CAUSES AND REMEDIES OF POOR MAINTENANCE OF PUBLIC BUILDING IN MINNA, NIGER STATE

BY

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2018/3/74387TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

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

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DECLARATION

I Hassan Abubakar with matriculation number 2018/3/74387TI an undergraduate 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 Diploma or Degree of this or any other university.

Hassan Abubakar   _____
2018/3/74387TI   **Sign and Date**

CERTIFICATION

This project has been read and approved as meeting the requirement for the award of B.Tech in (Building Technology) Education, Industrial and Technology Education, School of Science and Technology Education, Federal University of Technology Minna, Niger State.

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DEDICATION

I dedicated this project to God almighty for his divine grace and protection throughout the period of my study and to my lovely parents for their support, may our good Lord bless and reward you abundantly. Amen.

ACKNOWLEDGMENT

I would like to express my profound gratitude to God almighty for sustaining me throughout the course of this project work and the completion of the whole course itself.

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ABSTRACT

The main of this study is to examine the causes and remedies of poor maintenance of public building in Niger state. Three research questions and one research hypothesis was formulated and guided the study. Descriptive survey research design was used for this study. The study was carried out in Minna, Niger State. The population for the study consists of 100 respondents comprising 20 Building contractors and 80 staffs in ministry of works and maintenances. There was no sampling since the population was small and manageable. A structured questionnaire was used as the instrument for data collection. The instrument that was used for the data collection was administered by the researcher with the help of three research assistants. 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. From the findings, it reveals that the Lack of maintenance culture, inadequate funds for the maintenance, Bureaucratic reporting process on building maintenance status, Pressure on facility/building due to number of occupants, Poor work done on building maintenance and Non response to maintenance request. The findings of the study also revealed that Ageing Stock of Building, Obsolescence of Building, Environmental Issues, can lead to dangerous situations, Accidents and health problems, Non-Functional Facilities, Facilities Functioning below Capacity. Based on the findings of the study, the following conclusions were drawn: The achievement of this great concern to building industry were good quality of workmanship should be insisted. Similarly the organization and builders should pay more attention to maintenance rather than huge sum of money on buildings structures whereas that amount could have been useful for the maintenance of such already existing projects. Based on the findings of the study, the following recommendations were made: there is the need for public institutions to embrace preventive maintenance practice as a high priority rather than adhoc maintenance among others.

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CHAPTER ONE

INTRODUCTION

Background of the Study

Building can be defined as a roofed and walled structures built for permanent use for man' s living, working and storage. A building is regarded as an enclosure or " envelope" designed and constructed to provide minimum level of comfort, and conveniences for man. Building provides safety, protects human inhabitants, animals and equipment from effects of weather, and gives internal comfort (Ogunoh, 2014) cited in Chima, et al (2021). This implies that the primary purpose of buildings is to provide occupants with conducive, safe, comfortable, healthy and secured indoor environment to carry out different kinds of activities ranging from work, study, leisure and family life to social interactions.

Building is an essential of human life, they are structures, which serve as shelters for man, his properties and activities. For any building to properly achieve it aim and objective there must be properly designed, adequately planned, constructed and maintained on standards and specifications established by governments, professional bodies and experts who are supposed to have adequate knowledge of users' needs and expectations Chima, et al (2021). The main functional requirement of building is to ensure strength and stability, weather tightness, internal comfort level, optimum use of buildings and a longer serviceable life of buildings. This is only possible through undertaking of periodic and planned maintenance, at regular intervals. Maintenance of any building is very essential if its aim and objective will be achieved.

Maintenance is define as work undertaken in order to keep or restore a facility at an acceptable standard. Maintenance can be defined as those activities required to up-keep a facility in as built

condition, so that it continues to have its original productive capacity depending on designer limitation of life span, manufacturer recommendations, age and service conditions Ruparathna, et al (2018). Maintenance is required throughout the life span of the building so that the various elements are kept to standard consistent with the overall policy. Proper maintenance contributes in ensuring safety of occupants, users of buildings and the public Chima, et al (2021). According to Uzoamaka and Emoh (2018) Maintenance problems start to creep in once building projects are completed and maintenance needs to be carried out on them in order to sustain the performance of the buildings and keep them in good condition. In order to maintain there must be proper maintenance.

The prevalent maintenance problems in both residential and public buildings leakage roof, rot in roof timber, damages to internal plaster and decoration, possible damage to contents and effect on health of occupants, damages to ceiling board, flaking of wall paints, cracking of walls, broken tiles, wearing off of floor finishes, broken broker PVC pipes and damage to soak away pit Misra, (2018). Another contributions to the deplorable state of buildings is the attitude of our building owners both residential and public building. The problem with most Nigeria building owners is that they do not know what they want in their buildings when completed Oyedele, (2018). This therefore compounds problem to designers during briefing and decision making. The owners may need a complex building without considering the convenience of construction. They may not even be ready to involve themselves with high cost buildings which they need.

 Neglecting of any building maintenance always accumulate consequences and rapid increase in the deterioration of the fabric and finishes of a building, accompanied by a harmful effect on the contents occupants (Sarbin, et al 2021). Inadequate building maintenance is a peculiar feature of almost every building in Nigeria. The declining maintenance of building in Nigeria and its effect

on buildings has become a major problem to both the public and private sectors. The study therefore seeks to identify the causes and remedies of poor maintenance of public buildings in Minna, Niger state.

Statement of the Problem

It is often said that building defects start on the drawing board. Design deficiencies could result in a building disaster if adequate attention is not given to the design of the bearings support, calculations, errors, deformation, shrinkage problems, errors in assumed loading (wind force) (Cruz, et al 2015), since good maintenance begins from plan design stage, therefore some of the problems are inadequate architectural design, inadequate structural, electrical and mechanical design, new material and construction techniques, lack of quality control and monitoring, poor workmanship, poor placement of materials and poor supervision of construction work, use of defective materials, lack of routine or preventive maintenance department and lack of maintenance manual (Islam, et al 2021). The study therefore seeks to identify the causes and remedies of poor maintenance of public builbuildings Minna, Niger state.

1.3   Purpose of the Study

The main purpose of this study is to identify the causes and remedies of poor maintenance of public buildings in Minna, Niger state. Specifically the study will identify the following:

The causes of poor maintenance of public buildings in Minna, Niger state

The effect of poor maintenance of public buildings in Minna, Niger state.

Remedies to poor maintenance of public buildings in Minna, Niger state.

1.4   Significance of the Study

The findings of this study will be of benefits to the building contractor, ministry of works, government and the society.

The building contractors will benefit from the findings of this study as it will an eye opener on proper planning of building before the construction of building commences. Also building contractors will be aware of the use of quality materials in the construction of any building. Also the findings of this study will facilitate the quality assurance in building construction in a way that every building must be up to standard to avoid untimely maintenance of building.

The findings of this study will also be of benefits to Building Technicians in Ministry of Works as it will enlightened them on the poor state of public building in the state and also findings of this study will enable the ministry of to how to go about the proper and regular maintenance of public buildings.

The government will benefits from the findings of the study as there will be remedies to poor maintenance from the study. The findings of the study will also help the government to be able to maintain the old public building that already deteriorating due to poor maintenance and also fund maintenance of public building in the state.

The findings of the study will be of benefit to the society as it will serve as an eye opener for them on how to maintain their various building in order to give it a long lasting lifespan. Also the society will benefit from the findings of the study as it will enable them to know what to watch out for from the commencement pf any building construction.

1.5   Scope of the Study

This study will be cover causes and remedies of poor maintenance of public buildings in Minna,Niger state. This study will focus on the causes of poor maintenance, effect of poor maintences as well as remedies to poor maintenance of public building.

1.6   Research Questions

What are the causes of poor maintenance of public building in Minna, Niger state?

What are the effect of poor maintenance of public buildings in Minna, Niger state?

What are the remedies to poor maintenance of public buildings in Minna, 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 of Building contractors and staffs in ministry of works and maintences on causes of poor maintenance of public buildings in Minna, 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   Conceptual Framework

2.1.1   Concept of Building Maintenance

According to Loosemore and Lim (2018) permanent structure requires less attention than temporary ones, any house owner will confirm that even the best constructed building needs constant attention. If the attention is delayed, what started as being something very minor is liable to turn quickly into an expensive operation? Similarly, Loosemore and Lim (2018) asserted that no building can exist throughout its span without one form of maintenance or the other; it is to say that much can be done at the design stage in order to reduce the amount of subsequent maintenance work. According to Loosemore and Lim (2018) maintenance work on a building should commence from the day the contractor leaves the site.

The necessity for maintenance work on buildings is noted in the fact that all buildings, as well as the materials and components therein, deteriorate or suffer loss in aesthetic, strength and or functional value, with exposure to the elements of weather over time. The appearance and life span of a building and also the quality of the materials would be affected depending on the manner to which maintenance is adhered to, in the building (Twumasi-Ampofo *et al.,* 2017). If the design process is to be enhanced, the building team need to come together and contribute towards the building' s maintainability at the project inception rather than leaving it for the maintenance personnel at the end of construction to battle with the curative measure (Twinamatsiko, (2021). This sometimes according to Lam *et al.* (2017) causes frustration and annoyance to maintenance personnel when taking over new buildings and finding themselves faced with bad details, poor choice of finishes, materials and components and lack of basic information about the building and its services. According to Guimaraes *et al.* (2018) the root cause of the problems that the construction industry and its clients experience lie in the division of the responsibilities between the design aspects and the construction aspect. The successful completion of any building depends on many things, few of which are as important as the designer-contractor relationship. The two parties must be willing to work together so that the clients get maximum benefit from their joint expertise. The contract should feel able to contribute to the design process in matters relating to construction practice and the designer should be willing to receive, analyse and subsequently act on such recommendations.

Ayoola (2016).outlines the concept of maintenance as:

Prevention: It entails protecting housing by controlling its environment, thus preventing agent of decay and damage from becoming active. It involves clearing schedule, good housekeeping and proper housing management.

Consolidation: Consolidation is the physical addition or application of adhesive or supportive materials unto the actual fabric of housing in order to ensure its continued durability or structural integrity.

Rehabilitation: Rehabilitation involves the modernization of aged building with or without adaptive alteration for use. It means the introduction of modern services into the building without changing its original use.

Repair: Repair is to revive housing to the original state so that it works as it was first put up or built. It involves reactive responses to housing deterioration and it is essentially ad hoc in nature.

Renovation: It consists of work done to restore a structure, services and equipment by a major overhaul to the original design and specification or to improve on the original design. This may include substantial additions and extensions to the original structure and in the extreme rebuilding. Renovation constitutes the interface with improvement and refurbishment. Renovation to some extent is unavoidable, since in replacing a fitting, such as a bath, the replacement were of a new design.

Refurbishment: Refurbishment means in architectural sense, as involving replacement of missing parts or introduction of new decorative elements into a structure. In addition, it involves working on a housing to make it bright, clean and fresh again.

Extension: With respect to housing, it involves addition of parts to make housing wider or larger in response to what is required of it.

Technology of Maintenance: The technology of maintenance is concerned with all the factors that influence and cause the need for maintenance work. The occurrence of defects in the fabric

of a building can result from many unrelated design decisions- unsuitable material, incorrect assessment of loads, inadequate appreciation of conditions of use and inadequate assessment of exposure. Exposure is influenced by rainfall, direction of prevailing winds, microclimate, atmospheric pollution and aspect and height of building. The durability of the building material also influenced by frost action, crystallization of salts, sunlight, biological agents, abrasions and impact, chemical action and corrosion and incompatibility of modern building material.

Cracks in building normally result from failure or defective construction and are invariably unsightful and unacceptable to occupants. If severe, they may result in loss of stability. Furthermore, cracks frequently give rise to air infiltration, heat loss and reduced sound insulation all of which cause reduced efficiency in buildings. Cracking is generally caused by tensile stresses in excess of the tensile strength of the material, produced by externally applied loads or internal movements arising from temperature or moisture changes.

Other important concept of the maintenance can be illustrated by reference to roof construction. A good roof which is well maintained should last the life of a building and it is false economy to save money on roof during construction, because if it ever requires replacement, it will cause serious dislocation of production, occupancy or other activities within the building. According to Ksit *et al.* (2021) A leaking roof apart from causing considerable inconvenience to users can lead to accelerated deterioration of other parts of the building such as ceiling, floors and walls and can cause serious damage to decorations and electrical installation. Traffic over a roof should be kept to a minimum and where it is essential, appropriate walkways and access ladders must be provided. To ensure that roofs are adequately maintained, they should ideally be inspected every three (3) years or alternatively one-third each year.

Types of Maintenance

Goh and Sun (2016) categorizes building maintenance by means of the following terms and definitions.

Planned maintenance: "The maintenance organized and carried out with Forethought, control and the use of records to a predetermined plan."

Unplanned maintenance: " The plan carried out to no predetermined plan." It refers to work necessitated by unforeseen breakdown or damages. For example, the ripping off of a building, through the action of a storm, and its remedial action constitute unforeseen damages. It can also be termed unexpected and unavoidable maintenance.

Preventive maintenance: " The maintenance carried out at predetermined intervals or corresponding to prescribed criteria and intended to reduce the probability of failure or the performance degradation of an item."

Corrective maintenance: " The maintenance carried out after a failure has occurred and intended to restore an item to a state in which it can perform its required function."

Emergency maintenance: " The maintenance which it is necessary to put in hand immediately to avoid serious consequences." This is referred to as day-to-day maintenance, resulting from such incidents as gas leaks and gale damage.

Condition-based maintenance: The preventive maintenance initiated as a result of knowledge of the condition of an item from routine or continuous monitoring.

Scheduled maintenance: The preventive maintenance carried out to a predetermined interval of time, number of operations, mileage, etc.

Running maintenance: Maintenance which can be carried out whilst an item is in service.

2. 1.2 Maintenance of Public Buildings

Ghazi (2016) defines 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. Maintenance is also defined as the restoring of an item to its original condition to working order (Den Hollander *et al.,* 2017). This can be achieved by repair, replacement of parts or total replacement of the item. Maintenance is also defined as work undertaken in order to keep or restore every facility i.e. every part of a site, building and contents to an acceptable standard.

Vandesande and Van Balen (2016) in his study " Towards innovative building maintenance" defines maintenance in its simplest sense to entail the repair or replacement of worn out or damaged parts in order to keep the building in a standard corresponding to its original characteristics and functions. In this case, maintenance does not include work necessitated by higher demands or for a change in the pattern of use that could not have been foreseen at the time of initial design.

Maintenance works as an important support function in business or organizations with significant investment in physical assets and plays an important role in achieving organizational goals (Sarbini *et al.,* 2021). Today maintenance is considered an integral part of business process and it is perceived as creating additional value. Maintenance has also been defined as ' All actions taken to retain material in or to restore it to a specified condition. It includes inspection, testing, servicing, and classification as to serviceability, repair, rebuilding, and reclamation' (Hacke *et al.*, 2018). It includes the routine recurring work required to keep a facility (plant, building,

structure, ground facility, utility system, or other real property) in such condition that it may be continuously utilized, at its original or designed capacity and efficiency, and for its intended purpose.

Obiegbu (1998) defined maintenance as a programmed transformation of a building fabric and services, reflecting changes in pattern of use and technology. Amobi (2006) opined, " Maintenance could be defined in engineering terminology as the continuous upkeep, in good condition of a system(s) to achieve operational reliability with maximum design output result, endurance and stability. This definition has been adapted for building maintenance as work undertaken to keep or restore every facility, that is, every part of a site, building and content to acceptable standard. Thus, maintenance aims at retaining components, equipment as well as the entire structure at specified level of performance. The acceptable standard inferred must be no less than statutory requirement and one, which sustains the facility and the value of the facilities. This may include a degree of improvement over the life of the building as acceptable comfort and amenity standards rise.

Seeley and Winfred (2005) defines building maintenance as actions carried out to restore or improve certain parts of a building to an acceptable standard. The BS 3811 defined acceptable standard as one, which sustain the utility and value of the facility. This definition is found to include some degree of improvement over the life of the building as acceptable comfort and amenity standard rise.

A more functional definition by Lee (2007) is that 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 to achieve a defined result, while the term

' specified regions' presumably has a similar meaning to ' acceptable standards' . Lee (2007) definition envisages a range of acceptability with upper and lower limits between which the conditions of the building must be maintained.

Maintenance therefore is all the necessary work done to preserve a building with its furnishes and fittings, so that it continues to provide the same or almost the same facilities, amenities and serves as it did when it was first built. It includes the expenditure necessary to maintain the rental value of the property and involves:

Day to day repairs such as leaking taps and electrical effects;

Periodic up-keep such as painting; and

Major repair requiring heavy expenditure and the services of technical experts.

Chanter and Swallow (2007) in reference to British Institute of Facilities Management define maintenance of buildings as ' the integration of multi-disciplinary activities within the built environment and the maintenance of their impact upon people and the work-place. The institute underscores the importance of facilities management to the success of an organization by contributing to the delivery of its strategic and operational objectives. In another instance, Lee (2007) defines maintenance as ' a combination of any actions carried out to retain an item in, or restore it to, an acceptable condition' . The actions referred to entail initiation, organization, and implementation.

The importance of housing maintenance cannot be ignored. Harrison (2003) states that building maintenance is important in preserving and enhancing standards of appearance and hygiene, preventing deterioration of fabric and ensuring efficient operation of buildings. For efficient

repair of existing buildings, on-site visual inspection and close examination of deterioration are essential. This permits understanding the process of deterioration and timely detection of defects and development of effective methods of building maintenance.

According to Syagga (2006), building maintenance aims at ensuring a systematic approach in the overall asset management while serving three major roles which include functional, aesthetic and financial roles. The functional role retains the property within reasonable standards of the user, while the aesthetic is about appearance in relation to surrounding environment. Financial role ensures that value of assets is enhanced.

The process of deterioration of buildings is complex and may set in due to a combination of factors such as human aspects, chemical factors, faulty designs, inappropriate cleaning, and misuse of building and faulty system of maintenance among others, Gahlot (2006). Eilenberge (2010) notes that with increase in size of buildings and need for longer economic life, there' s need that buildings be maintained in an optimum condition. This calls for early planning, caution in initial design of the building to permit ease of inspection of structure, selection of most appropriate materials and fabric and a regular maintenance programme to maximize the economic life of buildings. This strategy also makes housing maintenance cost effective.

To avoid substantial building failures, it is important to conduct condition survey to confirm performance of buildings. According to Thomas (2010), a condition survey on the behavior and performance of different types of existing buildings conducted in India revealed that building failure is more often due to negligence in the diagnosis of the defect and faults than the structural failure. He also observed that proper diagnosis and repair of failure and defects can avoid substantial failures.

Housing maintenance is not preserve for governments alone; rather it requires the concerted efforts of all concerned parties. Waithanji (2011) states that the primary initiators of maintenance should be owners and or occupiers or users of the building facility. She however indicates that other parties such as inspectors, insurance companies, employees, or members of the public may influence how maintenance is undertaken. According to Waithanji (2011), maintenance of buildings should be planned for and catered for in any tenancy agreements, while clearly outlining the party responsible for the maintenance, the areas as well as the scope of maintenance.

2. 1.3 Maintenance Policy and their Standards

BS 3811(1993), defines maintenance policies as a strategy within which decisions on maintenance are taken. Alternatively, 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. British Standard (BS 3811:1993), as cited in (Afranie and Osei-Tutu, 1999) 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. Seeley (1993) 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.

A more functional definition proposed by Lee & Yuen (1993) is that, " 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 Causes of Maintenance Problems

According to Stephen (2002) 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. These made Dekker, (2002) Kelly (2002); Kachashkin (2002) to assert that " thinking on the maintenance should start in the design phase" . According to Speight (2000) 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. Cheetham (1992); Both (1999); Edwin and Curtis (2000) and Mc Call (2001) described how the occurrence of defects in the building fabric could result from many unrelated designs such as unsuitable materials. According to Arayela and Adams (2001) 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. Seeley (1997) 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. 1.5 Building Maintenance

The technology of maintenance is concerned with all the factors that influence and cause the need for maintenance work. Maintenance generators degrade the quality standard of a building as well at design and commissioning stage. The occurrence in the fabric of a building can result from many unrelated design decisions, unsuitable materials, incorrect assessment of loads, inadequate appreciation of condition of use and inadequate assessment of exposure. Factors responsible for building maintenance are listed below

Design Factors

Decision by designers in the process of designing has vital effect on the volume of maintenance work that will be required by the completed building. As such the role of the designer in building maintenance cannot be overemphasized. Inherent design problem such as complex specification, wrong design decision, incorrect assessment of loads condition upon which the building will be exposed and subjected to, will affect maintenance of the building in future. Unsuitable materials due to lack of knowledge of their characteristics and use of inadequate size of structural members will result in failure of building component. Faulty design will lead to faster

deterioration of building structure. Adequate attention to maintenance needs of future at the time of design is essential to reduce maintenance problems.

Human Factor/The User

Human factor may be either socio-cultural or economic factors. Socio-cultural factors may include educational level of the developer, competency of the professionals involved in the design, construction and management of the project, and the attitude and culture of the end-users of the building. Also, the desire of building owners in the area of taste for modernity without regards to environmental implication may leads to high cost of maintenance. Human factor can be viewed from two aspects; Maintenance staff lack of maintenance culture and occupants misuse of buildings.

Deterioration occurs due to lack of appropriate maintenance culture on the part of the maintenance staff. Failure to provide the necessary capital, either due to inappropriate budgeting or inadequate allocation of financial resources hampers maintenance and thus leads to deterioration. Delay in attending to the maintenance job can also lead to more severe problem of maintenance. The deterioration may also be enhanced due to failure to carry out routine maintenance well in time, lack of knowledge about factors causing deterioration, poor planning, budgeting and allocation of inadequate monetary resources to enable maintenance activities to be undertaken, lack of awareness of maintenance needs among the users, using casual approach to repairs, failure to establish acceptable standards of maintenance and having a negative attitude of waiting until emergency measures becomes necessary.

The users of the building also contribute to its deterioration and this usually takes various forms. One of such ways is vandalism, which is the intentional damage and disfiguration of the building

and its components such as doors, windows, furniture, electrical and sanitary fittings. Lack of security, lack of awareness among users on the need to keep their surrounding tidy and failure to repair the areas damaged by vandalism are some of the causes which becomes sources of further deterioration in buildings. In some cases, the buildings are converted to different uses from the initial design purpose resulting in rapid deterioration of the building. Overuse and overcrowding of buildings can accelerate deterioration and contribute largely to the deplorable living condition in the structures. A building occupied by careful occupants will result in less maintenance than similar one occupied by careless occupants.

Environmental Factors

These refer to the effect of soil types, climatic condition (sun, rain, dust), and vegetation on the building maintenance. The severity of these environmental factors is based on the site and orientation of the building. For example, a structure built on firm, evenly slope, well drained and stable soil will require less work to maintain. On the other hand, building built on swampy soil may require more attention to maintain both the foundation and the building as an entity. Similarly, some building materials are sensitive to climatic factors like temperature, rainfall and humidity. For example, extremes in heat and cold can lead to cracks in concrete, if adequate expansion joints are not provided. While extremes sunshine and frequent rains can also makes paints on exposed external wall to fade faster in areas such as Maiduguri and Jos in Nigeria respectively. In addition, a building in an area of heavy rainfall such as Lagos and Port Harcourt in Nigeria is more likely to have maintenance problems of roof leakages or roofs blown away during heavy rainstorms. The chemical content of the atmosphere due to environmental pollution also affect the rate of deterioration of external finishes of a building. A building close to the sea for example in areas such as Lagos in Nigeria, is exposed to salty moist breezes from the sea

which leads to chemical reactions on exposed wall surfaces and roof. High humidity may also affect some metabolic fittings and rust can easily occur.

Age of Building

The older the building is, the more the need for its maintenance (Sharma and Gahlot, 2006). As a building reaches its full life span, it depreciates at a fast rate and the cost of maintenance tends to be higher than in the early stages of occupation. The lives and property of the users at the apex of the building life tend to be in danger, if they are not evacuated on time or if building is not demolished for new site.

Faulty Materials

Similar to the effect of human factors on maintenance is the materials used in the construction of building. The following causes result in poor quality of construction which in turn, give rise to future maintenance problems; wrong selection of materials and specifications, use of substandard materials, inadequate inspection of materials, provision of inadequate facilities for storage at site, inconsistent mixing of materials at site, use of inappropriate materials in relation to use and use of stale/expired materials. A building owner should not think of using cheaper materials based on absolute scale. He should rather be concerned with cost-in-use of each alternative materials and this will assist him in evaluating the life cycle cost of each materials. This will in turn help him to select the best quality materials that will require less maintenance. Cheaper materials might require more frequent maintenance than high quality materials at the long run.

Faulty Construction/Poor Workmanship

The following factors will give rise to maintenance problem during the service life of the building; lack of supervision during construction period, failure to monitor the work adequately, failure to understand and follow exactly the specifications / drawings, failure to replace the defective work, lack of skilled labour and over-emphasis on need for quantity rather than quality output.

Faulty System

Inadequate knowledge on the part of the designer, unsatisfactory design details, inability of the builder to follow specifications/drawings, inadequate testing of the system before commissioning, failure to follow maintenance instructions and inability of the owner to operate the system as instructed can generate maintenance problems in building structures. According to Akinsola *et al.* (2012), other factors that attribute to poor maintenance include inadequate routine maintenance, an ineffective maintenance programme, lack of proper inspections on a planned basis, changing standards or/and tastes and Inadequate data to enable the preceding items to be properly carried out.

Maintenance Funds

The distribution of funding for maintenance works is determined by factors such as organization' s policy, asset management plan, the asset in question, current condition and age profile, operational requirements and backlog maintenance (Al-hammad, n.d). Maintenance personnel experience difficulties in determining the maintenance standard of a building because of the inadequate maintenance resources allocated from top management. Organizational and maintenance objectives are not properly understood at top management level; therefore allocation of maintenance resources is insufficient to meet maintenance needs (Lateef, Khamidi,

and Idrus, 2011). Funds for maintenance works are not provided as and when due hence delays are experienced in carrying out the work, further deterioration of building components and additions to maintenance backlogs. Lateef *et al*. (2010) further asserted that maintenance is budget-driven and not need-driven. Maintenance is only carried out subject to availability of funds which automatically puts off proactive maintenance until when funds are available to perform the tasks.

2. 1.6 Factors affecting building maintenance

According to Stephen (2002) 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. These made Dekker, (2002) Kelly (2002); Kachashkin (2002) to assert that " thinking on the maintenance should start in the design phase" . According to Speight (2000) 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. Cheetham (1992); Both (1999); Edwin and Curtis (2000) and Mc Call (2001) described how the occurrence of defects in the building fabric could result from many unrelated designs such as unsuitable materials. According to Arayela and Adams (2001) 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. Seeley (1997) 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.

2.1.7   Building maintenance strategies

Strategies for building maintenance can be divided into three:

Corrective

Preventive

Condition – based

Corrective Maintenance

Corrective maintenance is the simplest type of maintenance strategy, where an element in a building is used until it breaks down. It covers all activities, including replacement or repair of an element that has failed to a point at which it cannot perform its required function. Corrective

maintenance is sometimes referred to as failure based maintenance .Corrective maintenance tasks often take place in an ad hoc manner in response to breakdowns or user requests (David and Arthur, 1989).

Corrective maintenance according to El-Haram, Horner and Munns (1997) can be extremely expensive for two reasons;

The failure of an item can cause a large amount of consequential damage to other elements in the building.

Failure of an item can occur at a time which is inconvenient to both user and the maintaining authority. This can make manpower and spare parts planning extremely difficult.

Preventive Maintenance

This was introduced to overcome the disadvantages of corrective maintenance, by reducing the probability of occurrence of failure and avoiding sudden failure. This strategy is referred to as time – based maintenance, planned maintenance or cyclic maintenance. Preventive maintenance tasks are performed in accordance with a predetermined plan at regular fixed intervals, which may be based on operating time (David, et al 1989).

Condition – Based Maintenance

Condition – based maintenance is defined as " maintenance carried out in response to a significant deterioration in a unit as indicated by a change in monitored parameter of the unit condition or performance" (Kelly and Harris, 1978).

The condition – based maintenance concept recognizes that a change on condition and/or performance of an item is the principal reason for carrying out maintenance. In this strategy,

maintenance tasks are determined and planned by efficiently monitoring the building's elements such as walls, floors, roof and service equipment such as boilers, pumps, and heating system, to identify which element or piece of equipment requires maintenance before a major failure occurs. To gain the full advantage of applying condition – based maintenance, the condition of an item must be monitored to identify whether there is any evidence of change from a normal to an abnormal condition (David, et al 1989).

2.2   Related Empirical Studies

Olatunji (2016) conducted a study on Assessment of Maintenance Management Culture of Tertiary Institutions in Nigeria. Buildings are critical factors in achieving desirable outcomes for tertiary institutions. Any inadequacy in building facilities represents a loss in value of the institution, its users and stakeholders. Hence, institution buildings require maintenance in order to create a conducive environment that supports and stimulates learning, teaching, innovation and research as there seems to be a strong correlation between learning and the environment in which knowledge is imparted. In this research, maintenance management structure of tertiary institutions was assessed and the usual maintenance procedures as well as means of funding maintenance activities in the institutions were examined and evaluated. Data used for this research work were collected using structured questionnaires and interview which were administered to workers of the various departments in charge of maintenance work. Data received were analyzed using simple statistical tools such as mean item score, percentage and frequency. The research shows that institutions have a structure in place to carryout maintenance work but do not have a formal organogram showing the hierarchy flow of authority and that maintenance department is characterized by inexperienced staff. It also revealed that maintenance works are properly funded but characterized by frequent occurrences like

underestimating and cost overrun. The research recommends that the institution should have a formal organogram to show the distribution of power and to carry out proper training of maintenance staff especially the quantity surveyors in preparing maintenance budgets.

The similarities between the study and the present study is that both study are building maintenance and adopted questionnaire for its data collection. The difference is the study covers Nigeria while the present study covers Minna, Niger state.

Okosun (2017) conducted a study on Assessment of factors contributing to maintenance problems in higher Institutions in Niger state, Nigeria. Maintenance generators degrade the quality standard of a building and if left unattended will definitely cause more damages and in the long– run, costly repairs. Maintenance staff are sometimes faced with the challenges of detecting the exact source of maintenance problems in buildings, this necessitated a research to assess factors that contribute to maintenance problems in higher institutional buildings and propose best practice criteria for effective maintenance management. Method of data collection was via questionnaire. The results from the data of the descriptive analysis were presented using Relative Important Index (RII). 101 questionnaires were administered with a response rate of 96.04%. Findings from the study revealed human/user factors and management related factors as the most contributory to maintenance problems of the studied higher institutions. The least considered best practice criteria was computerized maintenance management system (CMMS) with a mean score of 2.82. Several higher institutions maintenance departments lack a computerized work system. This may not be surprising giving the phobia many people still have for computers. Almost all the maintenance departments lack qualified computer personnel to operate an effective CMMS. This study will help the higher institution management tackle the identified major problems that results in deterioration of building facilities.

The similarities between the study and the present study is that they both focus on building maintenance also the both study make adopt a descriptive survey design for their study.

Ugwu (2018) conducted a study to assess the building maintenance in the Nigeria University system. A cases study university of Nigeria Nsukka. It also proffers solutions to maintenance problems. The field investigation focused on staff residential houses, students' hostels offices and classrooms. Questionnaires were used to collate data/Information on 500 residential apartments, offices and a total of 260 hostel rooms were examined The results were analyzed statistically. The results show that about 80% of the buildings within the University require immediate maintenance. Maintenance works are also needed at the staff residential buildings, students' hostels, offices and classrooms. They are also needed in the plumbing works, bathrooms, toilets doors windows, the painting walls, floors, rook and electrical installations of the buildings 74.60% of the residential buildings need roof maintenance, 57.30% need floor maintenance, 60% need wall maintenance, 71.30% need re-painting and 68.60% need window maintenance. In the students hostels 617096 of the hostels need door maintenance, 59.50% need to have their toilet facilities maintained while 72.40% of the hostels need to have their plumbing works maintained it is concluded that lack of maintenance policy and funding is the major cause of public building deterioration in University of Nigeria, Nsukka It is recommended that a holistic maintenance framework should be adopted in line with International best practices in developed countries In addition, the University should adopt preventive maintenance policy by employing outsourcing maintenance services The University should also introduce the use of one stop shop maintenance services including the use of information and communication technology.

The similarities between the study and the present study is that both study focus on building maintenance and also adopt survey research design. The difference between the study and the present study is that both the study is carried out in Nsukka while the present study is out Minna.

Izobo-Martins (2018) carried out a study on users' perceptions of the current maintenance disorder of Public Secondary School in Ogun, Nigeria. The challenges facing public schools are multifaceted and include: teachers dissatisfaction, non-commitment of educators, chronic absenteeism by educators, low morale, poor work ethics by educators, late coming of both educators and learners, overcrowding in classes, lack of technical resources and many more. A cursory investigation of public secondary school buildings in Ado-Odo/Ota L.G.A shows its deplorable conditions of structural, aesthetical and decorative disrepair. Therefore the paper focused on examining users " perception of the present deplorable physical condition and neglect of public secondary school. The study engaged the use of quantitative method of analysis, employing the use of questionnaire administered randomly and distributed face-to-face to targeted despondences" . The result of findings revealed performance/productivity of building users depends largely on working and learning condition of building. The outcomes of the research would help policy makers, facilities maintenance experts and professionals alike to device a policy for regular maintenance of public buildings in other to enhance performance and increase productivity amongst users.

The similarities between the study and the present study is that both study focus on building maintenance. The difference between the study and the present study is that both the study is carried out in Ogun while the present study is carried out in Minna also the study adopted a quantitative research design while the present study adopted survey research design.

Chima (2021) carried out a study on current issues associated with public building maintenance in South-East Nigeria. Focusing on the rate of deterioration and decay, identification of the existing condition of a building must be detail measured to overcome the actual problem and risk associated for the next construction activities. The principal means of obtaining information about the construction and condition of a building comes from undertaking an inspection and survey. The research Primary source of data were questionnaire. The population consists of users of the selected public buildings in south-eastern Nigeria, comprising of Abia, Enugu and Imo state. A sample population of 314 respondents participated in the research. The targeted respondents were drawn from users of the selected public buildings, Estate Management Officers, Estate Assistants and Artisans that are in charge of managing and overseeing government properties of the selected study area as stated in the population of the study. A random sampling technique was used to determine the users of the selected public buildings. Mean, Relative Importance Index (RII) and a T-test was used in the analysis of result. From the result most of the building elements are not in a good position, with exception of electrical systems which has RII of 0.75. The result with tstatistic value of -0.801 and associated probability value of $0.449 > 0.05$ indicates that there is no substantial development in the conditions of public buildings in the study area. However, the negative coefficient of T-statistic implies that the condition had continued to worsen over period. The research concludes that there is indication of a poor maintenance culture. Improvement of the maintenance of the public buildings and adoption of maintenance plan that are prompt in tackling the maintenance issues of the plumbing system.

The similarities between the study and the present study is that both make use T-test to test their hypothesis also both studies focus on maintenance of public building.

2.4   Summary of Literature Reviewed

The literature review is discussed under the following subheadings: Maintenance of public buildings, maintenance policy and their standards, causes of maintenance problems, building maintenance, factors affecting building maintenance, building maintenance strategies. From the study it was deduced that lact of maintenance leads to occurrence in the fabric of a building can result from many unrelated design decisions, unsuitable materials, incorrect assessment of loads, inadequate appreciation of condition of use and inadequate assessment of exposure. Relevant and adequate literatures were discussed 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 causes and remedies of poor maintenance of public buildings in Minna, Niger state. Survey design is aimed at collecting data on and describing in a systematic manner, the characteristics features or facts about a given population.

3.2 Area of the study

The study will be carried out in 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).

3.3   Population for the Study

The population for the study consists of 100 respondents comprising 20 buildings contractors and 80 staffs in ministry of works and maintences.

3.4   Sample and Sampling Technique

There will be no sampling since the population was small and manageable.

3.5   Instrument for Data Collection

The researcher designed a structured questionnaire as an instrument that will be 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 causes of poor maintenance of public buildings in Minna, Niger state. Section ' C' find out the effect of poor maintenance of public buildings in Minna, Niger state. While Section ' D' find out the remedies to poor maintenance of public buildings in Minna, 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 (√) against the response category that best satisfies their opinion.

3.6   Validation of instrument

The instrument will be 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 will be conducted using 15 respondents in other locations. During the test, the questionnaires will be distributed by the researcher. The questionnaire will be 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 will be used for the data collection was administered to the 15 respondents by the researcher and 3 research assistant in the study area, Minna metropolis, Niger State.

3.9   Method of data analysis

Data collected will be 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)   =   4 points (3.5 – 4.0)

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

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

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

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

$$\bar{X} = \frac{4+3+2+1}{4} \quad \bar{X} = \frac{4+3+2+1}{4} \qquad = \qquad \frac{1010}{4\ 4} = 2.5$$

3.10   Decision Rule

The cutoff point of the mean score of 2.50 will be 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 causes of poor maintenance of public buildings in Minna, Niger state?

Table 4.1: Mean responses of the building contractor and building technicians in ministry of works and maintences on the causes of poor maintenance of public buildings in Minna, Niger state.

$N_1 = 20$ $N_2 = 80$

S/N	ITEMS	$\overline{\overline{XX}}$	SD	Remark
1	Inconsistency in maintenance culture	3.61	.601	Agreed
2	Inadequate funds for the maintenance	3.56	.656	Agreed
3	Bureaucratic reporting process on building maintenance status	3.60	.586	Agreed
4	Pressure on building facility due to number of occupants	3.43	.685	Agreed

5	Poor work done on building maintenance	3.55	.657	Agreed
6	Non response to maintenance request	3.65	.500	Agreed
7	Incorrect selection of building materials for maintenance works	3.62	.599	Agreed
8	Client poor attitude to maintenance	3.63	.601	Agreed
9	Poor implementation of building maintenance standard and policy	3.54	.673	Agreed
10	Lack of preventive maintenance culture.	3.70	.503	Agreed

N=100

$\overline{XX}$= mean of the respondents

N₁ = Building contractors

N₂= Building technicians in ministry of works and maintenance

SD = Standard deviation of the respondents

Table 4.1 showed that both the building contractors and building technicians in ministry of works and maintenance agreed on all items from 1 to 10. 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 0.500 and 0.685. This showed that the responses of the building contractors and building technicians in ministry of works and maintenances on the items were not divergent.

4.2   Research Question 2

What are the effect of poor maintenance of public buildings in Minna, Niger state?

Table 4.2: mean response of building contractors and building technicians in ministry of works and maintences on the effect of poor maintenance of public buildings in Minna, Niger state.

N₁= 20   N₂=80

S/N	ITEMS	$\overline{XX}$	SD	Remark
1	Ageing stock of buildings	3.90	.346	Agreed

2	Obsolescence of buildings	3.54	.706	Agreed
3	Environmental issues affecting the beauty of the buildings	3.90	.623	Agreed
4	Can lead to dangerous situations like sudden colapse	3.09	.816	Agreed
5	Accidents and health problems resulting from reactions from building materials	3.80	.422	Agreed
6	Non-functional building facilities	3.79	.530	Agreed
7	Building facilities functioning below capacity	3.60	.699	Agreed
8	Part of the building become death trap	3.04	1.137	Agreed
9	Outdated facilities resulting from weakness of abandoned buildings	3.80	.422	Agreed

N=100

$\overline{XX}$= Mean of the respondents

N_1 = Building contractors

N_2= Building technicians in ministry of works and maintenance

SD = Standard deviation of the respondents

Table 4.2 showed that both the building contractors and building technicians in ministry of works and maintences 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 0.347 and 1.137. This showed that the responses of the building contractors and building technicians in ministry of works and maintences on the items were not divergent.

4.3   Research Question 3

What are the remedies to poor maintenance of public buildings in Minna, Niger state?

Table 4.3: Mean responses of the building contractors and building technicians in works and maintences on the remedies to poor maintenance of public buildings in Minna, Niger state.

S/N	ITEMS	$\overline{XX}$	SD	Remark
1	Employment of well trained and experienced building maintenance staff	3.43	1.061	Agreed
2	Using maintenance programs which include the standards and response time.	3.20	1.033	Agreed
3	Take safety precautions from the designing stage	3.79	.530	Agreed
4	Implement adequate value management techniques.	3.60	.516	Agreed
5	Providing adequate training to employees on maintenance	3.67	.540	Agreed
6	Long term maintenance plan need to be reviewed and revised after every inspection	3.80	.422	Agreed
7	Implement the new technology giving proper training to the employees for the effective utilization	2.98	1.263	Agreed
8	High quality and durable materials are very important to be used in carrying out building maintenance	3.80	.422	Agreed
9	Using effective maintenance management team to control over all maintenance issues during the design and initial stage of construction.	3.12	.819	Agreed
10	Perform periodic condition assessment/surveys from which maintenance workload and prioritization of maintenance work is determined	3.53	.501	Agreed

N=100

$\overline{XX}$= Mean of the respondents

N₁ = Building contractors

N₂= building technicians in ministry of works and maintenance

SD = Standard deviation of the respondents

Table 4.3 showed that both the building contractors and building technicians in ministry of works and maintences agreed on all items from 1 to 10. 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 0.422 and 1.263. This showed that the responses of the building contractors and sbuilding technicians in ministry of works and maintenances on the items were not divergent.

4.4   Hypothesis 1

There is no significant difference in the mean response of building contractors and building technicians in ministry of works and maintenances on causes of poor maintenance of public buildings in Minna, Niger state

Table 4.4 T-test on causes of poor maintenance of public buildings in Minna, Niger state.

$N_1 = 20$ AND $N_2 = 80$

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Building contractors	20	2.92	0.74	98	0.549	0.06	NS
Building technicians in ministry of works and maintenances	80	3.47	0.68				

N=100

$\overline{XX}_1$= Mean of building contractors

$\overline{XX}_2$ = mean of building technicians in ministry of works and maintenances

N_1 = Building contractors

N_2= Building technicians in ministry of works and maintenances

SD_1 = standard deviation of building contractors

SD_2 = standard deviation building technicians in ministry of works and maintenances

NS= Not Significant

Table 4.4 showed that there was no significant difference in the responses of building contractors and building technicians in ministry of works and maintences on all the items as poor maintenance of public buildings in Minna, Niger State; therefore the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.5   Findings of the study

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

The finding on the causes of poor maintenance of public buildings in Minna, Niger state showed that all the respondents agree on all the items, among all is pressure on building facilities due to number of occupants.

The finding on the effect of poor maintenance of public buildings in Minna, Niger state showed that all the respondents agree on all the items, among all is accidents and health problems.

The findings on remedies to poor maintenance of public buildings in Minna, Niger state shows that showed that all the respondents agree on all the items, among all is using maintenance programs which include the standards and response time, Take precautions from the designing stage.

There was no significant difference in the responses of building contractors and building technicians in ministry of works and maintenances on causes of poor maintenance of public buildings in Minna, Niger state.

Discussion of findings.

The result from table 4.1 shows the findings on the causes of poor maintenance of public buildings in Minna, Niger state. The findings of the study revealed the inconsistency in maintenance culture, inadequate funds for the maintenance, bureaucratic reporting process on building maintenance status, pressure on building facility due to number of occupants, poor work done on building maintenance, non response to maintenance request, incorrect selection of building materials for maintenance works, client poor attitude to maintenance, poor

implementation of building maintenance standard and policy, lack of preventive maintenance culture. The findings of the study is inline with Speight (2000) 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.

The result of the hypothesis on the causes of poor maintenance of public buildings in Minna, Niger state shows that there was no significant difference in the responses of building contractors and building technicians in ministry of works and maintenances on causes of poor maintenance of public buildings in Minna, Niger state.

Table 4.2 shows the result of the findings on the effect of poor maintenance of public buildings in Minna, Niger state. The findings of the study revealed that ageing stock of buildings, obsolescence of buildings, environmental issues affecting the beauty of the buildings, can lead to dangerous situations like suddend collapse, accidents and health problems resulting from reactions from building materials, non-functional building facilities, building facilities functioning below capacity, part of the building become death trap, outdated facilities resulting from weakness of abandoned buildings.

The result from table 4.3 reveal the findings on remedies to poor maintenance of public buildings in Minna, Niger state. The findings of the study revealed that employment of well trained and experienced building maintenance staff, using maintenance programs which include the standards and response time, take safety precautions from the designing stage, implement adequate value management techniques, providing adequate training to employees on

maintenance, long term maintenance plan need to be reviewed and revised after every inspection, implement the new technology giving proper training to the employees for the effective utilization, high quality and durable materials are very important to be used in carrying out building maintenance, using effective maintenance management team to control over all maintenance issues during the design and initial stage of construction, perform periodic condition assessment/surveys from which maintenance workload and prioritization of maintenance work is determined. The findings of the study is inline with Kazeem et al. (2014), some surveyed designers said that building collapse would be history if adequate measures are taken to improve on supervision and monitoring of construction projects.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1   Summary of the Study

The main focus of this research study was to find out the causes and remedies of poor maintenance of public buildings in Minna, 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 concept of building maintenance, maintenance of public buildings, maintenance policy and their standards, causes of maintenance problems, building maintenance, factors affecting building maintenance, building maintenance strategies. 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 building contractors and building technicians in ministry of works and maintenances. The entire respondents were used. A number of 100 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.

Implication of the Study

The findings of the study had implications for government, building construction industries and ministry of works and maintenance. From the outcome of the study, it implies that If the identified areas where put in place it will give building maintenance more attention in the government agenda, construction industry and also improve their performance and participation in the construction sector.

5.3 Contribution to knowledge

Contribution to Knowledge

1. The study will contribution to the knowledge of the building contractors as it will serve as an eye opener on proper planning of building before the construction of building commences. Also building contractors will be aware of the use of quality materials in the construction of any building. Also the findings of this study will facilitate the quality assurance in building construction in a way that every building must be up to standard to avoid untimely maintenance of building.

2. The study will also improved and contribution to the knowledgebe of the Building Technicians in Ministry of Works as it will enlightened them on the poor state of public building in the state and also findings of this study will enable the ministry of to how to go about the proper and regular maintenance of public buildings.

3. The government will benefits from the findings of the study as there will be remedies to poor maintenance from the study. The findings of the study will also help the government to be able to maintain the old public building that already deteriorating due to poor maintenance and also fund maintenance of public building in the state.

5.4   Conclusion

Based on the findings of the study, the following conclusions were drawn: The achievement of this great concern to building industry were good quality of workmanship should be insisted. Similarly the organization and builders should pay more attention to maintenance rather than huge sum of money on buildings structures whereas that amount could have been useful for the maintenance of such already existing projects. Supervision of all projects is highly recommended to ensure the use of quality materials, good and better workmanship; this will prevent having newly constructed project showing signs and defect even before occupying it.

5.5   Recommendations

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

There is the need for public institutions to embrace preventive maintenance practice as a high priority rather than adhoc maintenance..

Estate and maintenance managers should oversee periodic inspections of buildings' conditions and create an inventory of buildings' components and equipment. They should plan building inspection, since proper planning of inspection is a sure way to reduce cost of maintenance since doing so can provide insight into future maintenance needs and avoid unnecessary costs.

There should be a state regulation to affect state maintenance of specific building systems. A state building and maintenance code should govern building construction and remodeling. It

should also affect accessibility, electricity, energy, fire protection, plumbing and other mechanical components such as elevators. In addition, a National Maintenance Policy should be formulated as part of the National Housing Policy to compel people to undertake maintenance on the buildings they occupy to avoid the situation where huge sums of taxpayers' money go down the drain through deterioration of public buildings due to lack of maintenance..

5.6   Suggestion for Further Study

The following are suggested for further studies:

Challenges of building maintenance advancement in building construction industries in other locations.

Causes and remedies of poor maintenance of public building in other location.

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QUESTIONNAIRE

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

A QUESTIONNAIRE ON CAUSES AND REMEDIES OF POOR MAINTENANCE OF PUBLIC BUILDINGS IN 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

Building Contractor:

Building Technicians in Ministry of Works:

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)	=	4 points
Agree	☐	(A)	=	3 points
Disagree		(D)	=	2 points
Strongly Disagree		(SD)	=	1 point

Section B: What are the causes of poor maintenance of public building in Niger state?

S/N	Items	Scales			
		SA	A	D	SD
1	Inconsistency in maintenance culture				
2	Inadequate funds for the maintenance				
3	Bureaucratic reporting process on building maintenance status				
4	Pressure on building facility due to number of occupants				
5	Poor work done on building maintenance				

6	Non response to maintenance request				
7	Incorrect selection of building materials for maintenance works				
8	Client' s poor attitude to maintenance				
9	Poor implementation of building maintenance standard and policy				
10	Lack of preventive maintenance culture.				

Section C: What are the effect of poor maintenance of public buildings in Niger state?

S/N	Items	Scales			
		SA	A	D	SD
1	Ageing Stock of Buildings.				
2	Obsolescence of Buildings.				
3	Environmental Issues affecting the beauty of the buildings.				
4	Can lead to dangerous situations like sudden collapse.				
5	Accidents and health problems resulting from reactions from building materials.				
6	Non-functional building facilities.				
7	Building facilities functioning below capacity.				
8	Part of the Building become Death Trap				
9	Outdated building facilities resulting from weakness of abandoned building.				

Section D: What are the remedies to poor maintenance of public buildings in Niger state?

S/N	Skill Items	Scale			
		SA	A	D	SD
1	Employment of well trained and experienced				

	building maintenance staff				
2	Using maintenance programs which include the standards and response time.				
3	Take safety precautions from the designing stage				
4	Implement adequate value management techniques.				
5	Providing adequate training to employees on maintenance				
6	Long term maintenance plan need to be reviewed and revised after every inspection				
7	Implement the new technology giving proper training to the employees for the effective utilization				
8	High quality and durable materials are very important to be used in carrying out building maintenance				
9	Using effective maintenance management team to control over all maintenance issues during the design and initial stage of construction.				
10	Perform periodic condition assessment/surveys from which maintenance workload and prioritization of maintenance work is determined				