APPRAISAL OF BUILDING MAINTENANCE AMONG LANDLORDS IN MINNA METROPOLIS, NIGER STATE.

BY

JUSTICE, Esla Joseph

2016/1/62334TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION,

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE.

APRIL 2023

APPRAISAL OF BUILDING MAINTENANCE AMONG LANDLORDS IN MINNA METROPOLIS, NIGER STATE.

BY

JUSTICE, Esla Joseph

2016/1/62334TI

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, SCHOOL OF TECHNOLOGY EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF TECHNOLOGY (B. TECH) DEGREE IN INDUSTRIAL AND TECHNOLOGY EDUCATION.

APRIL, 2023

DECLARATION

I, **JUSTICE Esla Joseph,** with matriculation number **2016/1/62334TI**, an undergraduate student of the department of Industrial and Technology Education, certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other University.

JUSTICE Esla Joseph

....

2016/1/62334TI   Sign and Date

CERTIFICATION

This project has been read and approved as meeting the requirement for the award of B. Tech degree in Industrial and Technology Education, School of Technology Education, Federal University of Technology, Minna.

Dr. KALAT   _____
Project Supervisor   Signature and Date

DR. T. M. SABA   _____
Head of Department   Signature and Date

                                                   _____
External Examiner   Signature and Date

DEDICATION

With profound joy and gratitude in my heart, I dedicate this project to God Almighty for His Unshakable and Unbreakable Faithfulness. His Divine and constant guidance in my life has made this project a reality today. Thank God.

ACKNOWLEDGEMENTS

ABSTRACT

This study examined the appraisal of building maintenance among landlords in Minna metropolis, Niger state. Three research questions were developed to guide the study and three null hypotheses were tested at 0.05 level of significance. The study employed a survey research design. The study used a four-point scale questionnaire, which contains a total of 22-items, as instrument. The total population of the study is 150 which consist of 50 landlords and 100 tenants. The result showed Day to day mopping/Sweeping and cleaning of the building, Mechanical cleanup, Services cleanup, repair and replacement, Elemental (ceiling, door, window, roof, etc) replacement. The study recommended among other things, The administrators should utilize the findings of this study on the landlords should put in more effort in maintenance of building.

TABLE OF CONTENTS

Contents	**Pages**

CHAPTER ONE: INTRODUCTION

CHAPTER TWO: LITERATURE REVIEW

2.1.0 Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLOGY

CHAPTER FOUR: RESULTS AND DISCUSSION

CHAPTER FIVE: CONCLUSION AND RECOMMEDATIONS

CHAPTER ONE

INTRODUCTION

1.1   Background of the Study

Maintenance is defined as the combination of all technical and associated administrative actions intended to retain an item in or restore it to a state in which it can continue to perform its action (Den Hollander *et al.,* 2017). Management is the organizational process that includes strategic planning, setting objectives, managing resources, deploying human and financial assets needed to achieve objectives, and measure results (Suarez *et al.,* 2016). Maintenance can be said to be the organizational process of actions taken to retain an item or restore it to a state in which it can continue to perform its action (Choka, 2012). Furthermore, he opined a good maintenance management system coupled with knowledgeable and capable maintenance staff can prevent health and safety problems, environmental damage, and yield longer asset life with fewer breakdown and result at lower operating costs and a higher quality of life. Maintenance of building is very important in order for long lasting of the structure.

Buildings are define as structures that serve as shelters for humans, properties and activities such as houses, factories, offices, schools and hospitals. Arif *et al.* (2016) stated that buildings should be properly planned, designed and constructed to obtain desired satisfaction from the environment. The primary function of a building is to provide shelter from the weather, fire outbreak, warmth, and comfort to the users. Ness and Xing (2017) stated that buildings are used for residence and support for other human activities. In essence a building has an important role in the life of man as it is one of man's basic necessities of life after food in the ranking of man's greatest needs. Building maintenance is very important aspect of construction.

Chen *et al.* (2015) opines that the most important reason for implementing a maintenance management system is to measure the value created by the maintenance process. The effectiveness or failure of the maintenance system may be judged by the maintenance condition of the facilities. Maintenance objective is primarily to preserve buildings in their initial functional, structural and aesthetic states. This is to ensure that they continue to remain in such state and retain their investment value over a long period of existence. According to Tecchio *et al.* (2017), maintenance is the work or a combination of actions associated with initiation, organization and implementation carried out to retain an item in or restore it to an acceptable standard. Nevertheless, building maintenance becomes more difficult according to age of the structure and this depends on the quality of the original building coupled with the rate of maintenance of the structure (Asdrubali *et al.,* 2017).

Maintenance of building received little attention from the users, designers and contractors. The users do not always make use of the property and the services in good condition, often users do not obey the information contained in the maintenance manual of the building if at all it exists. Most property owners sometimes endeavour to keep maintenance expenditure to the least, eliminating the consequent of the long-term effect of such action. On the part of the designers, they may forget the durability of the materials and its serviceability before including them in their designs (Adejimi, 2005). While the builders or contractors prefer new projects rather than maintenance job. The attitude of city landlords is totally negative towards maintenance. The city dwellers see the cities as no man's land and therefore remain totally indifferent to the unsightly vista our streets and venues.

Inadequate building maintenance is a peculiar feature of almost every building in Nigeria. According to Leal Filho *et al.* (2016) is partly due to poor maintenance culture on one hand and partly due to the absence of an appropriate benchmark. Amanchukwu and Ololube (2015) asserted that lack of proper maintenance culture bring the life of a building last before

reaching the total obsolescence state. Terés-Zubiaga *et al.* (2015) opine that it is highly desirable but hardly feasible to produce buildings that are maintenance free although much can be done to reduce the volume of maintenance work to be carried out on the building subsequently. The authors further argued that building maintenance has often been neglected in the industry especially in the public sector; which is due to the fact that construction of new buildings is more preferred over the maintenance of the existing ones. Once these buildings have been constructed, most property owners tend not to care for it again as all that matters to them is that they have a property which they can call their own. This is as a result of the lack of maintenance culture amongst most Nigerians. However, the effective management of properties is very important, due to its nature and the capital involved in its construction (Omesi & Berembo, 2020). He further buttressed that properties that are properly managed will maximize the income realized from it in a case where it is built for investment purpose; it also ensures the property is in a good physical and structural state for it to continue performing the purpose for which it is built. The study therefore seek to determine the appraisal of building maintenance among landlords in Minna metropolis, Niger state.

1.2   Statement of the Problem

Maintenance in a building is very important, the importance of maintenance in a building are prolonging the life span of a building, giving building a new look and also occupant of the building can be rest assured that the building in which they lived in is in a good standard. Despite the importance of building maintences many land lord tends not to give attention to maintenance of their building after the construction of any building they tends to forget that the building will need maintenance. In Nigeria, the culture of maintenance is very poor except in emergency situations when it might have become too late and even costly to achieve the desired results (Okosun and Olagunju, 2017). According to Lock (2017)

Maintenance work is considered waste of money and time by most landlords, they rather divert funds towards new buildings rather than the upkeep of existing ones. Ganisen *et al.* (2015) noted that some building structure do not make Provision for easy access for the various building elements such as the external wall, roof, lift, basement and services which can make maintenance more efficient. On the opinion Holgado *et al.* (2020) financial consequences of neglecting maintenance is often not only seen in terms of reduced asset life and premature replacement but also in increased operating cost and waste of related, natural and financial resources. The study therefore seek to determine the appraisal of building maintenance among landlords in Minna metropolis, Niger state.

1.3   Purpose of the Study

The main purpose of this study is to determine the appraisal of building maintenance among landlords in Minna metropolis, Niger state. Specifically the study will identify the following:

1. Find out the importance of building maintenance among landlords in Minna metropolis, Niger state.

2. Find out the responsibilities of landlords and the rights of tenants in building maintenance.

3. Determine the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state.

1.4   Significance of the Study

The findings of the study will be of benefit to the following: landlords, tenants and governments.

The findings of the study will be of benefit to the landlord as it will be any eye opener for them on the benefit of maintenance of their building and also help them to be able to maintain the building effective for long lasting usage.

Tenants also will benefit from the findings of the study as they will know their right as a tenants and also their part in the maintenance of their various rented apartment.

It will help Niger State Government to find a way of providing good policies for building maintenance practice among landlords. It Hill enhance the landlords to be acquainted with skills for building maintenance practice. It will also enable landlords to clearly understand in the areas of Appraisal of Building Maintenance among themselves.

1.5   Scope of the Study

This study seek to determine appraisal of building maintenance among landlords in Minna metropolis, Niger state. The scope of the study will cover Find out the importance of building maintenance among landlords in Minna metropolis, Niger state, the responsibilities of landlords and the rights of tenants in building maintenance, the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state. Due to constraint the types of maintenance carried out by landlord will not be covered.

1.6   Research Questions

1. What are the importance of building maintenance among landlords in Minna metropolis, Niger state?

2. What are the responsibilities of landlords and the rights of tenants in building maintenance?

3. What are the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state?

1.7   Hypotheses

The following null hypotheses will be tested in the study:

H_{01}:   There is no significant difference in the mean response Landlords and tenants on the importance of building maintenance among landlords in Minna metropolis, Niger state

H$_{02}$: There is no significant difference in the mean response Landlords and tenants on the responsibilities of landlords and the rights of tenants in building maintenance

H$_{03}$: There is no significant difference in the mean response Landlords and tenants on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The review of related literature of this study is organized under the following subheadings:

2.1   Conceptual Framework

2.1.1   The Concept of Building

2. 1.2   Concept of Maintenance

2. 1.3   Maintenance Policy and their Standards

2. 1.4   Concept of Users' Satisfaction

2. 1.5   Factors Affecting Maintenance of a Building

2.3   Related Empirical Studies

2.4   Summary of Literature Reviewed

2.1   Conceptual Framework

2.1.1   The Concept of Building

Building is an edifice erected by art, and fixed upon or over the soil, composed of stone, brick, wood, or other proper substance connected together, and designed for use in which it is so fixed (Chima *et al.,* 2021). Also Bertino *et al.* (2021) defined a building as a relatively permanent enclosed structure made up of stone, brick, wood, or other proper substance connected together, over a plot of land, having a roof and usually windows and often more than one level, used for any of a wide variety of activities, as living, entertaining, or manufacturing

A building can serve varying purpose and according to Rahman *et al.* (2018) buildings can be generally classified into public buildings and residential buildings. Any building accessible to the public and is funded from public sources (state or local government) can be referred to as a public building. He gave examples as public buildings as schools, hospitals, libraries, courthouses, state bungalows and post offices. He gave examples of residential buildings as detached houses which is a single family homes that does not share a wall with any other home / building, semi – detached houses which are pairs of houses built side by side sharing a party wall usually in such a way that each house's layout is a mirror image of its twin and finally apartments which is a self-contained living space which may consist of one room or a set of rooms generally located in a building occupied by more than one household.

Hong *et al.* (2017) stated that a building's performance can be measured in many ways, the most common being condition. He further explained that a building's condition gives a measure of the effectiveness of current maintenance programs because it determines because it determines the remaining useful life of components or the whole system. The elements in a building that determine the condition of the building can generally be grouped into: External works – site maintenance, manholes, curbs, fences, parking area, pathways and sidewalks;

Architectural works – porches and covered walkways, walls and wall finishes (exterior and interior), floor and ceiling finishes, doors and windows, roofing, vents and staircases and handrails; Mechanical works – air conditioning systems, lift systems, water supply system, water treatment plants, bathtub, sinks, water closets, showers, floor drains wash hand basins and urinals; Electrical works – Lamp holders, wall brackets, switches, socket outlets, control and gear boxes, solar panel, distribution boards and earthing.

2. 1.2   Concept of Maintenance

Building maintenance is an essential part of building management that is often ignored (Pärn *et al.,* 2017). Maintenance helps retaining economic life of buildings. Building maintenance is the work undertaken in order to keep, restore or improve every facility, i.e. every part of a building, its services and surrounds to a currently acceptable standard, and to sustain the utility and value of the building. Olanrewaju *et al.* (2015) defined maintenance as the combination of all technical and administrative actions including supervisory actions, intended to retain an item in or restore it to a state, a state where it can perform a required function. Elhegazy (2022) maintenance primarily aim at preserving buildings in their initial functional, structural and aesthetic states so that they continue to remain as such and retain their investment value over a long period of existence. Furthermore, with the appropriate maintenance, a building's economic life can be prolonged.

De Jonge and Scarf (2020) states maintenance comprises of three separate components namely; Servicing, Rectification and Replacement. Other components as related to housing namely; Prevention, Consolidation, Rehabilitation, Repair, Renovation, Refurbishment and Extension.

Types of Maintenance

Purnomov (2022) gives types of maintenance as: Corrective Maintenance, Preventive/Planned maintenance and Condition – based maintenance. Trojan and Marçal

(2017) generally group the types into two main categories; Planned and Unplanned maintenance, they further classified planned into Preventive maintenance (Scheduled and Condition based maintenance) and Corrective maintenance.

Corrective Maintenance: According to Abiodun *et al.* (2016), corrective maintenance is the maintenance carried out after a failure has occurred and is intended to restore an item to a state in which it can perform its required function. They deemed the maintenance strategy simple and straightforward and described it as "fix it when it breaks" i.e. the defective items are fixed after failure or during failure.

Duan *et al.* (2018) opines that it is the simplest type of maintenance which is often adopted where the element of the building is used until it breaks down. They further explained that form of failure based maintenance can be expensive for two reasons; failure of an item can cause a large amount of consequential damage to other elements/parts of the building and failure of an item can occur at a time when it is inconvenient to both operator and user.

Yu *et al.* (2019) described corrective maintenance as a restoring process i.e. work carried out after failure. Alves *et al.* (2020) opines that it is a maintenance practice embarked upon after a building infrastructure or any of its components breaks down or ceases to provide its intended function.

Corrective maintenance is a form of planned maintenance. Zhang *et al.* (2017) describes unplanned maintenance as a maintenance carried out with no predetermined plan. Furthermore, it is work necessitated by unforeseen breakdown or damages. He gave an example of the ripping-off of a building, through the action of a storm, and its remedial action constitute unforeseen damages and therefore correction work would need to be carried out to restore the ripped off part of the building. Unplanned maintenance can also be termed unexpected and unavoidable maintenance.

Preventive Maintenance: According to Alaswad and Xiang (2017) this is the maintenance carried out at predetermined intervals or corresponding to research criteria and intended to reduce the probability of failure or the performance degradation of an item. They further described it as an action performed on a time or machine run based schedule that detects, precludes or mitigates degradation of a component or system with the aim of sustaining or extending its useful life.

Chibu (2018) posit that preventive (pre-planned maintenance) is used to overcome the disadvantages of corrective maintenance, by reducing the probability of and likelihood of failure of an element. Furthermore, advantages of the preventive maintenance over corrective are; that it can be planned ahead and carried out when convenient to the user, maintenance cost can be reduced by avoiding consequential damage, the time that an element of a building or the whole building is out of service (downtime) can be minimized and the health and safety of the user can be improved.

Wijaya *et al.* (2020) opines preventive maintenance involves maintenance tasks such as inspection, monitoring, cleaning, lubrication, adjustment, alignment, repair, replacement and maintenance of building's and systems' components before failures or system breakdowns occur. Preventive maintenance is a retaining process i.e. work carried out in anticipation of a failure. Amanchukwu and Ololube (2015) preventive maintenance as all facility maintenance practices embarked upon as part of a scheduled maintenance activities executed before a facility starts to malfunction, for example, regular cleaning of drainage systems to prevent blockages. Preventive maintenance is an effective approach to enhance the reliability and quality of a system and its components. Xiao *et al.* (2016) also posit that a preventive maintenance carried out at a predetermined interval is a Scheduled maintenance.

Condition – based Maintenance: According to Lee *et al.* (2019), it is a form of preventive maintenance which is initiated as a result of knowledge of the condition of an item from routine or continuous monitoring.

Ofori *et al.* (2015) also agreed that it is similar to preventive maintenance in that regular inspections are made and the condition recorded however no work/replacement would be undertaken until there was a significant change in condition/performance of the item. He further explains that it is a form of maintenance that is carried out in response to a significant deterioration of the item. This deterioration is indicated by a change in the monitored parameter of the condition and performance.

2. 1.3 Maintenance Policy and their Standards

Maintenance policies are strategies within which decisions on maintenance are taken Alaswad and Xiang (2017). On the other hand, it is the ground rule for the allocation of resources between the alternate types of maintenance actions available to management. Closer examination further revealed that maintenance policy is influenced by some criteria which occasionally could be conflicting. These are social providing a quick service to high standards of quality; financial investing funds in activities in the most efficient manner with due regard to the effects on debt charges, subsidies and rent. Technical criteria deals with the maintenance of a property at a level deemed necessary after thorough and regular technical survey; to provide continuous employment for certain operatives within a fixed budget. Den Hollander *et al.* (2017) defines maintenance as "a combination of any actions carried out to retain an item in or to restore it to an acceptable standard".

The concept of 'acceptable standard' may be construed as acceptability to the person paying for the work, to the person receiving the benefit or to some outside body with the responsibility of enforcing minimum standards. Additionally, it can also be construed more widely as acceptability to the public at large or to specific sections of the public. Clearly,

there are no absolute standards which would be equally acceptable to everybody and remain acceptable to the same group of people over period of time. The standards acceptable at the time of undertaking the work may be higher or lower than the initial design standards. In many cases, the standards deemed acceptable would be higher than the originally provided and the work includes an element of improvement. Buildings, however, with the passage of time are modified to accommodate new uses and it becomes increasingly unrealistic to think in terms of keeping or restoring the initial standards. Clearly, standard is related to safety and efficiency determined by the amount of money allocated rather than the results of assessing the benefits obtained from maintaining the building to a particular state. Mazzarella (2015) stated that maintenance is the combination of all technical and associated administrative actions intended to retain an item in or restore it to a state in which it can perform its required functions to an acceptable standard.

According to Fonseca and Schlueter (2015) maintenance is synonymous with controlling the condition of a building so that its pattern lies within specified regions". The word "control" suggests a positive activity which is planned so as to achieve a defined end result while the term "specified regions" presumably has a similar meaning to "acceptable standards". The definition envisages a range of acceptability with upper and lower limits between which the conditions of the building should be maintained. Maintenance, therefore, is all the necessary work done to preserve a building so that it can continue to provide the same or almost the same facilities and amenities, and serve its purpose as it was first built. This includes the expenditure necessary to maintain the rental value of the property and involves day-to-day repairs such as leaking taps, electrical effects, periodic up-keep and major repairs requiring heavy expenditure and services of technical experts.

2. 1.4   Concept of Users' Satisfaction

According to Ozbekler and Ozturkoglu (2020), the SERVQUAL model defined quality as a perceived quality rather than an objective quality. This means that it depends on what a customer thinks he can get from a service and what he believes he has received, rather than an objective standard as laid out by a professional group or in performance measurement. He further termed service quality a component of customer's satisfaction. Also, Selvakumar (2015) opine that when perceived service quality is higher than the expectations, then it will lead to an increase in customer satisfaction. Service quality ("Customers' Satisfaction Level Towards Service Quality of Highways in Malaysia," 2009) is a complex phenomenon and it can mean different things to different people. It was further explained that people's perception towards the services provided by management services will differ because each user has different background and culture. Also, the needs and wants differ among users and this is due to the complexity of human needs and wants. As a result, knowing customers' needs and wants is key towards satisfy them.

Customer can be referred as the purchaser, the supplier, the contractor or the user ("Customers' Satisfaction Level Towards Service Quality of Highways in Malaysia," 2009). However, for this study, the customer is the user. According to Behera *et al.* (2015), a customer is the owner of the construction project and the one that needs the constructed facility.

Pakurár *et al.* (2019) gives ten determinants of level of customer's satisfaction towards services provided, they are; Access (approachability and ease of contact), Communication (informing and listening to customers), Competence (possession of required skills and knowledge to perform the service), Courtesy (demeanour and attitude of contact personnel), Credibility (trustworthiness and honesty), Reliability (consistency of performance and dependability), Responsiveness (timeliness of service and willingness of employees),

Security (freedom from danger, risk or doubt), Tangibles (physical evidence of service) and Understanding and knowing the customer.

Oladapo (2020) explains that a user has the primary responsibility to notify the appropriate quarters about defects for remedial actions. He further describes the indicators of tenants satisfaction with housing maintenance are summarized as; procedure for requesting repairs, the courtesy of maintenance staff, speed of response and execution by maintenance staff, level of mess and nuisance caused by maintenance staff, the quality of work done by maintenance staff and the overall maintenance of houses.

Oladapo (2020) argues that "conventional tenant satisfaction surveys which set out to measure tenants satisfaction with service provided often end up measuring factors independent of the providers performance and the likely impact of other factors upon the rating". To overcome -these limitations, he advocates that tenant satisfaction measurement should take the following in account; not all consumers are likely to have perfect information, degrees of satisfaction vary for different individuals in different circumstances, most housing services have no absolute criteria of judgment and judgment of service quality (and degree of satisfaction) are subjective, and dependent upon culture, social identity, etc. Despite all these criticisms, the fact remains no better alternative has been found to tenant's satisfaction survey. One of the indicators of the level to which a building has been maintained is the degree of users' satisfaction and this makes tenants' satisfaction a good measure of housing maintenance performance.

2. 1.5 Factors Affecting Maintenance of a Building

According to Eze *et al.* (2018) building services rarely perform as well as desired. The causes emanate from deficiencies in design, construction, commissioning, tenancy work and maintenance; many researchers have also observed that the generators of maintenance problems could be looked at under three main divisions.

- Causes initiated during the design stage.

- Causes initiated during the construction stage

- Causes initiated during the usage stage or the user's carefree attitudes (Bad maintenance culture).

He further said that all these could be planned for during the design stage. Maintenance problems though do manifest during the use of the building, their causes might be during the design stage. According to Swift *et al.* (2017) it is at the design stage that the maintenance burden can be positively influenced for better or for worse. Where the designer fails to make adequate consideration for minimizing maintenance problems, it always turns out to be a big problem when the building is eventually occupied for usage, the consideration for effective maintenance as one of the parameters for the building design. Lee *et al.* (2016) described how the occurrence of defects in the building fabric could result from many unrelated designs such as unsuitable materials. According to Thunberg and Fredriksson (2018) it is often said that building defects start on the drawing board, but in some cases, they can originate at an earlier stage. Inadequate brief may lay down totally unrealistic cost limits or fail to give vital information on the building. Design deficiencies could result in a building disaster if adequate attention is not to the design of bearing support, calculation errors, deformation, shrinkage problems, errors in assumed loading (especially wind), and changes in alteration of existing structures – all these could contribute substantially to building failures and disasters. Ofori *et al.* (2015) also said that a skilful design can reduce the amount of maintenance work and also make it easier to perform, since good maintenance begins on the drawing board.

2.3   Related Empirical Studies

Ogunmakin (2013) conducted a research on factors affecting building maintenance in government residential estates in Akure, the capital city of Ondo State, Nigeria. The paper

reviews the existing literature on building maintenance, types of maintenance, nature of maintenance, purpose of maintenance and causes of maintenance. The effects of poor building maintenance were also observed. It identified non-availability of funds, indiscipline and ignorance, bad economy, corruption, cultural beliefs, lack of maintenance culture, lack of skilled maintenance personnel, use of foreign building materials and unethical behaviour as some of the factors responsible for poor maintenance work. The study utilized a structured questionnaire, which was administered on the residents of three (3) different government owned estates in the city. Data analysis indicated that, maintenance is carried out whenever a fault is detected within the building. The study also revealed that majority of the population studied provides little or no fund at all for maintenance works. The paper in conclusion makes recommendations for improved maintenance culture and the need for proactive approaches to maintenance, which includes a maintenance manual to be strictly adhered to by all and sundry.

Izobo (2014) carried out a study on Maintenance Strategies and Condition of Public Secondary School Buildings in Ado-Odo/Ota Local Government Area Ogun State, Nigeria. There is a growing awareness that appropriate maintenance strategies can help to improve the present conditions of buildings in public secondary schools in Nigeria. However, there are few studies on the most appropriate maintenance strategies to be engaged in by maintenance managers to improve the conditions of the existing academic buildings in public secondary schools in this country. Therefore, the aim of this research was to investigate the present conditions of academic buildings and the maintenance strategies in the public secondary schools in Ado-Odo/Ota Local Government Area of Ogun State, Southwest Nigeria. The study examined the availability and conditions of academic buildings in Public Secondary Schools. A survey research strategy and stratified random sampling technique were used in selecting thirty-six public secondary schools out of forty-seven in the study area. Structured

questionnaire was used to extract primary data from the users of the academic buildings, while direct observations were employed in deriving data on the state of disrepair of the buildings. The quantitative data was analysed using univariate and multivariate analyses; while the qualitative data was analysed using content analysis. The result shows that most academic buildings, especially classrooms in public secondary schools investigated were in the state of disrepair, and that there was a need for urgent steps to be taken in addressing the situation. Also eleven of the nineteen deterioration factors investigated were the most significant, five were less significant and two were found not to be significant in explaining the conditions of academic buildings in the schools. In terms of their contribution to deterioration of academic buildings in the public secondary schools sampled, the lack of maintenance body and policy was rated higher than location of the schools. In addition, result of the multiple regression analyses involving seventy-four independent variables and four dependent variables was significant at ($p < 0.005$) and the 95% confidence level; and the adjusted R^2 for the four models were 30%, 25%, 25% and 60%, respectively. Validation of the models confirmed that in the order of importance, maintenance planning; maintenance strategy; physical condition of buildings; and the length of stay of maintenance managers in the schools were the key predictors of the present conditions of academic buildings in public secondary schools in the study area. Findings of this study imply that if adequate attention is given to the development and adoption of appropriate maintenance strategies; maintenance planning, building components and length of stay of maintenance managers in public secondary schools, there will be a significant improvement in the conditions of academic buildings in public secondary schools in the study area in particular, and Nigeria in general.

Olagunju (2015) carried out a study on sustainability of residential buildings in Nigeria: an appraisal of [he factors that influence maintenance of residential buildings' standards. Sustainability issues in residential buildings in many cities of the world and the search for

factors that influence the level of maintenance of residential buildings, with appropriate measures to assist in the solutions to the problems of building maintenance has been an issue of concern, most especially to the house designers and developers in Niger State, Nigeria. This paper therefore planned to determine factors that influence the level of maintenance of residential buildings' standards. The research method employed was descriptive and inferential survey. The data collected were subjected to uni-variate analysis and multi-variate analysis, using Statistical Package for Social Sciences (SPSS). The study found among others that factors that influence the level of maintenance of residential buildings standards includes, (i) building's state of repair, (ii) building type and (iii) Owners/Occupiers highest level of education. The paper concludes that for any meaningful approach to maintainability of residential buildings in view of adequate provision of descent accommodation for the populace, the state Government need to embark on public enlightenment campaign for the residential buildings' owners/occupants on the need for residential buildings and building premises maintenance and the implication for failure to maintain buildings and buildings' premises regularly.

Ayoola (2016) carried out a study on An Investigation of Building Maintenance Culture in Selected Residential Neighbourhoods in Ilesa, Osun State, Nigeria. The rapid pace of urbanization experienced in most Nigerian cities has contributed immensely to the quantitative and qualitative problem of housing. Most residential units either public or private are characterized by a poor state of maintenance and a major part needing various degrees of repairs. Two specific residential neighbourhoods in Ilesa were selected for the study, 455 questionnaires were successfully administered and analysed with descriptive analysis. The study was able to establish that maintenance culture was lacking among the residents, (20.2%) of the respondents adopts preventive building maintenance while the others performed corrective maintenance after the building has reached a state of failure. The

maintenance of building was done majorly by homeowners (73.2%) and the tenants (20.7%), although the frequency of maintenance is poor. The study recommends that government should review its housing maintenance policy to ensure effective housing maintenance.

2.4   Summary of Literature Reviewed

The summary of literature review is discussed under the following subheadings: The Concept of Building, Concept of Maintenance, Maintenance Policy and their Standards, Concept of Users' Satisfaction, Factors Affecting Maintenance of a Building. It was deduced from the study that maintenance is a vital part of the building construction and many landlords tends to ignore the maintenance of their structures thereby leading to the deterioration of the building. Relevant and adequate literatures were reviewed in the study.

CHAPTER THREE

3.0   **METHODOLOGY**

3.1   Design of the Study

The study adopt the descriptive survey research design used to determine the appraisal of building maintenance among landlords in Minna metropolis, Niger state. Survey design according Nworgu (1991) is aimed at collecting data on and describing in a systematic manner, the characteristics features or facts about a given population. Osuala (2005) said that it is a design which studies the characteristics of people, the vital facts about people and their beliefs, opinions, attitude, motivation and behaviour.

3.2   Area of the study

The study was carried out Minna metropolis, Niger state. Niger state falls on the land mass area of about 76,363km2 and with the population of about 3,950,349 (NPC, 2006) and the study was carried in out Niger state in order to determine the determine the appraisal of building maintenance among landlords in Minna metropolis, Niger state.

3.3   Population for the Study

The targeted population for the study is 1500 respondents comprising 500 landlords and 1000 tenants.

3.4   Sample and Sampling Technique

Random sampling techniques was used to sample the population size. The total population size of the study will now be 150 which consist of 50 landlords and 100 tenants

3.5   Instrument for Data Collection

The researcher designed a structured questionnaire as an instrument that was used in collecting data for the study. The questionnaire was made up of four sections (A, B, C and D). Section 'A' contains items on personal information of the respondents. Section 'B' seeks the importance of building maintenance among landlords in Minna metropolis, Niger state.

Section 'C' find out the responsibilities of landlords and the rights of tenants in building maintenance. While Section 'D' seek the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state. The questionnaire items were based on four points scale types. Items for section 'B', 'C' and 'D' contain four responses category each. The response categories for section 'B', 'C' and 'D' are strongly Agree (SA), Agree (A), and Disagree (D) and strongly disagree (SD). These response categories will be assign numerical values of 4, 3, 2 and 1 respectively. Respondents were require checking ($\sqrt{}$) against the response category that best satisfies their opinion.

3.6 Validation of instrument

The instrument was validated by three lecturers in the department of Industrial and Technology Education, Federal University of Technology, Minna and contributions on the appropriateness of the instrument will be considered in the production of the final copy of the research instrument.

3.7 Reliability of instrument

In order to determine the reliability of the research instrument, a pilot test was conducted using fifteen in other locations. During the test, the questionnaires were distributed by the researcher. The questionnaire was filled by the respondents and then returned to the researcher. The data collected will be analyzed using Crombach Alpha

3.8 Administration of instrument

The instrument that was used for the data collection was administered to the respondents by the researcher and three research assistant in the study area.

3.9 Method of data analysis

Data collected was analyzed using mean and standard deviation for the research questions while t-test was used to test the hypothesis at the 0.05 level of significant. A four (4) point rating scale was to analyze the data as shown below.

Strongly Agree   (SA)   =   4points (3.5 – 4.0)

Agree   (A)   =   3points (2.5 - 3.49)

Disagree   (D)   =   2points (1.5 – 2.49)

Strongly Disagree   (SD)   =   1point (1.0 – 1.49)

Therefore, the mean value of the 4 point scale is:

$$\bar{X} = \frac{4+3+2+1}{4} \qquad = \qquad \frac{10}{4} = \quad 2.5$$

3.10   Decision Rule

The cutoff point of the mean score of 2.50 was chosen as the agreed or disagreed point. This will be interpreted relatively according to the rating point scale adopt for this study. Therefore, an item with response below 2.49 and below was regard or consider as disagreed while an item with response at 2.5 and above was regarded or considered as agreed.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

4.1   Research Question 1

What are the importance of building maintenance among landlords in Minna metropolis, Niger state?

Table 4.1: Mean responses of the Landlords and tenants on the importance of building maintenance among landlords in Minna metropolis, Niger state.

S/N	ITEMS	N_1= 50		N_2=100
		$\bar{X}$	SD	Remark
1	help ensure the health and safety of tenants and landlords	3.84	.510	Agreed
2	It Increase the lifespan of the building	3.73	.554	Agreed
3	It gives an healthy environments	3.70	.505	Agreed
4	Its preventing building collapse	3.63	.586	Agreed
5	It avoid costly repair bills and the need for urgent repairs	2.78	1.404	Agreed
6	free from damage	3.23	1.025	Agreed

N=100
$\bar{X}$= mean of the respondents
N_1 = Landlord
N_2= Tenant
SD = standard deviation of the respondents

Table 4.1 showed that both the Landlords and tenants agreed on all items from 1 to 6. This is because none of the mean response was below 2.50 which was the beach mark of agreed on the 4-points response options. The standard deviation score ranged between 0.505 and 1.404. This showed that the responses of the Landlords and tenants on the items were not divergent.

4.2   Research Question 2

What are the responsibilities of landlords and the rights of tenants in building maintenance?

Table 4.2: mean response of the Landlords and tenants towards the responsibilities of landlords and the rights of tenants in building maintenance.

S/N	ITEMS	N_1= 50		N_2=100
		$\bar{X}$	SD	Remark
1	Day to day mopping/Sweeping and cleaning of the building	3.74	.443	Agreed
2	Mechanical cleanup	3.58	.594	Agreed

S/N		$\bar{X}$	SD	
3	Services cleanup, repair and replacement	3.68	.513	Agreed
4	Elemental (ceiling, door, window, roof, etc) replacement	3.63	.586	Agreed
5	Re-painting	3.74	.443	Agreed
6	Fixing of dampened wall	3.74	.443	Agreed

N=100
$\bar{X}$= mean of the respondents
N₁ = Landlord
N₂= Tenant
SD = standard deviation of the respondents

Table 4.2 showed that both the Landlords and tenants agreed on all items. This was because none of the mean response was below 2.50 which was the bench mark of agreed on the 4-point response options. The standard deviation score ranged between 0.443 and 0.594. This showed that the responses of the Landlords and tenants on the items were not divergent.

4.3   Research Question 3

What are the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state?

Table 4.3: mean responses of the Landlords and tenants on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state.

		N₁= 50		N₂=100
S/N	ITEMS	$\bar{X}$	SD	Remark
1	Lack of funds	3.18	1.196	Agreed
2	Lack of maintenance culture	3.66	.519	Agreed
3	Indiscipline/Ignorance	3.40	.672	Agreed
4	Bad Economy	3.68	.513	Agreed
5	Death of owner of building	3.53	.506	Agreed
6	Quality of building materials	3.58	.673	Agreed

7	Lack of skilled maintenance Personnel	3.58	.594	Agreed
8	Remoteness of the building	3.68	.513	Agreed
9	Absence of the owner Family quarrel	3.68	.526	Agreed

N=100
$\overline{X}$= mean of the respondents
N_1 = Landlord
N_2= Tenant
SD = standard deviation of the respondents

Table 4.3 showed that both the Landlords and tenants agreed on all items from 1 to 9. This was because none of the mean response was below 2.50 which was the bench mark of agreed on the 4-point response options. The standard deviation score ranged between 0.506 and 1.196. This showed that the responses of the Landlords and tenants on the items were not divergent.

4.4 Hypothesis 1

There is no significant difference in the mean response Landlords and tenants on the importance of building maintenance among landlords in Minna metropolis, Niger state

Table 4.4 T-test on importance of building maintenance among landlords in Minna metropolis, Niger state.

							$N_1 = 50$ AND $N_2 = 100$
Respondents	**N**	**X**	**SD**	**Df**	**Tcal**	**P-value**	**Remark**
Landlords	50	3.52	0.50	63	0.549	0.06	NS
Tenants	100	3.67	0.62				

N=150
$\overline{X}_1$= mean of Landlord
$\overline{X}_2$ = mean of tenant
N_1 = Landlord
N_2= Tenant
SD_1 = standard deviation of Landlord
SD_2 = standard deviation of Tenant
NS=Not Significant

Table 4.4 showed that there was no significant difference in the responses of Landlords and tenants on all the items as importance of building maintenance among landlords in Minna metropolis, Niger state; therefore the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.5   Hypothesis 2

There is no significant difference in the mean response Landlords and tenants on the responsibilities of landlords and the rights of tenants in building maintenance

Table 4.5 T-test on the responsibilities of landlords and the rights of tenants in building maintenance $N_1 = 50$ AND $N_2 = 100$

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Landlords	50	3.64	.485	148	.261	1.710	NS
Tenants	100	3.60	.632				

N=150
$\bar{X}_1$= mean of Landlord
$\bar{X}_2$ = mean of tenant
N_1 = Landlord
N_2= Tenant
SD_1 = standard deviation of Landlord
SD_2 = standard deviation of Tenant
NS=Not Significant

Table 4.5 showed that there was no significant difference in the responses of Landlords and tenants on all the items as responsibilities of landlords and the rights of tenants in building maintenance; therefore the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.6   Hypothesis 3

There is no significant difference in the mean response Landlords and tenants on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state.

Table 4.6 T-test on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state..

						$N_1 = 50$ AND $N_2 = 100$	
Respondents	N	X	SD	Df	Tcal	P-value	Remark

Landlords	50	3.60	.495	148	.930	5.134	NS
Tenants	100	3.73	.458				

N=150

$\bar{X}_1$ = mean of Landlord

$\bar{X}_2$ = mean of tenant

N_1 = Landlord

N_2 = Tenant

SD_1 = standard deviation of Landlord

SD_2 = standard deviation of Tenant

NS = Not Significant

Table 4.6 showed that there was no significant difference in the responses of Landlords and tenants on all the items as factors affecting building maintenance practice among landlords in Minna metropolis, Niger state; therefore the null hypothesis of no significant difference was upheld at 0.05 level of significance.

Findings of the study

The following are the main findings of the study; they are prepared based on the research questions and hypothesis tested.

1. The finding on the importance of building maintenance among landlords in Minna metropolis, Niger state showed that all the respondents agree on all the items, among all is help ensure the health and safety of tenants and landlords, It Increase the lifespan of the building, It gives an healthy environments.

2. The finding on the responsibilities of landlords and the rights of tenants in building maintenance showed that all the respondents agree on all the items, among all is Day to day mopping/Sweeping and cleaning of the building, Mechanical cleanup, Services cleanup, repair and replacement.

3. The findings on factors affecting building maintenance practice among landlords in Minna metropolis, Niger state shows that showed that all the respondents agree on all the items, among all is Lack of funds, Lack of maintenance culture, Indiscipline/Ignorance

4. There was no significant difference in the responses of Landlords and tenants on the importance of building maintenance among landlords in Minna metropolis, Niger state.

5. There was no significant difference in the responses of Landlords and tenants on the responsibilities of landlords and the rights of tenants in building maintenance

6. There was no significant difference in the responses of Landlords and tenants on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state.

Discussion of findings.

The result from table 4.1 shows the findings on the importance of building maintenance among landlords in Minna metropolis, Niger state. The findings of the study shows help ensure the health and safety of tenants and landlords It Increase the lifespan of the building, It gives an healthy environments, Its preventing building collapse, It avoid costly repair bills and the need for urgent repairs, free from damage. The findings of the study is inline with (Nayanthara, 2013) who stated, that accessibility plays a vital role in the maintenance of high-rise buildings

The result of the hypothesis on the c importance of building maintenance among landlords in Minna metropolis, Niger state shows that there was no significant difference in the responses of Landlords and tenants on the importance of building maintenance among landlords in Minna metropolis, Niger state.

Table 4.2 shows the result of the findings on the responsibilities of landlords and the rights of tenants in building maintenance. The findings of the study shows Day to day mopping/Sweeping and cleaning of the building, Mechanical cleanup, Services cleanup, repair and replacement, Elemental (ceiling, door, window, roof, etc) replacement, Re-painting, Fixing of dampened wall. The findings off the study is inline with Ofide *et al.* (2017) that stated, there is no doubt that dilapidated and unhealthy buildings in a decaying

environment depresses the quality of life and contributes in some measure to antisocial behaviours would be mitigated

The result of the hypothesis on the responsibilities of landlords and the rights of tenants in building maintenance shows that there was no significant difference in the responses of Landlords and tenants on the responsibilities of landlords and the rights of tenants in building maintenance

The result from table 4.3 reveal the findings on factors affecting building maintenance practice among landlords in Minna metropolis, Niger state. The findings of the study shoes Lack of funds, Lack of maintenance culture, Indiscipline/Ignorance, Bad Economy, Death of owner of building, Quality of building materials, Lack of skilled maintenance Personnel, Remoteness of the building, Absence of the owner Family quarrel. The findings of the study is inline with Siyanbola *et al.* (2013) noted that Lack of knowledge of maintenance by building owners and users has prevented the application of good professional approach to maintenance activities.

The result of the hypothesis on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state shows that there was no significant difference in the responses of Landlords and tenants on the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1   Summary of the Study

The main focus of this research study was to find out the appraisal of building maintenance among landlords in Minna metropolis, Niger state.

Chapter 1 of the study discussed the background of the study, the statement of problem, purpose, significance, scope and the research questions were all stated and discussed for the conduct of this research.

The review of related literature looked into The Concept of Building, Concept of Maintenance, Maintenance Policy and their Standards, Concept of Users' Satisfaction, Factors Affecting Maintenance of a Building. Various views of different authors concerning the topic were harmonized in a comprehensive literature review and empirical studies.

A survey approach was used to developed instrument for the study; the respondents identified as the population of the study were the Landlords and tenants. The entire respondents were used. A number of 150 questionnaires were administered. The instrument used was analysed using frequency count, and mean scores. The research questions were discussed base on the findings from the responses and results of the instrument used.

Implication of the study and conclusions were also drawn from the findings discussed. Recommendations and suggestions for further study were formulated and stated according to the findings of the study.

5.2 Implication of the Study

The findings of the study had implications for government, Building construction industries and women working in construction industry. From the outcome of the study, it implies that If the identified areas where put in place it will give women more access into the construction industry and also improve their performance and participation in the construction sector.

5.3 Contribution to Knowledge

The study will improve the knowledge of landlords and tenants on building maintenance and also provide an awareness for building professional on the importance of building maintenance. The study will also provide a body of knowledge on the responsibilities of tenants in maintenance of building.

5.4   Conclusion

Based on the findings of the study, the following conclusions were drawn: The study has revealed the various causes of maintenance works, types of maintenance, nature of maintenance works and the factors responsible for poor maintenance. The opinions of the residents of the Estates have been examined based on these factors. It was discovered that, bad workmanship, conversion of building, faulty design and construction and environmental or climatic factors are the major causes of maintenance work in the estate while lack of fund, lack of maintenance culture, bad economy and quality of building of materials have been the major factors responsible for poor maintenance of the buildings. Buildings left unmaintained pose different threats such as; sickness, eye and skin irritation etc. to the inhabitants and the built environment. It is worthy to note that, the maintenance of buildings will have a positive effect on the health of the inhabitants and a preservative effect on the value of the property. Since Nigerians lack maintenance culture, professionals responsible for the design and construction of buildings should give their clients buildings with minimum maintenance. Finally, Nigerians should learn and embrace maintenance culture as this will elongate the anticipated life span of our buildings.

5.5   Recommendations

Based on the findings of the study, the following recommendations were made:

1. The infrastructural agencies such as Federal Ministry of Works, Housing and Environment etc. should make regular and stable allocations towards building maintenance in most government owned estates.

2. There is need for good preventive maintenance through regular inspections to avoid breakdowns and repairs, which costs more.

3. There is need for public awareness on the danger of lack of maintenance and the advantages of good maintenance.

4. Laws enforcing every occupant to carry out proper maintenance should be enacted and agencies to enforce the law should be established.

5.6   Suggestion for Further Study

The following are suggested for further studies:

1. Appraisal of building maintenance among landlords in other location.

2. Assessment of causes and remedy of poor maintenance practice in existing building.

References

Abiodun, T. S., Olayemi, A. A., & Joseph, O. O. (2016). Lack of maintenance culture in Nigeria: the bane of national development. *Civil and Environmental Research*, *8*(8), 23-30.

Alaswad, S., & Xiang, Y. (2017). A review on condition-based maintenance optimization models for stochastically deteriorating system. *Reliability engineering & system safety*, *157*, 54-63.

Alves, B., Angnuureng, D. B., Morand, P., & Almar, R. (2020). A review on coastal erosion and flooding risks and best management practices in West Africa: what has been done and should be done. *Journal of Coastal Conservation*, *24*(3), 1-22.

Amanchukwu, R. N., & Ololube, N. P. (2015). Managing school plant for effective service delivery in public secondary schools in Rivers State of Nigeria. *Human Resource Management Research*, *5*(4), 95-102.

Amanchukwu, R. N., & Ololube, N. P. (2015). Managing school plant for effective service delivery in public secondary schools in Rivers State of Nigeria. *Human Resource Management Research*, *5*(4), 95-102.

Arif, M., Katafygiotou, M., Mazroei, A., Kaushik, A., & Elsarrag, E. (2016). Impact of indoor environmental quality on occupant well-being and comfort: A review of the literature. *International Journal of Sustainable Built Environment*, *5*(1), 1-11.

Asdrubali, F., Ferracuti, B., Lombardi, L., Guattari, C., Evangelisti, L., & Grazieschi, G. (2017). A review of structural, thermo-physical, acoustical, and environmental properties of wooden materials for building applications. *Building and Environment*, *11(4)*, 307-332.

Behera, P., Mohanty, R. P., & Prakash, A. (2015). Understanding construction supply chain management. *Production Planning & Control*, *26*(16), 1332-1350.

Bertino, G., Kisser, J., Zeilinger, J., Langergraber, G., Fischer, T., & Österreicher, D. (2021). Fundamentals of building deconstruction as a circular economy strategy for the reuse of construction materials. *Applied sciences*, *11*(3), 939.

Chen, D. Q., Preston, D. S., & Swink, M. (2015). How the use of big data analytics affects value creation in supply chain management. *Journal of management information systems*, *32*(4), 4-39.

Chibu, O. R. (2018). Integration of Reliability, Availability, Maintainability, and Supportability (Rams) in Maintenance Decision Policies in Afam Electric Power

Station In Rivers State Nigeria. *International Journal of Electrical and Electronics Engineering (IJEEE)*, *7*, 1-16.

Chima, O. A., Ifeanyichukwu, N. E., Callista, O. U., & Okwudili, O. E. (2021). Current Issues Associated With Public Building Maintenance in South-East Nigeria. *International Journal of Innovative Science, Engineering & Technology*, 8(2), 225-214.

De Jonge, B., & Scarf, P. A. (2020). A review on maintenance optimization. *European journal of operational research*, *285*(3), 805-824.

Den Hollander, M. C., Bakker, C. A., & Hultink, E. J. (2017). Product design in a circular economy: Development of a typology of key concepts and terms. *Journal of Industrial Ecology*, *21*(3), 517-525.

Duan, C., Deng, C., Gharaei, A., Wu, J., & Wang, B. (2018). Selective maintenance scheduling under stochastic maintenance quality with multiple maintenance actions. *International Journal of Production Research*, *56*(23), 7160-7178.

Elhegazy, H. (2022). State-of-the-art review on benefits of applying value engineering for multi-story buildings. *Intelligent Buildings International*, *14*(5), 544-563.

Eze, C. J., Obaje, J. A., & Zubairu, S. (2018). Evaluation of traditional methods in the maintenance of mud houses for environmental sustainability in Northern Nigeria. *Journal of Architecture and Construction*, 1 (3), 34-43.

Fonseca, J. A., & Schlueter, A. (2015). Integrated model for characterization of spatiotemporal building energy consumption patterns in neighborhoods and city districts. *Applied Energy*, *142*, 247-265.

Ganisen, S., Mohammad, I. S., Nesan, L. J., Mohammed, A. H., & Kanniyapan, G. (2015). The identification of design for maintainability imperatives to achieve cost effective building maintenance: A delphi study. *Jurnal Teknologi*, *77*(30).

Holgado, M., Macchi, M., & Evans, S. (2020). Exploring the impacts and contributions of maintenance function for sustainable manufacturing. *International Journal of Production Research*, *58*(23), 7292-7310.

Hong, T., Yan, D., D'Oca, S., & Chen, C. F. (2017). Ten questions concerning occupant behavior in buildings: The big picture. *Building and Environment*, *114*, 518-530.

Leal Filho, W., Brandli, L., Moora, H., Kruopienė, J., & Stenmarck, Å. (2016). Benchmarking approaches and methods in the field of urban waste management. *Journal of Cleaner Production*, *112*, 4377-4386.

Lee, D. Y., Chi, H. L., Wang, J., Wang, X., & Park, C. S. (2016). A linked data system framework for sharing construction defect information using ontologies and BIM environments. *Automation in Construction*, *68*, 102-113.

Lee, S. M., Lee, D., & Kim, Y. S. (2019). The quality management ecosystem for predictive maintenance in the Industry 4.0 era. *International Journal of Quality Innovation*, *5*(1), 1-11.

Lock, D. (2017). The essentials of project management. Routledge.

Mazzarella, L. (2015). Energy retrofit of historic and existing buildings. The legislative and regulatory point of view. *Energy and Buildings*, *95*, 23-31.

Ness, D. A., & Xing, K. (2017). Toward a Resource-Efficient Built Environment: A Literature Review and Conceptual Model. *Journal of Industrial Ecology*, *21*(3), 572-592.

Ofori, I., Duodu, P. M., & Bonney, S. O. (2015). Establishing factors influencing building maintenance practices: Ghanaian perspective. *Journal of economics and sustainable development*, *6*(24), 184-193.

Okosun, B. O., & Olagunju, R. E. (2017). Assessment of factors contributing to maintenance problems in higher institutions in Niger State, Nigeria. *Journal of Building PerformanceI*, 8(1), 47-57.

Oladapo, F. O. (2020). Impact of After-Sales Service on Customers' Retention of Mobile Telecommunications in Nigeria. *Indonesian Journal Of Business And Economics*, 3(2).

Olanrewaju, A. L., Abdul-Aziz, A. R., Olanrewaju, A. L., & Abdul-Aziz, A. R. (2015). Building maintenance processes, principles, procedures, practices and strategies. *Building maintenance processes and practices: The case of a fast developing country*, 1(2), 79-129.

Omesi, I., & Berembo, A. P. (2020). Social Accounting and Financial Performance of Oil and Gas Companies in Nigeria (2012-2017). *European Journal of Business, Economics and Accountancy*, 8(1), 29-41.

Ozbekler, T. M., & Ozturkoglu, Y. (2020). Analysing the importance of sustainability-oriented service quality in competition environment. *Business Strategy and the Environment*, 29(3), 1504-1516.

Pakurár, M., Haddad, H., Nagy, J., Popp, J., & Oláh, J. (2019). The service quality dimensions that affect customer satisfaction in the Jordanian banking sector. *Sustainability*, 11(4), 1113.

Pärn, E. A., Edwards, D. J., & Sing, M. C. (2017). The building information modelling trajectory in facilities management: A review. *Automation in construction*, 75, 45-55.

Pham, L., Limbu, Y. B., Bui, T. K., Nguyen, H. T., & Pham, H. T. (2019). Does e-learning service quality influence e-learning student satisfaction and loyalty? Evidence from Vietnam. *International Journal of Educational Technology in Higher Education*, 16(1), 1-26.

Purnomo, M. R. A. (2022). Incorporating deep learning data analytics techniques in the optimisation of capacitated planned maintenance. *Jurnal Sistem dan Manajemen Industri*, 6(2), 167-175.

Rahman, A., Srikumar, V., & Smith, A. D. (2018). Predicting electricity consumption for commercial and residential buildings using deep recurrent neural networks. *Applied energy*, 212, 372-385.

Selvakumar, J. J. (2015). Impact of service quality on customer satisfaction in public sector and private sector banks. *PURUSHARTHA-A journal of Management, Ethics and Spirituality*, 8(1), 1-12.

Suarez, E., Calvo-Mora, A., & Roldán, J. L. (2016). The role of strategic planning in excellence management systems. *European journal of operational research*, 248(2), 532-542.

Swift, H. J., Abrams, D., Lamont, R. A., & Drury, L. (2017). The risks of ageism model: How ageism and negative attitudes toward age can be a barrier to active aging. *Social Issues and Policy Review*, 11(1), 195-231.

Tecchio, P., McAlister, C., Mathieux, F., & Ardente, F. (2017). In search of standards to support circularity in product policies: A systematic approach. *Journal of cleaner production*, 16(8), 1533-1546.

Terés-Zubiaga, J., Campos-Celador, A., González-Pino, I., & Escudero-Revilla, C. (2015). Energy and economic assessment of the envelope retrofitting in residential buildings in Northern Spain. *Energy and buildings*, 86, 194-202.

Thunberg, M., & Fredriksson, A. (2018). Bringing planning back into the picture–How can supply chain planning aid in dealing with supply chain-related problems in construction?. *Construction management and economics*, 36(8), 425-442.

Trojan, F., & Marçal, R. F. (2017). Proposal of maintenance-types classification to clarify maintenance concepts in production and operations management. *Journal of Business Economics*, *8*(7), 560-572.

Wijaya, L., Latief, Y., & Machfudiyanto, R. A. (2020). Development of Preventive Maintenance Guidelines for Architectural Components on Government Building Based on Work Breakdown Structure. *Civil Engineering and Architecture*, *8*(3), 312-319.

Xiao, L., Song, S., Chen, X., & Coit, D. W. (2016). Joint optimization of production scheduling and machine group preventive maintenance. *Reliability Engineering & System Safety*, *146*, 68-78.

Yu, T., Zhu, C., Chang, Q., & Wang, J. (2019). Imperfect corrective maintenance scheduling for energy efficient manufacturing systems through online task allocation method. *Journal of Manufacturing Systems*, *53*, 282-290.

Zhang, C., Gao, W., Guo, S., Li, Y., & Yang, T. (2017). Opportunistic maintenance for wind turbines considering imperfect, reliability-based maintenance. *Renewable energy*, *103*, 606-612.

Appendix A

QUESTIONNAIRE
FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

A QUESTIONNAIRE ON APPRAISAL OF BUILDING MAINTENANCE AMONG

LANDLORDS IN MINNA METROPOLIS, NIGER STATE.

INTRODUCTION: Please kindly complete this questionnaire by ticking the column that best

present your perception about the topic. The questionnaire is for research purpose and your

view will be confidentially and strictly treated in response to the purpose of the research

work.

SECTION A

PERSONAL DATA

Landlord: ☐

Tenant: ☐

Note: A four (4) point scale is used to indicate your opinion, tick the options which best

describe your agreement as shown below:

Strongly Agree   (SA)   =   4points

Agree   (A)   =   3points

Disagree   (D)   =   2points

Strongly Disagree   (SD)   =   1points

Section B: What are the importance of building maintenance among landlords in Minna metropolis, Niger state?

S/N	Items	Scales			
		SA	A	D	SD
1	help ensure the health and safety of tenants and landlords				
2	It Increase the lifespan of the building				
3	It gives an healthy environments				
4	Its preventing building collapse				
5	It avoid costly repair bills and the need for urgent repairs				
6	free from damage				

Section C: What are the responsibilities of landlords and the rights of tenants in building maintenance?

S/N	Items	Scales			
		SA	A	D	SD
1	Day to day mopping/Sweeping and cleaning of the building				
2	Mechanical cleanup				
3	Services cleanup, repair and replacement				
4	Elemental (ceiling, door, window, roof, etc) replacement				
5	Re-painting				
6	Fixing of dampened wall				

Section D: What are the factors affecting building maintenance practice among landlords in Minna metropolis, Niger state?

S/N	Skill Items	Scale			
		SA	A	D	SD
1	Lack of funds				
2	Lack of maintenance culture				
3	Indiscipline/Ignorance				
4	Bad Economy				
5	Death of owner of building				
6	Quality of building materials				
7	Lack of skilled maintenance Personnel				
8	Remoteness of the building				
9	Absence of the owner Family quarrel				