of the responsibilities of managing the hostels. Cordial

relationships exist between the two sections; and that eases the coordination of maintenance operations of the hostels.

The new executive management of the university is about six months old; even the Works Department has new administrators. According to the Acting Director of the Works Department, the maintenance office had no proper coordination of its activities before the new management came on board. It is not an easy task to turn around an office that was redundant for many years. Maintenance management is beginning to get recognition of the senior management of the university.

The head of the works department is not a member of the executive council of the university. Recently the Vice-Chancellor requested that he should always be invited to councils to educate and advise members on the decisions that relate to maintaining the built environment of the institution. The management engages staff of the department, sometimes in response to a request of the department but most times at their discretion.

5.9.4.4 Impact of the External Environmental Factors on the Maintenance Management of On-campus Hostels

The university depends on a few boreholes for water supply; the population of the students has increased; almost doubled the number from about four years ago. The current supply of both electric power and water is unable to meet the demand on the campus. Power and water are basic infrastructural requirements for proper functioning of the maintenance management unit.

Financial support for the department is not received when due; the department signs agreements with suppliers and contractors. They supply and render services on credit and they get payment as soon as management releases funds. The biggest challenge for the university is inadequate funding; as a result, there are administrative and operational challenges that have become apparent in the institution due to inadequate funding. Since the inception the university has depended on subventions from the parent organisation, it has not been able to sustain itself with its internally generated revenue. The owner organisation has a strong missionary focus and has suffered a

severe strain on its internal finances. A fund appealing committee has been commissioned to help raise funds to support the development of the university.

5.10 Case C2

In 2005, this institution was licenced by the NUC to operate as a private university in Nigeria, a Christian mission organisation owns it. It pledged to provide education to all Nigerians and beyond without discrimination based on race, tribe, political or religious affiliation.

The founders had a vision of instituting a world class university for knowledge advancement by proffering quality teaching, research and holistic education that supports moral values.

Philosophy

"To develop a total person through a University education that is qualitative, comprehensive, and relevant, and that propels an individual to be self-reliant. The institution does provide opportunities for all persons who accept her vision and mission to acquire higher education".

Most of the structures on campus are very old because the Christian mission organisation operated a secondary school on the site in the early 1960s. A female hostel block that is about four year old was donated by a philanthropist. In all, there are four blocks in a cluster for the female students and only two blocks for the male students.

5.10.1 Structure of the Hostel Buildings

The university operates a full on-campus residency for its students; therefore no student is allowed to live off campus while studying in the university. The student population is less than 2000; therefore, the available spaces in the hostels can accommodate all of them comfortably. More blocks are under renovation and are supposed to be completed before the university expands its programmes of study and increase admission numbers.

5.10.2 Physical Condition of the Hostels

(a) Side view   (b) Front   (c) Rear

Figure 5. 51 External views of female hostel block at Case C2

Figure 5.51 depicts views of the on-campus hostel block for the female students in the university. At the rear view in (c) are water cisterns for the building.

(d) Walls   (e) Ceiling   (f) Toilet

Figure 5. 52 Photos of the interior spaces in the female hostel at Case C2

A view of the corridor in good condition is shown in (d), and the condition of the ceilings in a bedroom is shown in (e). In (f) is a washroom en-suite in a bedroom in the female hostel.

(g) Back   (h) Front   (i) old dilapidated hostel

Figure 5. 53 Photos of the male hostel area at Case C2

The pictures in Figure 5.53 are views of the male students' hostel area.Pictures (g) and (h) show the back and front of a renovated old block and (i) shows old dilapidated blocks about to undergo renovation works.

(j) Ceiling   (k) Wall   (l) Toilet

Figure 5. 54 Views of rooms in the male hostel at Case C2

The views of a room on a renovated block are shown in Figure 5.54 (j), (k), and (l).

5.10.2 Condition Survey of Hostel Facilities

Thirty bedrooms with lavatories enclosed at the female hostel blocks were evaluated and twenty bedrooms (lavatories enclosed) at the male hostel blocks; all on the campus, were surveyed. The results are revealed in Figures 5.55 and 5.56.
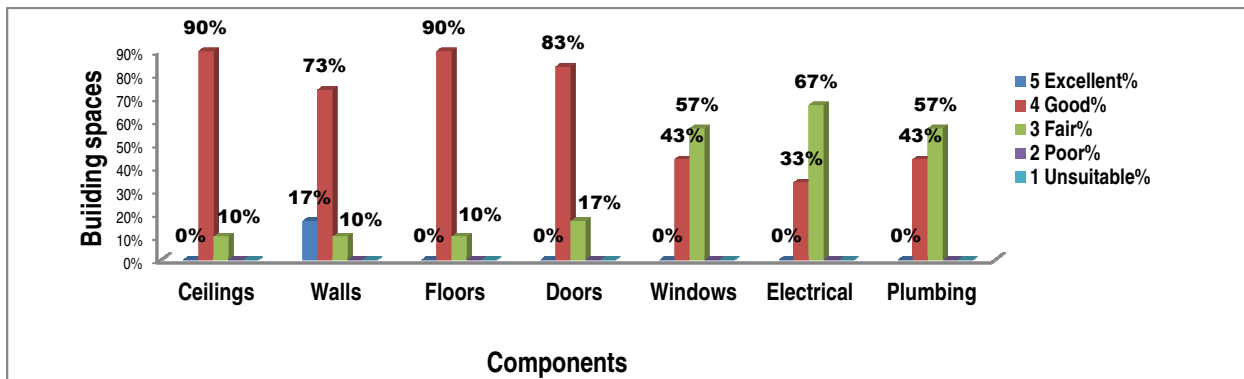
Figure 5. 55 Female hostel blocks at Case C2

Most facilities in the hostels are in good condition, and a few (17%) of the rooms have walls in excellent condition. However, less than 45% of the building services are in good condition but none is poor or unsuitable for use.
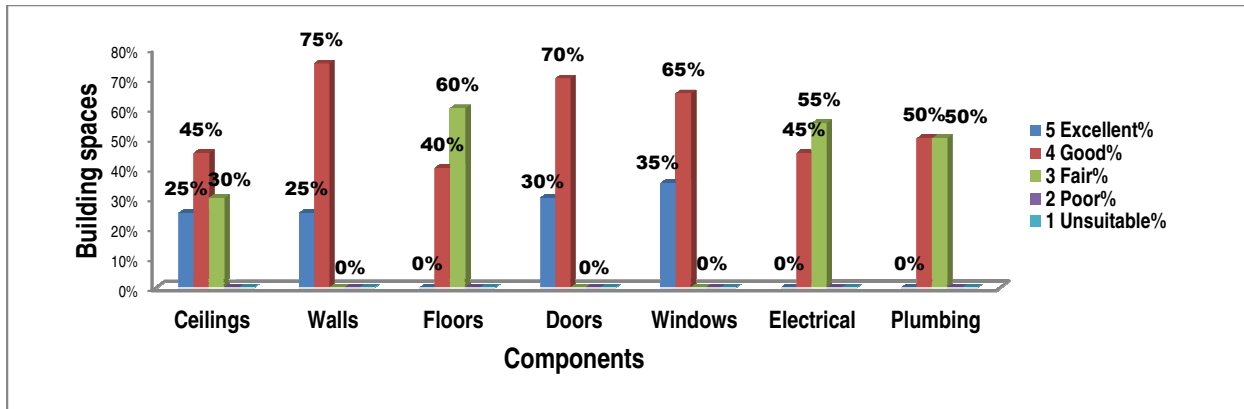
Figure 5. 56 Male hostel blocks at Case C2

The hostel blocks for the male students have been renovated, and most facilities are in their best conditions except for inferior materials or low quality of workmanship. Only 35% of the windows, 30% of the doors, 25% of the ceilings and walls are in excellent condition. Over 60% of the walls, doors and windows are in good condition.

5.10.3 Interview

In this case, a senior technical officer was interviewed on the 26th of September 2014 at his office. The thirty minutes discussion focused on the maintenance management system of the on-campus hostels of the institution. The proceedings of the interview is presented in the next sections.

Maintenance management is one of several responsibilities of the works and physical planning department of the university. The head of the department is the director; a principal technical officer who is concerned majorly with new works and major renovation and refurbishment works assists him. The next in office is the senior technical officer who oversees the minor maintenance works that crop up and the management of the boreholes and power generators.

5.10.3.1 Maintenance Management Strategies

Maintenance management is central in the university and the sole responsibility of the Works Department. The works department has about twenty tenure staff and about forty contract staff. The Acting Director of Works is the head of department; his major duties

are to represent the department at the executive management level. The principal and senior technical officers coordinate the affairs of the department.

i.   Maintenance plan

Maintenance priority is given to older and more dilapidated structures, and that includes some hostel buildings.

No maintenance policies have been documented yet. The structures that are occupied or in use are newly renovated or constructed. The focus of the works department now is on the renovation of more of the old dilapidated structures to provide more space for academic and social activities.

There is no record keeping system of previous works carried out; the only administrative works are the estimates that are prepared to get approvals from the Vice-Chancellor.

ii.   Maintenance budget and funding

The department does not prepare periodic budgets; estimates are prepared as the works arise.

iii.   Maintenance operation strategies

There are no preventative maintenance plans for the buildings; only reported problems are given attention. Most maintenance works are in-house; specialist works are outsourced. The department lacks sufficient resources (materials, tools and equipment) for maintenance works due to financial constraints.

Quality building materials are readily available in this part of the country. Secondly the university only deals with contractors and suppliers of reputable ethical character, and therefore the problem of inferior materials or poor workmanship is not experienced often.

iv.   Communication

The students are lectured by student affairs officers on maintenance culture during the orientation week for new students. They also receive handbooks that guide their conduct on campus. Students are not penalised in cases of accidental damages but in

the case of vandalism, the culprit is disciplined appropriately, and he/she is charged for the replacement or repairs of the facility.

Students report problems in their rooms to the porter on duty, who in turn reports to the hall administrator. The forms available are in the form of work order; only the maintenance officers can fill the forms describing the nature of the defect.

v.   Performance evaluation

The department prepares comprehensive reports on the condition of the hostels when the students vacate the hostels at the end of the session. A visual inspection of the buildings is carried out to identify failures or defects that must be corrected before a new session commences.

5.10.3.2 Interrelationship between Maintenance Management and other Management Aspects

The management of hostels is the responsibility of the SAD, but the Works Department carries out all maintenance related works. The works department works closely with the student affairs officers such as the Dean, Hall administrator and the porters. There are very few hostels considering the size of the university.

The operations officers are appropriately skilled and experienced; they carry out works at their discretion, and the department only provides them with the resources.

Refreshments are organised for workers during peak periods of the maintenance office. Sometimes a little bonus is given to motivate the workers; especially when workload is high.

The university does not have resources to enable workers attend workshops or any skill development programmes outside the university. The few professionals and skilled workers in the department serve as supervisors and mentors for those at the lower levels; skills are developed in the process.

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5.11 Case C3

The university in this case is owned by an Islamic organisation whose mission is to promote academic and moral excellence of the Nigerian nation and to promote the cause of humanity. A secondary goal of the university is to contribute to the economic growth of the nation through offering educational opportunities to all, irrespective of political, social, religious, gender, racial or ethnic affiliations.

It was established in 2005 when the FGN granted the organisation a licence to operate a conventional private university. With a curriculum founded on Islamic philosophy, the academic activities commenced in the same year with three colleges (Humanities, Management sciences and Natural Sciences) and seventy students. The 2013/2014 session recorded over three thousand students spread across four colleges.

5.11.1 Location and Structure of the Campus

The university operates on one campus located at a strategic part of a major city in Nigeria. The position of the campus is cost effective for the members of the university community in terms of mobility and access to basic standard infrastructural facilities such as housing and roads.

5.11.2 Hostels Provided for the Students

The institution provides on-campus hostels for only the female students. There are two hostels for the male students that are owned and operated by the university, but located on two separate sites, within 8 kilometres of the main campus.

(a) Male hostel   (b) Female hostel

Figure 5. 57 The hostel areas at Case C3

The picture in Figure 5.57 (a) depicts the mosque within the site of a male hostel off the main campus and the entrance gate to the compound. In (b) are entrances to the female hostel area on the main campus.

(a) Female hostel blocks   (d) Male hostel blocks

Figure 5. 58 Views of the compounds of the hostels at Case C3

(e) Corridor and stair spaces   (f) Toilet and a kitchen

Figure 5. 59 Photos showing condition of components within hostels at Case C3

Figure 5. 60 Plumbing conditions around the hostels at Case C3

5.11.3 Condition Survey of Hostel Blocks

A condition survey of thirty bedrooms, twelve bathrooms/toilets and four kitchens purposely selected from the five blocks of the female hostels on campus was

undertaken. The conditions of twenty bedrooms, six bathrooms and three kitchen spaces were surveyed at one of the male hostel sites.
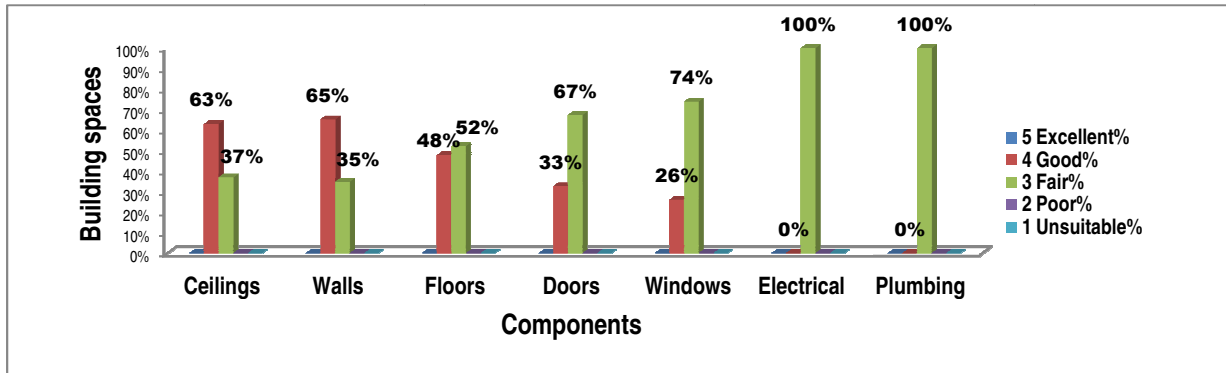
Figure 5. 61 Female hostel Blocks at C3

The bar chart in Figure 5.59 shows that no component is in excellent condition, and none is unsuitable or in poor condition in the female hostel blocks. However, most of the components are in fair condition with all (100%) of the services in this condition and over 65% of the doors and windows. High percentages (65% and 63%) of walls and ceilings are in good condition. Some floors, doors and windows are also in good condition (48%, 33%, and 26% respectively). The condition of the hostels is satisfactory and somewhat adequate as a support facility for living in a university.
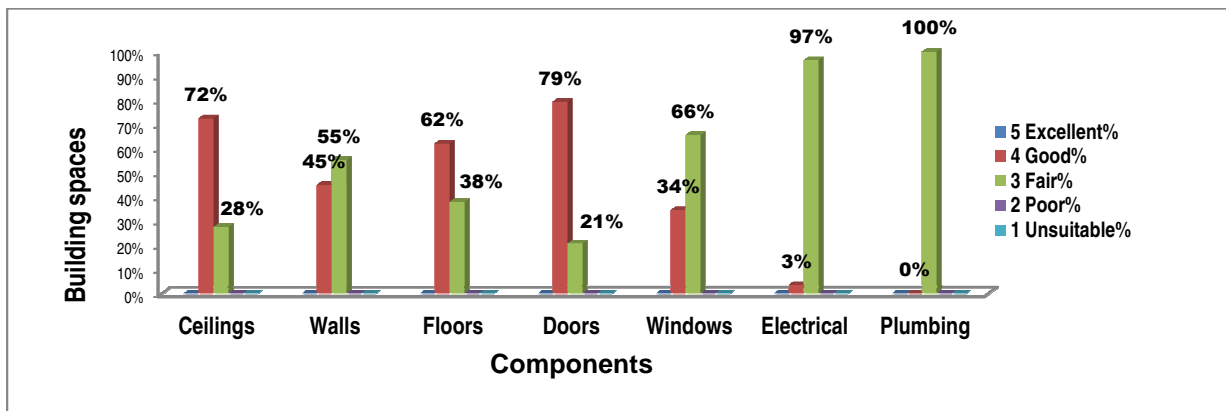
Figure 5. 62 Male hostel blocks at C3

All the components are either in fair or good conditions as the bar chart in Figure 5.60 reveals. The condition of all plumbing and 97% of the electrical services is fair. Most of

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the doors (79%) are in good condition, but only 34% of the windows are in good condition. The condition of most of the ceilings (72%) and floor (62%) were rated 'good' but more than half (45%) of the spaces evaluated have walls in good condition.

5.11.4 Interview

The two hall wardens and the head of the works department were the interviewees in this university. The hall wardens are retired principals of secondary schools. The head of the Works Department holds a Bachelor of Engineering degree in Mechanical Engineering. He is engaged as a Chief Engineer with over five years of work experience in physical planning and the maintenance of the built environment of the institution.

The hall wardens were interviewed in their offices within the hostel blocks after accompanying the researcher on the condition survey exercise of the hostel blocks under their care. The interview with each of the hall wardens lasted for about fifteen minutes. The head of the works department was interviewed in his office on the main campus which lasted for about thirty-five minutes.

The information about the maintenance management system for the hostels generated from the respondents is summarised under the sections that follow. The objective for providing students with on-campus hostels is to foster interaction among the students that supports the main classroom academic activities. Secondly, there are many young students that come from distant parts of the country. Most of the students (especially the first year) are the age of twenty and leaving home for the first time. The university has a mission of providing a "home away from home" for such students by providing the hostel accommodation and parental care.

i.   *Maintenance management strategies*

Maintenance of the hostel facilities is the responsibility of both the SAD and the Works Department of the university. A contractor engaged under the office of the Director of Works is responsible for cleaning the university environment, and that includes the female hostels on campus and the male hostels on other sites of the university.

ii.   Budget and funding

The budget for the Maintenance Department is based on the proposed new construction works and the maintenance backlog. A percentage is usually added to the total estimate to cover unplanned maintenance problems that may arise in during the session. The allocation for the period is never sufficient because maintenance works are difficult to estimate.

When there is a deficit, which is always the case, the director of a works requests for additional funds to attend to only critical maintenance problems. Other works are postponed to the sessional break.

iii.   Maintenance operation strategies

All maintenance works are corrective; minor works are undertaken in-house using the few artisans while major works and all cleaning services in the university are outsourced.

iv.   Communication

The students are provided with a handbook that contains rules and regulations for residing in the hostels. The students' hostel admittance form also outlines these rules and regulations. The students read and sign an undertaking to abide by them.

5.11.3.2 Interrelationship between Maintenance Management and other Management Aspects

The hostel buildings of the university are under the office of the student affairs department, but the maintenance of the facilities in the hostel blocks is the responsibility of the Works and Maintenance Department. The maintenance officers work with the hall wardens and porters. No maintenance operations can be undertaken without a request from the student affairs officers.

The performance management function is under the office of the registrar. The recruitment of staff for all departments and their promotions are determined by the evaluation process of the registrar's office.

Maintenance officers are usually paid for overtime besides other incentives they receive periodically. On skill development, the professionals attend at least a workshop or conference in their related fields once in a year, which the university pays for. The artisans are also encouraged to enrol for further skills development courses at technical training centres.

The Director of the Works and Maintenance Department is a member of the strategic team of the university. The university management understands the importance of the Works and Maintenance Department. The university therefore, tries to meet the major requirements of the Works and Maintenance Department at all times.

5.11.4.3 Impact of the External Environmental Factors on the Maintenance Management of the On-campus Student Hostels

The only source of revenue for the university is the fees paid by students and a few donations that the institution receives from individuals and other Islamic organisations. There are many pressing needs competing for finances in managing the university. The university management, with other private universities in the country, has been appealing to the FGN for financial support from the education trust funds it releases to the public institutions.

The population of the female students that seek accommodation in the female hostel on campus is still within a manageable range, but there are many of the male students that cannot be accommodated in the hostels. However, the problem of overpopulated hostels that may impinge on the maintenance of the hostel does not arise because the students can rent decent and affordable accommodation in the town.

There is a major problem of poor electric power and water supply in the city that affects the maintenance management of the buildings generally. The university has made provisions for water reservoirs at the hostels, and a lot is expended on servicing the water tankers to refill the reservoirs daily. Most hours in a day, the university runs on electric power generating plants, therefore, a lot is expended on servicing and fuelling the generators.

Many students misuse the facilities provided in the hostels owing to their backgrounds. The most frequent maintenance problem that is experienced in the hostels is blocked drains and waste pipes of the bathrooms and toilets. Some of the buildings have latent defects due to poor workmanship and substandard materials that were used. As a result, components often fail.

5.12 Conclusive Remarks

This chapter presented overviews, pictographic presentations of the on-campus hostels at all the ten case studies. The chapter also presented and discussed condition survey results of the hostel buildings and textual analysis of the interviews that were conducted. The next chapter presents the interpretation of the results discussed in chapter five and describes how the research problem, sub-problems and objectives were addressed.

Chapter 6: Interpretation and Discussion of the Research Results

6.1 Introduction

This chapter relates each of the four objectives outlined earlier in the research to the results that emerged from the analysed data. The problem that led to the investigation and as stated in section 1.5 is that currently, there is little understanding of the maintenance management systems of on-campus hostel buildings in both the public and the private universities. Moreover, there is a dearth of research evidence demonstrating that there is an appreciable difference in the maintenance management systems of the Federal, State and private universities in Nigeria.

6.2 Criteria for an Effective Maintenance Management System

The first step in addressing the research problem was to articulate the concept and principles of maintenance management, which identified and provided an understanding of the criteria for an effective maintenance management system. The criteria have been discussed in section 3.4 and a summary is presented in the following sections.

6.2.1 Understand the Functions and Components of Maintenance Management

The first criterion requires an articulation of the distinct components (managerial and operational) of maintenance management procedure and understanding their distinctive functions; which clarifies the types of skills required for every activity. The managerial process requires extensive strategic planning skills in addition to professional skills of construction and facilities management as well as operations.

The operational functions may not require strategic planning skills but managers require construction and project management professional skills to supervise work execution according to strategic plans and be able to evaluate performance. It has been pointed out in the literature that the two components cannot function effectively independently. Therefore, establishing a systematic relationship between the executive managers that are mostly at the strategic level and the artisans that constitute the bulk of the operational workers at a lower management level is paramount.

6.2.2 Understand Maintenance Operations

The two main types of maintenance operations are corrective and preventative. The functions of the operational process are basically physical execution of maintenance works and the activities are usually one or a combination of the following: servicing, rectifying or replacing an element or its part. For an effective maintenance system to be achieved, the maintenance operations should be guided by a maintenance policy, designed with adequate information about the facility to be maintained and consideration of available resources.

The preventative maintenance is commonly referred to as planned preventative because its functions are scheduled and executed in anticipation of a breakdown. The maintenance functions are planned based on predictions of the failure patterns of the system. Corrective maintenance is simply maintenance operations carried out after a failure occurs.

6.2.3 Understand the Maintenance Managerial Processes and Develop Policies

The managerial process of maintenance incorporates basic principles of management in the development of an effective maintenance system. Developing maintenance policies is important for an effective maintenance management system because the policies provide guidelines for defining a potential maintenance strategy and enable proper coordination of maintenance activities for best maintenance practice.

A policy that would provide an efficient framework is formulated on the basis of a clear aim and objectives of maintenance in the organisation. The different types of maintenance policies were discussed in Section 3.4.3.1. The maintenance managers need to identify the type of policy that suits the facility within the available means of the organisation.

6.2.4 Develop Effective Maintenance Strategies and Objectives

A maintenance strategy is either proactive or reactive, but a strategy that would provide the desired effect is definitely a proactive one because it is pre-conceived therefore, it is

guided by a pre-determined programme of the necessary actions in response to a specific issue.

Developing strategies for maintenance is the responsibility of the officers engaged at the managerial level of the maintenance management unit of an organisation. The effectiveness of a strategy is determined by the necessary information available and accessible to the strategic maintenance managers to utilise in the strategic planning phase.

Key factors that determine the maintenance strategy that an organisation develops for its facilities include the maintenance objective; the maintenance standard set by the strategic management; and the resources of the organisation available for maintenance management.

Maintenance objectives are important tools for both developing maintenance strategies and carrying out the operational functions of maintenance. The maintenance objective is a fundamental element in understanding the purpose, goals and scope of maintenance management. Therefore, objectives have a major influence on maintenance policy formulation.

6.2.5 Ensure a Good Quality of Maintenance Service

Facilities attain their various levels of physical, operational and economic standards desired by their owners when they receive the best maintenance service. However, the quality of the maintenance service is a function of the standards set by the organisation as part of its maintenance policy.

Setting maintenance standards could be challenging for the managers in an organisation because of the high degree of subjectivity involved and the difficulty in harmonising varying perceptions. Nevertheless, clear understanding of the objectives by all the team members enables the managers to decide on the best standard for maintaining their facilities.

6.3 Hostels Maintenance Management Systems of the Universities

The second objective was to identify the maintenance management systems of the on-campus hostel buildings in the Nigerian

a. Federal;

b. State; and,

c. Private universities.

The sub-sections discuss how this objective was addressed by this research

6.3.1 The Maintenance System at the Universities

The SADs of the universities are responsible for students' accommodation on campus. The administrative duties of the divisions include allocation of bed spaces to the students and general management of the hostels and students' welfare. They also regulate the behaviour of the students that reside in the hostels.

The SAD at two of the federal universities handles all maintenance responsibilities of their respective hostels with regular support from the central maintenance departments. All the SGs-owned and private universities including one of the FGN-owned ones operate central maintenance systems for all built assets on their respective campuses including the hostels.

6.3.1.1 Maintenance Management Strategies

All categories of the universities have a similar objective for the maintenance of their on-campus hostels, and that is to ensure that the hostels are safe and in the best condition for the occupants. The objective implies that the maintenance managers understand that hostels are support facilities for academic pursuits of the students; therefore, maintenance of the hostel facilities is an important function.

i.   *Maintenance plans*
- There are no maintenance policies for the hostel facilities at any of the universities
- There are no maintenance manuals for the hostel facilities at the universities.

- The units/departments in charge of maintenance do not (except for case C1) have inventory of the facilities provided in the hostels, and most cases have not evolved proper record keeping systems for previous maintenance operations.

The results indicate that the maintenance managers have disparate knowledge of the facilities provided at the hostels, evidence that there are no proper planning for maintenance activities at all the universities.

ii.   *Maintenance operations strategies*

- The corrective maintenance strategy is used at all the institutions. Minor works are executed in-house, but most major works are outsourced. Cleaning services of the hostels are also outsourced.
- The maintenance units/departments do not have adequate numbers of workers at every level (management and operations staff).
- The faults are detected by students or via walk-abouts during session breaks and communicated to the maintenance office via the student affairs officers. Responses to complains depend on the availability of maintenance officers and the resources for the operation.
- There are no strategies in place for assessing maintenance performance at the institutions.

There is clear indication that the managers do not prepare programme of works for maintenance operations, which implies that the maintenance operations are not properly planned and coordinated.

iii.   *Performance evaluation of hostel buildings*

- The hostels facilities are not regularly inspected; the maintenance managers rely on complains they receive from the student occupants that are lodged through the hostel administrators.
- Most in-house maintenance operations are not supervised and not evaluated when they are completed. The outsourced operations are supervised and evaluated by senior officers because their payments are based on the evaluated works.

The findings suggest that the maintenance managers do not have adequate knowledge, at all times, of the conditions of the facilities in their care.

iv.   *Maintenance budget and funding*

- Budgets for maintenance are prepared every session; a budget for a session constitutes of materials, equipment and tools for in-house operations and office administration. Others include estimates for servicing generating plant and water tankers.

- The allocations for a session to the departments are never sufficient for the planned expenditure during the session.

- Pressing issues are given priority while, others are given attention when more resources are received.

The results imply that maintenance activities are not adequately funded; the problem may be partly blamed on the lack of proper maintenance planning and operations programmes. In addition, the managers do not have proper knowledge of the condition of the facilities; therefore a proper estimate of the maintenance requirements is not feasible.

6.3.1.2 Relationships of the Maintenance Department with the University Strategic and Performance Management Aspects

The establishment units under the registrar's office at all the institutions are responsible for employment and evaluating the performance of all employees at their institutions. The registrars are members of the strategic management of their respective universities. In essence, the functions of the establishment units are performance management of employees.

i.   *Performance management involvement*

- The performance managers are not involved in evaluating the performance of the maintenance strategies in place for built facilities; rather they evaluate the employees' annual performance for the purpose of promotions. The evaluations are based on the reports that the units receive from the heads of departments on

the performance, additional qualifications and further skills acquired by each employee.

- Other forms of motivating the maintenance staff besides promotion are overtime allowances, bonus and operating an open door policy at the departmental level.

ii. *Strategic management involvement*

The highest level of management at the universities is referred to as 'the senate'. The senate members take strategic management decisions of the universities at this level. Members of the strategic management team of the universities comprises of a Vice-Chancellor (chairman of the committee); usually two Deputy Vice-Chancellors (academics and other non-academic administrations), the Registrar, the Bursar and the Chief Librarian. However, some institutions engage other senior managers in the strategic management activities.

- Only two of the Deans of SAD are engaged in strategic management planning at their universities. None of the maintenance officers are members of strategic management at their institutions; however, two of the heads of maintenance departments are sometimes invited to strategic management meetings.
- The maintenance needs of the built facilities are not clearly communicated to the strategic managers. The maintenance departments do not have professionals that would be engaged in strategic planning and decision-making that would form the basis for maintenance reports and budgets that would communicate the needs for proper resource allocations from the strategic team.
- The strategic managers are not involved in preparing the budgets for maintenance activities at the various institutions. They evaluate maintenance budgets that are submitted and make decisions on the allocation of funds, which are usually short of the estimated total amounts.

The implication of the opinions about the involvements of the two main management arms of the universities is that, the maintenance departments do not get the desired attention and support from the executive management of the institutions.

6.3.2 Impact of the External Environmental Factors on the Maintenance of the On-campus Student Hostels at the Universities

The study identified five external environmental factors (economical, sociological, cultural, political and physical) that have an impact on the management of any organisation. These factors are not controllable by the organisations, but they have a major influence on the strategic planning of the managers. In turn, these impacts are transferred to the discrete units of the organisations. Therefore, it is important for managers to understand these factors and their impact on the business functions.

This study found that these factors impose and have effects that result in major challenges for the maintenance management systems of the universities. The following points describe some of the challenges that the hostel maintenance management department face. The challenges are related to the impact of the external environmental factors on strategic management of the universities.

i. Economic factor

The maintenance departments at all the universities irrespective of the category lack adequate funding for maintenance activities. Management of public institutions are faced with a difficult task of running their institutions within very tight budgets because government's subvention to the universities has reduced.

The private universities are also appealing for funds from the government and other private organisations and individuals because their revenues are not able to sustain the administration of their institutions.

The financial constraints experienced by the universities and in turn the maintenance of their built assets are effects of the economic downturn in Nigeria that started since the early 1980s.

ii. Social factor

- Poor infrastructure such as poor electric power and water supply inhibit effective maintenance practices.
- Vandalism of the hostel facilities by the students. Secondly, the students misuse facilities because of lack of proper orientation on operating the facilities.

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- The facilities in the hostels of the public universities (except in Case B4) are overstretched due to overpopulation.

iii. Political factor

- Government policies regarding the percentage of students that the public universities must accommodate in their hostels.
- Changes in policies and decisions of management on the maintenance of the hostels at different periods.
- Changes in the occupancy ratio of the hostels to accommodate more students.
- The FGN insists on regulating and subsidising accommodation fees for the students at the public universities without any substantial increase in the capital allocations to the universities.
- There are no corresponding expansions of hostel facilities at the public universities to meet the sessional increase in the enrolment number of students.

iv. Cultural factor

The diverse cultural beliefs and traditional backgrounds of most students manifest in their conduct within the hostels and the manner in which they use the facilities. As a result, they damage many facilities.

A major concern of maintenance managers of the hostels at some of the universities is the attitude of the female students regarding the disposal of their used sanitary towels and the synthetic hair extensions. The students dispose of these materials in the toilets instead of the waste bins provided at the lavatories for that purpose.

v. Physical factors

Different maintenance problems have their peak periods.

- Electrical facilities break down more often during the peak heat period (April-May)
- Problems of leaking roofs are experienced during the rainy season (June-July)
- In the dry and dusty Harmattan season, water levels drop drastically; plumbing problems are experienced, and the departments at this period are usually pre-

occupied with supplementing water supply to the university community as a whole.

- Some of the hostel buildings have been in existence from long before the creation of the universities; the nature of the aged structures is a major problem for maintenance management.

6.4 Current Conditions of the On-campus Hostels at the Nigerian Universities

The third objective of the study was to examine the condition of the on-campus hostels in each of the three types of universities in Nigeria. This section discusses how this objective was achieved in the course of the research.

6.4.1 Overview of the Universities in the Study

The three FGN-owned universities in this study are established on very large land areas. All built facilities for academics purposes are provided on the campuses including accommodation facilities for both staff and students. All except for one of the universities operate on multiple campuses. The main campuses are all located far from towns and cities.

The SGs-owned universities in this study all started operating on the sites and existing structures of old colleges in their various states of origin. Each of the universities acquired the sites of old schools in more than one town or city within their states, and they operate on all campuses at the same time.

The fourth university is an exception, it stated operating on its own acquired site and started developing its structures; however, the institution has been experiencing development problems resulting from political interference of its State government.

The private universities in this study are all owned and operated by faith-based organisations on single site campuses. The universities are governed strictly by the principles of the respective religious backgrounds of their founding organisation. Two of the universities have Christian backgrounds, and the third has an Islamic background.

Unlike the public universities, the campuses of the private institutions are established on relatively small sites.

6.4.2 The Structures of the Hostels

The main structures of the hostels in the FGN-owned universities appear to be products of standard designs and construction. All hostels on the main campuses are about ten years old, but the structures appear older than buildings of their age that are adequately maintained. The approach views of the hostels give an impression of decent abodes for students on campus. The sides and rear views give a different impression; they show poor sanitary conditions with overgrown bushes, worn-out surfaces of finishes, deteriorated waste pipes, broken inspection chambers and soakaways.

The hostels on two of the SG-owned universities are old buildings that the universities inherited from the previous colleges that operated on the sites. These buildings appear aged; their appearances give an impression that they have not undergone major renovations since they were acquired from the previous colleges. The third state university in this study has a main campus that was developed from scratch. The hostels on the main campus are about the same age with the institution.

All the hostels are clusters of blocks with a central courtyard; most are multi-storey buildings with up to three floors. Each floor has general toilets and bathrooms at one or both ends of the floors; the laundries and kitchen blocks are built midway between the floors. Some of the hostel blocks have *en-suite* bathrooms.

In both the Federal and State universities, the courtyards are in poor sanitary states with broken/open and untidy drainages. There are stagnant water patches in the courtyard from leaking pipes and the waste water that students dispose of from their various floors when they wash in their rooms or corridors. These poor sanitary conditions provide breeding grounds for harmful insects such as mosquitoes. The open/broken drainages create good hideouts for rodents. The external walls of most of the hostels are worn-out.

In the case of the private universities, the structures of the hostels are not of standard quality compared to the structures at some of the public universities. However, the environment and general condition of most of the buildings are good.

6.4.3 Condition Assessment of the Hostel Facilities at the Universities

To achieve optimal performance of buildings, building managers are required to formulate and implement strategies that emanate from users'/occupants' requirements. The fundamental stages of the development of an effective system for maintaing buildings includes understanding of the building dynamics and conducting condition surveys. The condition survey exercise provides the basis for analysing the operational profile of the building (Loy & Coleman, 2006, p. 161).

6.4.3.1 Conditions of the On-campus Hostels at the Federal Universities

The walls, floors and ceilings of the enclosed spaces such as the bedrooms, kitchens and washrooms are in habitable conditions but with various degrees of deterioration. In most of the bedrooms, there are minor cracks and worn-out finishing with evidence of inadequate routine maintenance.

 There are many doors and windows with major problems such as damaged locking devices or door handles. Cracked or broken window panes and door panels are common. The toilets and bathroom facilities are almost not operational and are in need of urgent major maintenance works.

6.4.3.2 Conditions of the On-campus Hostels at the State Universities

Two of the hostels at the States' universities are in similar conditions as the Federal universities. There is evidence of poor maintenance operations at some of the hostels; the walls in many of the bedrooms have been defaced with writings and stains as a result of the students cooking in their rooms. There are dangerous electrical connections mostly in the rooms of the male students.

The hostels at one of the state universities can best be described as in critical condition, due to the rate of deterioration of the facilities. Many of the rooms are no longer in habitable states with major structural defects. The state of the facilities is unsafe and unhealthy for the occupants.

The fourth state university is in a class of its own because the existing hostels are not the usual hostel designs. Most of the structures are in good condition with minor defects that can be addressed with adequate routine maintenance.

6.4.3.3 Conditions of the On-campus Hostels at the Private Universities

Most of the hostels at the private universities are in good habitable condition and some of the buildings or components were rated to be in excellent condition. Majority of the defective components are related to poor construction of the buildings.

6.5 Effect of the Maintenance Management Systems on the Conditions of the Hostels

The fourth objective of the research is in line with this opinion. It was set out to evaluate the effect of maintenance management systems on the condition of the hostels in each of the categories of universities in Nigeria.

Evaluating the discussions under section 6.3 and 6.4 of this chapter provides an understanding of the effect that the maintenance management systems have on the condition of the hostels.

6.5.1 Maintenance Management Systems and the Hostels Condition at the Federal Universities

The structures of the on-campus hostels at the federal universities in the study are observed to be products of standard/quality constructions. However, the condition assessment revealed a state of disrepair obtaining at these facilities.

The maintenance management "system" in place at the universities fall short of the stipulated criteria for best practice of maintenance articulated from related literature in section 3.4.

There are many factors, which have been identified from the study, that have contributed to the deteriorated condition of the hostels at these universities. They include increasing population of the students; vandalism of facilities; but all the factors cannot be separated from the maintenance management systems.

Therefore, the maintenance management systems of the universities have a major influence on the deteriorated conditions of their on campus hostels.

6.5.2 Maintenance Management Systems and Hostels Condition at the State Universities

Aged structures are difficult to maintain; which is the case of most of the inherited hostels at some of the state universities. Most of the hostels at these universities are overpopulated, and students vandalise the facilities. These factors are all part of the threats of the environment that a proper or effective maintenance system must consider and devise strategies to minimise their impact.

Most of the hostels in this study are in states of disrepair; some are even in critical conditions that make them unsafe and unhealthy for the occupants. Ineffective maintenance management systems of the hostels constitute a large share of the blame for the poor state of the hostels.

6.5.2 Maintenance Management Systems and Hostels Condition at the Private Universities

Most of the hostels at the private universities in this study were found to be in good condition except for the construction defects and poor infrastructure that are generating undue maintenance issues for the facilities. The universities do not have a problem with the population of their students in contrast to the public institutions.

However, the maintenance management systems of the private universities are not much different from the systems in use at the public universities. Therefore, the commendable condition of the hostels may not be attributed to the effect of the maintenance management systems obtaining at the Private universities.

6.6 Maintenance Management Framework for the Hostel Buildings

Maintenance management of hostel buildings is an important service in a university that provides hostel facilities to accommodate students on campus. The effectiveness of the maintenance management system has an impact on the condition of the buildings and in turn, the health and safety of the students that occupy the said hostels.

An effective maintenance management system integrates the principles of strategic management, performance management and operations management. This study

revealed that the maintenance management systems of all the three categories of universities (FGN-owned, SG-owned and private) are ineffective. The attention afforded to the management of the hostels in 50% of the case studies is either minimal or negligible.

The maintenance management processes for the on-campus hostels for most part do not have strategic focus. There are misunderstandings regarding the maintenance of the hostels as educational buildings and as residential buildings. Proper and executive level understanding of the value and positioning of maintenance would necessitate the development of an effective maintenance management framework for the on-campus student hostels.

The fifth and last objective of this study proposed development of a framework and model for the effective maintenance management of student hostels at Nigerian universities. The framework was developed, firstly from the articulated concepts of maintenance management from the literature and the gaps in the systems obtaining at the surveyed institutions. Secondly, from an understanding of current condition of hostels and the maintenance systems in place at the surveyed institutions.

The framework is presented on Figure 6.1 and discussed hereinafter. The framework depicts three main aspects of management that are involved and describes the responsibilities and span of control.
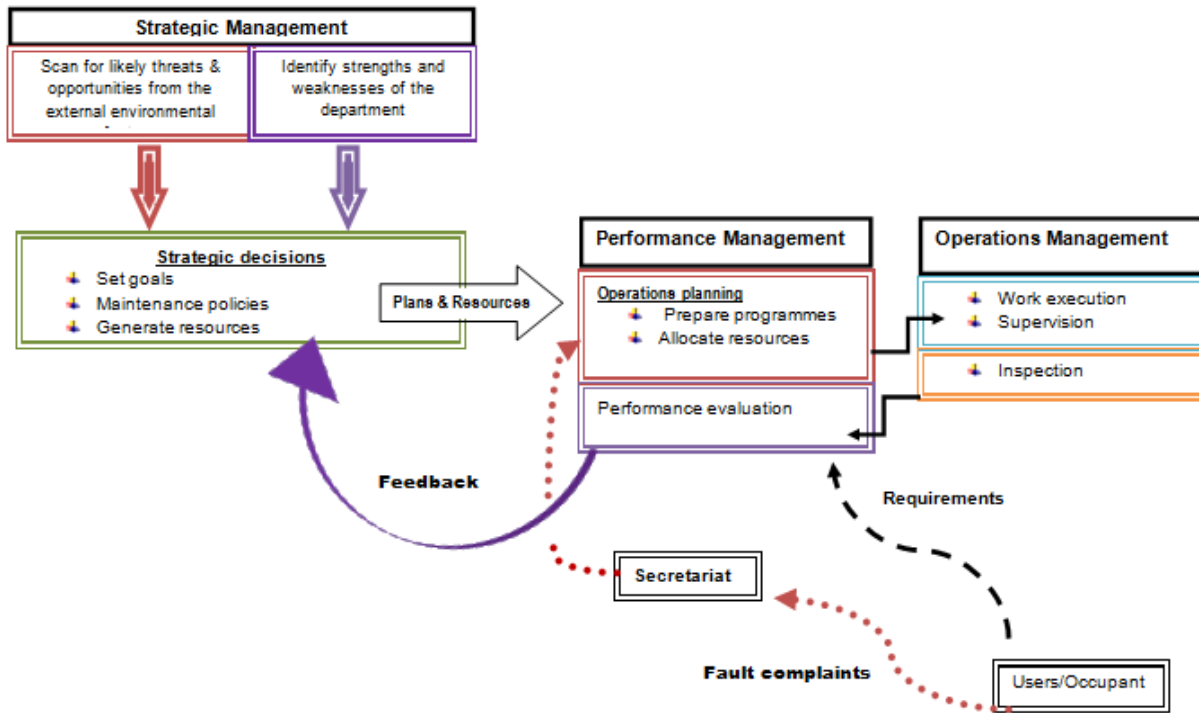
Figure 6.1 Maintenance management framework for student hostels

The framework is based on the principles of strategic planning and decision-making. There are three management components that are major actors in the process. The process is described in the following sections.

6.6.1 Maintenance Strategic Management

The managers at this level are required to be construction and property professionals that have strategic planning skills and experience. Knowledge and skills of construction and facilities management will be of great advantage to the team.

6.6.1.1 Functions

The plan of action for the maintenance strategic management function is based on a structured planning method popularly known as the 'SWOT analysis' (Strengths, Weaknesses, Opportunities and Threats).Figure 6.2 shows a diagram of the SWOT matrix.

Figure 6.2 The SWOT Matrix

Maintenance strategy formulation

The stage begins with identifying the external environmental factors that are perceived to have major impact on the maintenance of the facilities. The behaviour or changes in the factors can either have positive or negative impact. Identification of the environmental factors (both internal and external) sets the parameters within which maintenance is to be managed; and their analysis provides a clear basis for forming maintenance objectives and consequently, the planning and control of maintenance (i.e. Planned preventive).

Those that have positive impact are regarded by managers as opportunities, for instance improved infrastructure or boost in the economy. The factors that have negative effect are regarded as threats to the system, in the case of hostel maintenance in this study, threats to effective maintenance strategy includes poor government policies or their implementations, for instance, increase in the population of students. This is how it works: a shift in say, the economic external environment, say a drop in the oil price (national recession) would have a harmful impact on the internal finances of the universities (given they depend on FNG, State and faith organisations disbursements) which in turn would affect the budgetary control of maintenance (making planning even more crucial).

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6.7 Conclusive Remarks

This chapter interpreted the results of the research in relation to all the research problem (Section 1.5), sub-questions (Section 1.6.1) and objectives (Section 1.7.1). The next chapter presents summary of the study; conclusions reached; contributions to the body of knowledge and recommendations.

Chapter 7: Summary, Conclusions and Recommendations

7.1 Introduction

This chapter presents a general summary of the study. The chapter presents the conclusions drawn and the recommendations to the Nigerian universities on the maintenance management of student hostels. An outline of the contribution to the body of knowledge by this research and suggested areas of further research are provided towards conclusion of the chapter.

7.2 Summary of the Research

This research aimed at establishing an understanding of the maintenance management systems of on-campus hostel buildings at Nigerian universities relative to stipulated criteria for best practice. In pursuit of this aim, the research embarked upon an intensive literature search in order to articulate the concept and principles of maintenance management and the perceived criteria for best practice.

The literature provided the desired understanding and furthermore clarified the theory surrounding the maintenance management of built facilities. A conceptual framework for the study was created on the foundation that was set by the theoretical framework. Knowledge about the philosophies underpinning academic research of this nature was acquired so as to inform the methodological procedures that guided the research.

The nature of inquiry of the research demands an in-depth study of the selected cases. The study adopted the qualitative method for the conduct of the research. The research questions asked in Section 1.6 and 1.6.1 were answered by the findings that emanated from the analysed data.

7.2.1 Major Findings

Five research questions were asked based on the research problem that was stated in section 1.5. The research problem is restated thus**,**

"Currently, there is little understanding of the maintenance management systems of on-campus hostel buildings in both the public and the private universities in Nigeria. Moreover, there is a dearth of research evidence demonstrating that there is an

appreciable difference in the maintenance management systems of the Federal, State and private universities in Nigeria".

The first question of the research sought understanding of the criteria for an effective maintenance management system. Five main criteria were identified that would enable the development of an effective maintenance management system for facilities. The first three criteria require that the maintenance managers should understand:

1. The functions and components of maintenance management;
2. Maintenance operations;
3. Maintenance managerial processes that would provide the bases for developing maintenance policies

The fourth criterion is clarifying and stating the objectives of maintenance and developing an effective maintenance strategy. The fifth criterion is centred on ensuring and providing the best affordable quality maintenance service by setting realistic standards and adhering to them.

The second question that emerged from this problem is what are the current maintenance management systems of the on-campus hostel buildings in the three classes of universities? The study found that the maintenance management systems in place at all the universities studied is reactive rather than proactive. The standards and plans are not prioritized; and in addition, the maintenance functions for the hostels lack proper coordination; and the activities are not adequately funded.

The systems do not have adequate resources and resource managers that would carry out strategic planning and other management functions that would be effective for maintaining the facilities. The findings demonstrated that the differences in the maintenance management systems of the Federal, State and private universities are insignificant.

The third question made enquiries about the current conditions of the on-campus hostels at each of the foregoing types of universities in Nigeria. The findings revealed

that the condition of the hostel buildings at most of the public universities (FGN-owned and SGs-owned), whilst different for each university, are generally not good.

The on-campus hostel buildings at the public universities were observed to be in various states of disrepair and are unsafe and unhealthy for the student occupants/users. Although the designs and construction of most of the hostel structures at these institutions was of high standard originally, the deteriorated condition depicts the poor quality of life of the students that reside in them.

The on-campus hostels at Private universities are still in satisfactory condition; however, most of the structures are products of low quality construction materials and workmanship. The hostels are not densely populated like their public counterpart; therefore, the pressure on the hostel facilities are not beyond their bearing capabilities.

The fourth research question asked about the effects of the maintenance management systems on the condition of the on-campus hostels at each of the foregoing types of universities. The study found that the maintenance management systems in place at the universities are ineffective due to several challenges such as insufficient funding; inappropriate planning and poor staffing.

The poor maintenance management systems share the blame for the deteriorated condition of the hostel facilities at the public universities. The impact of the ineffective systems at the private universities are not obvious because of the number of students at these institutions is still within normal control limits for the hostel managers.

Lastly, the literature and empirical findings from the study provided the parameters for developing a model for effective maintenance management for the hostel buildings.

7.3 Conclusion

The prime purpose of providing hostels on the campuses of most universities in Nigeria is to proffer affordable and secure accommodation for students. The on-campus hostels are in close proximity to academic facilities; and the hostels are designed for interactive living and learning. However, this purpose has been defeated due several factors, such as economic instability in the country; and population explosion especially of youth

within the university age bracket. Furthermore, maintenance activities are not planned strategically; and the executive management of the universities do not give the maintenance management departments the desired attention or resources.

The state of deterioration in the physical condition of on-campus student hostels at some of the universities may be blamed for poor academic performance coupled with social problems such as student unrest; poor quality of life and other negative behavioural patterns that are found in disadvantaged communities.

The financial constraints have intensified at a crucial period when the rate of deterioration of the existing hostel facilities at the universities has worsened Political pressure has shifted the focus of the government towards the establishment of new higher institutions rather than maintaining the existing ones.

Private participation in the establishment of more and new universities has taken root and the private universities have now outnumbered the public ones. However, students struggle for admission into the public institutions because of the subsidised tuition and accommodation fees. Therefore the major problems faced by the public universities are not likely to be resolved any time soon.

7.4 The Research Contributions to Knowledge

The contributions of this research to the body of knowledge as follows:

- The research has established the criteria for an effective maintenance management system for universities in Nigeria.
- The research has provided an understanding of the maintenance management systems of on-campus hostel buildings in both the public and private universities in Nigeria.
- The research has provided an understanding of the influence of the external environmental factors in Nigeria on the strategic management of the universities. In addition, the research has established the effect of the EEF on the maintenance management systems of the hostels.
- The research has developed a bespoke methodology for assessing the condition of the on-campus hostel facilities at the Nigerian universities

- The research has identified the importance of strategic planning in the hostel maintenance management process. The research has provided an insight into interrelationship of strategic management, performance management and maintenance management in development of an effective maintenance management system.

7.5 Review of the Research Approach, the Techniques and Limitations of the Study

The research adopted the qualitative approach in accordance with its philosophical underpinnings. The data collection effort was via reviews of related literature, recorded interviews with both groups and individuals as determined by the particular cases.

Direct observation of the facilities was necessary; it generated data on the structures of the buildings and their current conditions. Condition assessments were carried out with the aid of adapted guides and rating sheets; cameras were used to capture photographs of the hostel buildings and some conditions that may not be easily described.

The approach assisted the research work to gain a deep understanding of the perceptions, experiences, attitudes and feelings of stakeholders in the case organisations regarding the maintenance management systems and their impact on the performance of the facilities and the well being of the students that live in the buildings.

Considering the large number of universities across the country (over a hundred) it was impossible to undertake an in-depth study of all the universities; therefore the study employed the case study approach that is tailor made for this type of research.

The Purposive sampling technique was adopted in the selection of cases that the researcher believes are truly representative of all the three categories of universities within the population. The selected cases yielded rich data that describes and enhances understanding of the various issues related to hostel management and their maintenance situations at the Nigerian universities.

The data generated were presented in form of photographs, bar charts and narrative interpretation of the interview discussions.

7.5.1 Limitations of the Research

Questions were asked directly to the individuals and groups that were interviewed to obtain honest responses on the management strategies of the hostels but there are biases of the respondents that cannot be controlled completely which may have impacted on the information utilised in the research.

The first limitation of this study relates to the nature of the topic and strategic responses. Obtaining candid responses on sensitive issues such as building performance in a university setting was not easy. To minimise this bias indirect questioning was adopted during the interviews and questionnaire design.

The researcher was allowed a limited number of assistants in conducting the condition assessments. Some institutions insisted on choosing the hostel buildings that would be inspected.

Tracking the targeted candidates for the interviews; and conducting the interviews within the time they could afford were major challenges on the research.

The geographical scope of this research study is North-Central Nigeria, which is one out of the six geopolitical zones in Nigeria. Only ten out of the nineteen universities within the zone were studied. The universities were purposefully but tactically selected for fair representation of the types of universities in the country.

7.6 Recommendations

The following recommendations are made based on the research findings and conclusions.

7.6.1 Recommendations for the Nigerian Government /Policy Makers

i.   The FGN should give priority to development or reconstruction of basic infrastructure at the universities (electric power and water supply).

ii.   Realistic policies that will decongest the hostels should be formulated such as:

- Enrolling a reasonable number of students by considering the available accommodation facilities.
- Public private partnerships rather than outsourcing the management or aspects of management of the hostels.
- Revise the accommodation charges and device ways that the hostels would generate additional funds that will aid in sustaining them.
- Provide funds for the construction of new hostels

iii. The FGN should partner with private organisations in establishing and running universities to enable more affordable universities for Nigerian youths seeking university education.

iv.   The FGN through the FME and ETF should make similar effort toward generating more funding for the maintenance of the existing hostels as in providing new ones.

v.   The Nigerian government should provide support to the existing private universities and consolidate the existing public universities instead of establishing more public ones.

vi.   There is need to review the capital allocations for maintenance of the hostels.

7.6.2 Recommendations for Executive Management of Universities

i.   The hostels are part of the built assets of the institutions and are important support facilities in achieving the prime goal of teaching and learning in universities. The managements should align the main goal of the universities and the objectives for providing and maintaining the hostels. The strategic position of maintenance management of the hostel facilities should become clearer and closer attention should be paid to the management of the hostels.

ii. The administration must have systematic plans that would provide adequate mechanism for orientation and supervising the activities of the students that occupy and use the hostel facilities.

iii. There should be a clear schedule of duties for all workers that are involved in managing the hostels with adequate understanding of the span of control.

iv. Maintenance budget approvals and allocations should be based on understanding of maintenance plans and reasonable estimates prepared by maintenance management.

v. There should be proper understanding and implementation of government policies; thereafter, the effect of the policies on the systems should be properly communicated to the policy makers.

vi. Engage competent employees for the maintenance departments and provide sufficient tools and equipment for maintenance activities.

7.6.3 Recommendations for Maintenance Management Departments

The structures of the maintenance management department should have three basic sections or work units according to the management aspects identified in this study:

i. *Strategic maintenance management unit:* Employees in this unit should have adequate skills in construction and facilities management as well as strategic planning, because they would be engaged in feasibility studies and developing strategic plans for all the maintenance activities. They should also relate closely with the executive management of the universities by informing and advising them on maintenance related issues.

ii. *Maintenance performance management units:* The managers in this unit should be engaged in the next line of operation of the department. They should work with the strategic plans developed by the strategic managers to design programmes of works for the maintenance activities. The available resources should be tactically allocated to the maintenance operations and schedules of duties should be prepared appropriately.

The performance managers should adopt or develop parameters for measuring and evaluating the performance of the maintenance plans and programmes. The information generated would be useful to the strategic managers in improving the strategic plans.

iii. ***Maintenance operations management unit:*** This unit would constitute employees such as professional construction facilities managers and skilled and semi-skilled artisans that are engaged in various works execution. The professionals should provide adequate supervision of works in accordance with the maintenance programmes designed by the performance managers. Regular reports of executed works and the condition of the facilities should be communicated to the performance managers to enable improvements.

7.7 Recommendations for Further Research

i. A quantitative study of all the maintenance management systems of the universities that would enable the study of the whole population or a larger sample.

ii. A comparative study of the maintenance strategies of the universities in different geopolitical zones to establish whether there are differences and variability in strategies employed.

iii. Evaluate the impact of the condition of the hostels on the performance of the students to discover the degree of impact the condition of on-campus hostels has on their throughput and failure rates.

iv. An intensive post occupancy evaluation study of the hostel buildings that would involve students' perceptions to generate information that would be incorporated in the development of new strategic plans or improving existing maintenance management models such as the one developed in this research.

7.8 Caution

The utilisation and quotation of this thesis should be done with caution as the results and conclusions are based on the chosen methodology.

7.9 Conclusive Remarks

This chapter presented the research summary and conclusions of the research and includes the contributions to knowledge, recommendations to various stakeholders and a critical review of the methodology adopted. The next section presents the references and appendices.

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Appendix 1

• PO Box 77000 • Nelson Mandela Metropolitan University

• Port Elizabeth • 6031 • South Africa • www.nmmu.ac.za

**Nelson Mandela
Metropolitan
University**

f o r   t o m o r r o w
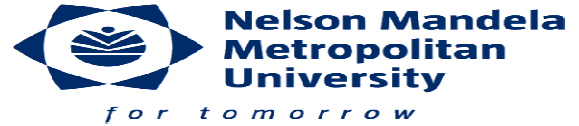
1ST September, 2014

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT
YOUR INSTITITUTION**

Dear Sir/Madam,

My name is Anita Dzikwi Adamu. I'm a PhD Construction Management candidate at the Nelson Mandela Metropolitan University in South Africa. I am conducting research on the topic: **"Maintenance management systems of on-campus students' hostels in Nigerian Universities"**. This research is being supervised by Professor Winston Shakantu   (NMMU, South Africa).

I hereby seek your consent to solicit information about the maintenance management of on-campus students' hostels in your institution. The process would involve interviews with officers responsible for the maintenance of the hostels and a condition survey of the hostel buildings.

In compliance with the Research Ethics provisions of the NMMU, all data generated from your institution will be treated with absolute confidentiality and used for academic research purposes only. The identities and other confidential interests of the participants will not be disclosed.

For further information, please do not hesitate to contact me or the
supervisor. Thank you, in anticipation, for your time and consideration
of this matter.

Yours sincerely,

Anita Dzikwi Adamu   Professor W. Shakantu
(+234803703616;s213505622@nmmu.ac.za)   Winston.Shakantu@nnmu.ac.za
(PhD candidate)   (Supervisor)

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Appendix 2

Maintenance Management systems of On-campus Students' Hostels in Nigerian Universities

General Information

1	**Information about University**	Name of institution
		Structure of institution
		Age of institution
		Mission and Vision
		Number of campuses
2	**Students' Affairs/accommodation department**	Structure of department
		Number of staff
		Number of hostels
		Number of off-campus hostels
		Age of hostels
		Percentage of students accommodated
3	**Maintenance management department**	Structure of department
		Number of staff
		Facilities maintained by the department

Section A: Demographic details of participant

i Qualification

ii Generalwork experience
What is your position in the
iii department

vi Describe your role in the department
How long have you been working in this
v department?

Section B: Maintenance Management Strategies
Maintenance plan

i. How important is the maintenance of students' hostels as compared to other built assets your department maintains in this university?

ii. Does the University have a policy for building maintenance management for its Students' hostels?

iii. Can you state the main objective of maintenance of on-campus students' hostels in this university?

iv.   Describe the content of the policy and how it helps in achieving the maintenance objectives of your department

v.   Describe the maintenance standard set by the university for the maintenance of its hostels

vi.   Is the department equipped with maintenance manuals for the facilities in the hostels to guide maintenance operations?

vii.   Do you have records of previous maintenance works carried out by the department?

viii.   Do you have an inventory of the building facilities of the hostels? How often do you update it?

ix.   Describe the office administrative duties (documentation, reports, research, accounting etc) you engage in.

Maintenance Budget & funding

i.   Describe your maintenance budget and the preparation

- budget periods
- based on previous budget, based on maintenance plan of the period etc
- describe the constituents of your budget (wages for outsourced works, material supply, Plant
equipment (generators, ladders), Vehicles, other tools, office administration

ii.   Do your periodic allocations meet your planned expenditures for the periods?

iii.   In case of deficit, how do you make up for the difference?

iv.   Do you have other sources of funding besides the strategic management of the university?

Maintenance operation strategies

i.   Describe the preventative maintenance plans in place for the hostel buildings

ii.   Describe the priority settings of maintenance works (emergency, urgency, based resource availability, others)

iii.   What maintenance operation strategy do you adopt to carry out maintenance works on hostels facilities?

-corrective based on reported faults
-preplanned operations whether a failure occurs or not
-operations carried out in anticipation of a failure
- others…..

iv.   Explain the mode of work execution (in-house, outsourcing, both)

v. Describe your staff strength (number, qualification, experience and expertise) in terms of efficiency

vi. Describe the adequacy of resources of the department in terms of availability, quality, sufficiency of

vii. supply(Plant, equipment, tools and materials) for site works

Communication

i. How do you educate the occupants/users about the right way of operating the facilities in the hostel? emails, notice boards, lectures, others………

ii. How do you make the student occupants aware of the rules of occupancy and their responsibilities to the maintenance of the hostels?

iii. Describe the communication route when there is a fault or complaint
-students report through a residence representative, hall administrator/porter, direct report to the
 maintenance office

iv. How are complains managed by the department (documentation, response time)

v. Describe the communication channels within the maintenance department (does every worker understand his/her schedule, is there an open door policy within the department?

Performance evaluation

i. How do you generate information about the condition of the hostel facilities-user feedback, building inspections

ii. How often do you embark of the exercise in 'i'?

iii. Describe the importance of the data you generate in the exercise tomaintenance management of the hostels

iv. What other methods do you use to evaluate and improve on the building performance of the facilities?

Section C: Interrelationships between Maintenance management and other management aspects

Relationship with Students accommodation department

Relationship with Performance management

i.   Describe how the maintenance management department relates with students' accommodation departments towards achieving maintenance objectives of the students hostels

ii.   Are the performance managers involved in evaluating the performance of maintenance strategies?

iii. How are workers motivated in the department?

iv.   Does the university organise training for the maintenance staff for new technology and skills?

v.   Do you have job schedule for every staff?

vi.   How does the performance management department evaluate the performance of the maintenance staff?

vii. How are the staff in your department employed (vacant positions advertised and employment based on qualification and competence for the job) by recruitment & performance department, others please explain

viii. Are the performance managers involved in evaluating the performance of maintenance strategies?

Relationship with strategic management

i.   What is the relationship between the main goal/ vision of the university and the maintenance management goal/vision?

ii.   Is the head of the maintenance department a member of strategic management team of the institution?

iii. Does the strategic management of the department understand the importance of the maintenance department?

iv.   Describe the involvement of strategic management in
- identifying the maintenance objectives for the hostels
- formulating maintenance strategies/policies
- budget preparation

v.   Describe strategic management's attitude towards maintenance budgets (on what bases are budgets approved and resources allocated)

vi.   In your opinion do you think the maintenance department receives desired attention from strategic management?

Section D: Impact of the external environmental factors on the maintenance management of on-campus students' hostels

i.   Economic (Funding challenges and coping strategies)

ii.   Social (population, basic infrastructure, student life)

iii.   Culture (organisational culture, religion, beliefs, tradition, dominant behaviour of people in the host community)

iv.

v.   Political (government policies regarding students housing and other legal issues)

vi.   Physical (nature of the environment, weather and climatic conditions)

vii.   Other challenges of maintenance management of students' hostels

Appendix 3

Condition Survey Guide

component	Description of condition	Rating	Value Assigned
Ceiling	Appearance is as new, no defects, routine maintenance is adequate to uphold quality and performance.	Excellent	**5**
	Slight soiling or discolouration, only appearance affected. Minor & routine maintenance is adequate.	Satisfactory	**4**
	Soiled surfaces, few cracks or tears, due to aging or misuse, no signs of leakage from roof.	Fair	**3**
	Badly stained surfaces, broken and cracked surfaces, sagging panels & evident signs of leakage from roof.	Poor	**2**
	Unsafe & unhealthy for occupants due to severity of deterioration. Requires urgent major refurbishment to save the structure.	unsuitable	**1**
Floor	Appearance is as new, no defects, routine maintenance is adequate to preserve quality.	Excellent	**5**
	Slight or early signs of wearing due to use or aging. Minor & routine maintenance is required to improve appearance.	Satisfactory	**4**
	Worn-out finishing, minor cracks apparent, finishing due for renewal, no major defects.	Fair	**3**
	Early signs of structural defects such as major cracks, dampness, worn-out surfaces. Urgent and major repairs required to restore component.	Poor	**2**
	Severe deterioration such as major cracks and water seepage. Component is unsafe & unhealthy for occupants due to severity of damage. Requires urgent major refurbishment to save the structure.	unsuitable	**1**
Wall	Appearance is as new; no defect; routine maintenance is adequate to preserve quality.	Excellent	**5**
	Diminishing aesthetic appearance due to aging and use; no other signs of defect. Minor works such as re-decoration and routine maintenance is adequate to improve appearance.	Satisfactory	**4**
	Faded surface finishing; minor cracks that may not be connected to structural failure. Minor maintenance action and re-decoration is necessary to restore component.	Fair	**3**
	Early signs of structural defects such as major cracks, dampness, worn-out surfaces. Urgent and major repairs required to restore component.	Poor	**2**
	Severe deterioration such as major cracks; dampness and moulds on element.Unsafe & unhealthy for occupants due to severity of damage. Requires urgent major works to save the structure.	unsuitable	**1**
Doors /windows	All doors and windows satisfy all functional and aesthetic purposes and are in best operational state. Routine maintenance adequate to uphold elements	Excellent	**5**
	Some of the elements show signs of wearing of finishing due to age and use. Routine maintenance and re-decoration is adequate to restore the elements.	Satisfactory	**4**
	All or most elements are in conditions described in 'B'; in addition, slightproblems are observed such as cracked or broken panes, and early operational issues with locks and hinges, that require minor repairs.	Fair	**3**
	Significant problems affecting the operation of most elements such as locking devices & difficulty of operating. Damaged door handles and broken or cracked panels.	Poor	**2**

	Completely dysfunctional and damaged elements. Unsafe for use by occupants; cannot be repaired; require complete replacement.	unsuitable	1
Electricals	All electrical fittings for power, lighting, fans/airconditioners are functional; their appearance is as new.	Excellent	5
	A few of the fittings show signs of wearing due to age and use. Facilities are not at their best operational state; space is adequately lighted; all power sockets, fans/air conditioners and control switches are operational and safe for users.	Satisfactory	4
	Few fittings appear good but non-operational such as dead light bulbs or tubes; faulty control switches that require minor repairs. Rooms can be lighted partially; fans/air conditioners are not fully operational.	Fair	3
	Poor or non-operational fans/air conditioners, power and light fittings. There are some damaged light and power fittings, with signs of overloading and misuse.	Poor	2
	Exposed wires from lighting and power points. Fittings appear inferior and not properly fixed. Room is dark especially at night. Unsafe conditions and connections for users/occupant.	unsuitable	1
Plumbing	Pipes and sanitary fittings are as new; quality not inferior; users operate with ease. Routine maintenance is adequate for preservation of the current standard.	Excellent	5
	Pipes and fittings still in good operational states, but showing early signs of wearing due to age and use. Minor repairs and routine maintenance works are adequate.	Satisfactory	4
	Pipes and fittings show minor cracks; no signs of leakage; few missing or broken seat or tank covers, shower or tap heads. Facilities can only be partially operated and used.	Fair	3
	Early signs of leakage of pipes and fittings due to ageing, use or poor previous maintenance work or deferred maintenance. Severe conditions of 'C' observed partial blocked sinks, basins and shower drains. Major maintenance works can restore facilities.	Poor	2
	Severely damaged fittings, blocked sinks, basins and shower drains. Unsafe & unhealthy. Facilities cannot be repaired. Replacement and new works required.	unsuitable	1

Appendix 4

Rating sheet

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					
Plumbing					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					
Plumbing					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					
Plumbing					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					
Plumbing					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					
Plumbing					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					
Plumbing					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					

Space:

Component	Rating				
	1	2	3	4	5
Ceiling					
Wall					
Floor					
Doors					
Windows					
Electrical					