AN INVESTIGATION INTO THE CAUSE OF BUILDING COLLAPSE IN NIGERIA,

(USING EDO STATE AS CASE STUDY)

BY

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A PROJECT WORK SUBMITTED TO THE DEPARTMENT OF BUILDING TECHNOLOGY, SCHOOL OF ENVIRONMENTAL STUDIES, AUCHI POLYTECHNIC AUCHI, EDO STATE, NIGERIA IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF "HIGHER NATIONAL DIPLOMAL" (HND) IN BUILDING TECHNOLOGY.

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CERTIFICATION

This is to certify that this project work titled: **AN INVESTIGATION INTO THE CAUSE OF BUILDING COLLAPSE IN NIGERIA, EDO STATE AS A CASE STUDY**, was carried out by Mr. Michael Osakpolor, Matric. No: ENV/2032070108. This work has achieved its objectives of both scopes and quality of the requirement for the award of Higher National Diploma in the department of Building Technology Auchi Polytechnic, Auchi

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DEDICATION

This project work is dedicated to God almighty. To my parents, Mr. Michael Agho and Mrs. Rose Agho, be the glory for a work well done.

ACKNOWLEDGEMENT

Thanks to God Almighty for his guidance and protection throughout the period for the preparation for the materials used mental demand and arrangement of work in this project. His Grace and infinite mercy that led me throughout the presentation of works which make this project an enviable work.

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ABSTRACT

This thesis discussed the investigation into the cause of building collapse in Nigeria, Edo State as a case study. It also discussed the importance of Building Technology. having duly conducted an investigation with the aids of questionnaires sent to the various building professionals in the construction industry. It was concluded that the problems toward the growth and development of Building Technology cannot however be tied to one source.

It is the responsibility of some persons and the government. Starting from the designers of the building, the contractors, clients/owners and the government which involves the inadequate performance of town planning and approval authorities.

It is recommended that in order to curb the menaces of building collapse in Nigeria, the Federal government and the state government should enact laws and penalties prescribe thereof to punish those responsible for building collapses as this will deter owner that engage in illegal conversion of buildings without obtaining permission from appropriate authorities. It also proffered the empowerment of CORBON (council of registered builders of Nigeria) to monitor and control building construction in Nigeria amongst others.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Since independence, the Nigerian government has made a determined effort in the field of quantitative (but not quality) supply of mass housing through massive financial and policy measures; the rate at which existing ones are collapsing requires immediate attention.

The number of building collapses across Nigeria is to worrying that it is difficult to predict the repercussions on the construction sector and the Nigerian economy as a whole. (Odulami.A, 2020).

Sadly however, the issues of building collapse during and after construction has failed to receive the attention it deserve from public and private clients and other construction sector stakeholders in Nigeria. This is ironic because of the obvious consequences of building collapse on urban and socio-economic development. Buildings that meet desired performance requirements add value to the national asset stock and enhance its Gross Domestic Product. Such buildings are sustainable because they meet the needs of the present while also contributing to future needs. There is only one alternative to sustainability; unsustainability which underperforming buildings portend to Nigeria's economy. Several productive lives and properties have been lost in the various incidents of building collapse in Nigeria, and these losses, which would only truly be felt by future generations, have negatively impacted the socio-economic status of its citizenry (Fagbenle and Oluwunmi, 2010).

Building and the provision of safe and affordable homes are major contributors to sustainable development and through the centuries, these have been important aspects of the socio-economic development of humans. However the contribution of buildings to Nigeria's development has not yielded the desired potentials because of failed projects and more recently their poor functional performance. It is common to hear of incidents

of building collapse in major Nigerian cities like Edo, Port Harcourt, Abuja, Enugu and Ibadan. There were over 50 incidents of building collapse in Edo alone between 2015/2020 (Olusola, Atta and Ayandgade, 2002).

According to encyclopedia Britannica, (2010), building can be defined as a roofed and walled structures built for permanent use for man's living, working and storage. Buildings are structures, which serve as shelters for man, his properties and activities as quoted by Ayedun et al, 2012 in Umeora (2013). To obtain the desire satisfaction, they must be properly designed, well planned, constructed and maintained. Failure in building can be define as the incapability of the building components not being sufficient to perform what are normally expected of those components. Building failure is a common phenomenon all over the world but more rampant and devastating in the developing countries like Nigeria. The rate at wish buildings collapse in Nigeria has reached a worrisome level in view of its alarming loses in term of lives and properties. Opara (2006) opined that the causes of this monster in order to proffer adequate solution of prevention, mitigation or preparedness. Each time a building collapses accusing fingers point at major industry stakeholders that ought to hitherto play both statutory and supervising role before, during and after erection of a structure. These stakeholders include structural and Civil Engineers, Building Contractors, and valuers, Architects, Town Planners, Quantity Surveyors and lands Developers. Each of the categories of stakeholders and/or professional shares a peculiar blame in any incident of building collapse depending on the nomenclature or causes.

However, building collapse is not only peculiar to Nigeria, it happens outside the country. Many lives were lost through sick building e.g. Tsunami disaster of December 26, 2004 (Tsunami, 2008) in Taiwo and Afolami (2011). The risk of a building collapsing increases when the proper review is not followed. This paper (investigation into the cause of building collapse in Nigeria) therefore reviews the causes of building collapse globally.

Ayininuola & Olalusi (2004) opined that every built structure is expected to satisfy the functional objectives of safety, serviceability, and economy. The processes of construction are complex and require the services of trained professionals. They further noted that a high level of skills is needed both in designing and construction. In his research titled ‘’Structural Stability in Nigeria and worsening Environmental Disorder.

The Way Forward’’ Ede (2010) noted that every structural system is designed to meet some needs and be safe to avoid loss of life, properly, and damage to meet some needs and safe to avoid loss of life, property, and damage to the environment. In a normal set up, failures are not expected within the projected lifespan of structures. But due to the imperfection in the actions of human beings and the existence of so many other external factors that influence the safety of structures, failure does occur. He also observed that the factors responsible for building collapse can give a more realistic prediction of those ones responsible for the collapse.

1.2 Statement of the problem

Building collapse is due to man’s negligence in some vital areas in construction such as soil investigation, incorporating design for extra loads, stress from winds, earthquakes, uneven terrain, use of substandard building materials, poor monitoring and overall poor workmanship Madu, 2005, identified causes of building failure as due to natural occurrences such as earthquakes, tornadoes, flood, etc. Other causes according to him include factors such as omission, carelessness, leading to use of deficient structural drawings, absence of proper supervision of projects alteration of approved drawings, use of substandard materials, corruption in the Nigeria system, building without approved drawings and translocation of building plans to different sites.

Ayinuola (2004), pointed accusing finger to all parties in the building industry, client’s architects, engineers, town planners in the local authorities and contractors stating that they have contributed to building failures in various dimensions.

Tyagler etal, (2007) traced the causes of building failures to defects or deficiencies at the design ,and the construction stages. Ukpata, (2006), opined that spate of building collapse in the country can always be traced to unsafe actions of parties involved in building process starting from clients to building consultants, contractors and users. Adebayo, (2006), opined that building collapse incidences can be controlled or minimized if the client is ready to pay for high quality materials and for expert professional services.

Building collapse in Edo metropolis has been a subject of concern for experts in real estate management. Therefore, the study purpose is to investigate the investigation into causes of building collapse in Edo state Nigeria.

1.3 Research Questions

In order to accomplish the objectives of the study, the research questions raised as follows

1. What are the major causes of building collapse on properties in Edo metropolis?
2. What are the social and environmental implications of building collapse on neighborhood in the study area?
3. What are the rate of building collapses in the country and its effects on the stakeholders in the building industry?
4. What are the problems of investigation into causes of building collapse in Edo State?

1.4 Purpose of the study

The purpose of the study is to find out the investigation into causes of building collapse in Edo state. To achieve this purpose, the following objectives are set up;

1. To identify the major causes of building collapse on properties in Edo metropolis.
2. To find out the social and environmental implications of building collapse on neighborhood in the study area.

3. To evaluate the rate of building collapses in the country and its effects on the stakeholders in the building industry.
4. To examine the problems of investigation into causes of building collapse in Edo state.

1.5 Scope of the Study

The research is on a case study of failure with more emphasis on its causes, effects and remedies.

However, this work has studied beyond the areas of specification and it also aimed at looking into the total collapse or failure on structure only with major concern on buildings with special focus on Edo State.

1.6 Significance of the Study

The result of this study will educate the general public on the causes and management of building collapse in Edo state in Nigeria with a view of reducing the issues of building collapse in Nigeria.

The outcome of this study will guide the government and policy makers on ways to make and implement policies that will reduce the rate of building collapse in Nigeria. This research will also serve as a resource base to other scholars and researchers interested in carrying out further research in this field subsequently, if applied will go to an extent to provide new explanation to the topic.

Research of this nature can be of considerable value in promoting sound methods to enhance the reduction of building collapse on the negative effects on properties.

1.7 Limitations of study

With the research at its inception, the primary glitch would be the sourcing of related literature to aid the research. Also, availability of finance geared toward the research appears to be a limitation.

1.8 Definition of Terms

Building collapse: building collapse is the falling away of building due to man negligence in some vital areas in construction such as soil investigation, incorporating design for extra loads, stress from winds, earthquakes, uneven terrain, use of substandard building materials, poor monitoring and overall poor workmanship.

Building collapses: Building collapses is a building that fell due to poor maintenance and infrastructure, security, dilapidation, natural disaster which has made the building not to be habitable.

Building management: Building management consists of the interlocking functions of creating corporate policy and organizing, planning, controlling, and directing an organization's resources in order to achieve the objectives of constructing a standard building.

Environment: This encompasses places and spaces created or modified by people including buildings parks and transportation systems. It is also means materials, spatial and cultural product of human labor that combines physical elements and energy in form for living, working and playing.

Abandoned building: Abandoned building is a building that has left unoccupied by the owner or tenant for period of time.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION TO THE STUDY

Collapse can be defined as a state in which building structural elements exceeds their elastic limit, ultimate yield stress and finally breaking or shearing occurs. It can also be seen as a state in which building components/elements disintegrates from one another thereby experiencing practical breakdown of building configuration.

Failure can thus be defined as a state in which building component cannot perform the functions which it was originally meant for. For example, where is an appreciably and visible deflection/deformation of beams, columns, floor slab or structural wall, such component his already failed because the law provides a limit for deflection, so anything exceeding that limit, it is said to have failed. But that does not to mean that the component or the entire building has collapsed.

When a building or its components are failing slowly, it can be rectified and the binding can perform its required functions without further failure but if it is failing rapidly, then it can lead to collapse.

2.2 CURRENT LITERATURE REVIEW

2.2.1 Causes of building collapse

There are many possible causes of building collapses. Some of them could be related to poor design while others could be as a result of accidents and deliberate attack. However, the emphasis will be on the causes of collapse at the construction stage of a building.

2.2.2 Structural design

The capacity of a building to withstand loads is related to its structural design in terms of its foundation, columns and beams. These elements are meant to withstand load and stress. Building serves different purposes in terms of load they carry. Buildings of several floors are expected to carry more load than building of fewer floors. Thus their designs are different in foundation, columns and beams. The structural aspect of the design is supposed to be handled by civil engineers or may sometimes be done by novice. This kind of situation sparks off the unwieldy nature of most buildings that made them prone to future collapse when not properly done (Ede,2010).

2.2.3 Poor supervision

Building is an expensive project and the trained professionals charge high rates in rendering their services. Most building are being managed to save costs by people who are quacks and that sometimes charges less. The management of the construction of buildings is the responsibility of professional builders (Federal Government of Nigeria, 2006). Many acclaimed contractors have no training in building construction but are the one supervising most buildings of several floors (Oni,2010). Their main interest is to maximize profit by compromising in terms of staffing and the use of materials. Standard measures are never used in order to save cost and time (Oloyede et al,2010). In some cases apart from shrewd practices, shares ignorance also pervades in the use of materials and following code of practices in testing and measurements (Bosede & Gards,2014). The result of these sharp practices and ignorance is poor services and buildings of low quality that susceptible to collapse.

2.2.4 Poor quality of building materials

Many commuters on collapse buildings in Nigeria attribute them to poor quality building materials. The materials that have direct relationship with building stability are cement, sand, irons, rod. The quality of cement has been cited as the most material that affects the stability of buildings. There are different grades of cement (32.5 Mpa, 42.5

Mpa, 52.5 Mpa) in use in Nigeria. The different grades are meant for different construction purposes (Bosede & Gana 2012; Teamaction international, n.d). for example, the 32.5 Mpa is mainly used in plastering but incidentally is the most used for molding blocks and concrete structures. Experts emphasized that the low grade cement is the most common in Nigeria market which is used for all kinds of construction purposes they were not meant to be applied (sunnewsonline.com.2014). it has also been argued that when Portland cement (especially the low grade cement is not properly mixed with sands, gravel, aggregate, and water the right proportions, the concrete resulting from such is fragile and gives way when used in floors, columns, beams and foundations (sunnewsonline.com.2014 wikipedia n.d.). the use of rod in construction adds to the strength of concrete especially in reinforced concrete. It has been claimed that most of the rod in Nigeria market are of low quality and this affects the quality of construction works in which they are used (federal Government of Nigeria, 2006). Another problem with the use of rod is that the specified diameter and quality of rod are hardly used in the proper quality and quantity (federal Government of Nigeria, 2006; Teamaction international, n.d.) is another worrisome development that affects the quality of construction that leads to collapse building.

2.2.5 Building approval process

The urban and regional planning law 1992 requires developers to obtain permission from the planning office before a building is erected. It is expected that the building whose approval is sought is expected to meet certain development standards especially safety standards in terms of structural stability. The structural stability of the building is ensured for some categories of buildings especially with building of more than one floor to structural plans duly prepared by qualified civil engineers and stamped. This standard is not fully complied with in most planning offices. It is an open secret that most structural plans are prepared by quacks. Most planning offices in Nigeria do not even have qualified staff to assess structural plans to determine whether such plans

are adequately prepared. The only thing they do during plan approval process is to merely establish the presence of such plans and not to determine their adequacy. This is because the development control department of the planning office does not ordinarily comprise a civil engineer as part of the team. This practice cannot forestall structural problems of building needless to preempt building collapse of its bud stage. This is a great lapse in the building approval process.

2.2.6 SOCIAL AND ENVIRONMENTAL IMPLICATIONS OF BUILDING COLLAPES ON NEIGHOBORHOOD IN THE STUDY AREA

The Environmental risks in building collapse consist of: Provides hideout for robbers and hoodlums, Place of abode for dangerous animals like snakes, Environmental damage, Loss of functionality in the neighborhoods, CO2 Emission/Pollution, Reduction in the energy use, Increase in toxic emission, Environmental studies/repair, Loss of building aesthetic values, Degrading of the environment, etc.

The extent of the impact of environmental risks on the stakeholders are as follows: Place of abode for dangerous animals like snakes, Degrading of the environment, Environmental damage, Provides hideouts for robbers and hoodlums, Loss of building aesthetics' values, etc. The above table shows that the most significant environmental risks that impact on the stakeholders in the Nigerian built environment are: place of abode for dangerous animals like snakes, degrading of the environment, environmental damage, and provides hideouts for robbers and hoodlums.

2.3 RELEVANT THEORIES OF THE REVIEW

2.3.1 Conceptual Framework

Building collapse is the result of over-stressing, that is, the imposition of loads in excess of the capacity of the structural components. Virdi (2000) refers to building failure as the loss of the load-carrying capacity of component or member

within a structure or the building itself. He explained that collapse is initiated when the material is stressed to its strength limit, thus causing fracture or excessive deformations. Feld and Carper (2006) also explain that the ultimate failure strength of material, component or system is its maximum load- bearing capacity. When this limit is reached, damage to the material has been done, and its load-bearing capacity is reduced permanently, significantly and quickly.

2.3.2 Building Industry

The building industry is the most complex of all the industries in the economy and the basis of its complexity is founded on the simple fact that, all other industries and sector of the socio-economy depend on it for the environment in which they operate. The building industry is to all practical purpose an all-comers affair (Akindoyeni, 2002). It is an industry where all manners of local and foreign materials, professionals and equipment co-habit in order to achieve quality buildings of high standard. The building industry plays an important and dynamic role in the process of sustainable economic growth and development of any nation due to its size and complexity. It is to be noted that up to one-sixth of the total amount allocated to construction projects by Nigeria governments takes the form of building as observed from past budget of the country. Whether a country is just developing like Nigeria or is already developed like Britain, buildings all over the world, constitute the most valuable assets of mankind. (Chinwokwu, 2000).

More so, while these buildings provide humanity with a great variety of accommodation in form of residences, mosques, churches, offices, schools, factories, hospitals, stadia, ports, hotels, and so on, it also provides employment for the skilled and unskilled persons. The aim and objective of the building industry is to provide suitable accommodation for the whole community, of the quality that can be appreciated by the community, at the cost that the community can afford, within the time required by the community and within the capacity of the building industry. (Akindoyeni, 2002).

However, it could be deduced that the ultimate goal for any building projects is for such projects to be delivered within the shortest possible time, at the lowest possible cost, within the highest possible quality so as to minimize the problem and the burden of looking for shelter.

2.3.3 Failures in Building

Failure can be considered as an occurrence in a component which when that component can no longer be relied upon to fulfill its principal functions. (Chapman, 2000). Most prominent building failures in the world have occurred under calamitous conditions such as major earthquakes, floors hurricanes and tornadoes. Other structural collapses especially in Lagos occurred due to human factors which happen during and after the construction. Many structural failures have been associated with innovation and inability to appreciate the significance of the causes of failure. Among the recent multi-storey building collapse in Lagos, the collapse of a two storey building at Mushin, which collapsed because the building was not designed to withstand the heavy live and dead load imposed on it. The function of a column is to carry the imposed load either dead or alive load and carry the weight of the load at an upright position without deflection or distortion. This is done to make sure that there is no weight load passed down to the foundation that can make it to deform. It is imperative that the foundations, as a structural component of a building be properly designed to spread the dead and superimposed loads over a sufficient area of soil. However, the ability of a building to remain firm for several years on the ground upon which it is built, depends on the strength of its foundation. The foundation of a structure refers to that part of it which supports the walls and columns and which bears directly on the soil or rock, including the soil or rock itself. The foundational requirement of a floor will determine the size, strength and the type of materials to be used in its construction. The form of construction selected for the floor may influence the provision of the structural components. For instance, the thickness of floors will affect the height of the walling, and the choice

between a solid or suspended ground floor can affect the location of services and the size of the heating installation

2.3.4 Examples of Building Collapse

There are many cases of building collapse around the world. Most of these cases are found in less developed countries which are also populous. Table 1 list some cases of building collapse and the cases.

1. Table 1: showing recent occurrences of building collapse in Nigeria

S/N	Building Location	Date	Suspected Causes	Remarks (Life Lost)
1	Okpella	2022	Structural defect	nil
2	Uzebu quarters in Benin City	2021	Excessive loading, faulty construction	3 died, 21injured
3	Benin	2021	Not disclosed	Not disclosed
4	Sabo	2019	Not disclosed	Not disclosed
5	Jattu	2017	Structural defect	3 injured
6	EDO (Sapele Road)	2015	Faulty construction	6 died
7	Benin	2014	Foundation problem	1
8	EDO (okpella)	2012	Unsupervised	1died
9	Benin (Hospital building)	2012	Faulty construction	Several injured
10	EDO (Ekenwan Road)	2011	Overloading	10 died
11	EDO (Egor)	2010	Faulty construction	Not disclosed
12	Estako West (Edo)	2010	Overloading	17 died

13	Egor local (Edo state)	2009	Structural defect	80 died
14	Benin	2008	Not disclosed	Not disclosed
15	Apongbon	2008	Structural defect	3 injured
16	Afuze	2008	Faulty construction	3 died,
17	Ekpoma	2006	Faulty construction	1 died
18	Igberra Camp	2006	Structural defect	nil
19	Okpella	2002	Old building	2 died
20	Auchi, Edo State	April 18, 2010	Non-compliance with building regulations	Nil

Sources: Fakere 2005; Nigeria daily newspapers, 2000-2003; Ogunsemi 2002; Oke, 2009 in Oloyede et al, 2010, Questionnaire, Oral Interview.

2.3.5 Functional requirement of building structures

For a structure to be considered as active it must satisfy the under listed functional requirements.

a) Each and every member of a structural system should be able to resist, without failure or collapse, the applied loads under service conditions. In other words, it must posses adequate strength. This demands that the materials of the structure must be adequate to resist the stresses generated by the loads and the shape and size of the structure must be adequate. A measure of the ability of a material of a structure or the structure itself to resist stress without fracturing is called its strength.

b) Every component of the structure should be able to resist deformation under loading conditions. Deformation implies a change in size or shape when a body in subjected to stress. Excessive deformations that are deformations exceeding specified acceptable limits will impair the functional performance of the structure and any attached services. This demands that the component should possess adequate stiffness. Thus the stiffness of beam or column is a measure of its resistance to bending or buckling. It should be noted that a component may be strong, but lacking in stiffness will so much deform that it will not be able to resist the applied loads. For example a floor slab that is strong but not stiff may deflect excessively under load and may cause discomfort to the occupants a situation that is not acceptable or cause cracking of finishes (e.g. tiles) thus the safe performance of a structure requires that is should be strong and stiff.

c) Every component of a structure must be stable otherwise the whole structure is assumed to be unstable structural stability is needed to maintain shape. It is the ability of a structure to retain, under load its original state of equilibrium. It can mean anything from resistance to a minor defreeze of movement to resistance to sliding overturning partial or complete collapse. Any phenomenon (which will be a potential source of load) that can alter the load-carrying behavior of a structure, if not properly taken care of can lead to instability, a condition in which the support reaction is less than applied load. Thus to ensure stability, loads must be balanced by the moments due to reactions. We therefore conclude that an unstable structure implies unbalanced forces: hence once a net force is acting there will be lack of equilibrium and a resultant acceleration of the structure or its components.

   It should be noted that a structure may become unstable at certain load levels which are safe for strength and stiffness requirements. For examples a long thin (or slender) member upon being subjected to compressive loading might collapse through buckling if the load exceeds a certain critical value from the foregoing, it

becomes obvious that the concept of a safe structure is a function of the strength, stiffness and stability of the structure, the latter three being like man's spirit, soul and body that exist differently, yet cannot be separated from one another.

Safety of building structures and role of structural design. A building structure will be judged to be safe if it is strong and stable B28110 states that ''the aim of design is the achievement of an acceptable probability that structures being designed will perform satisfactorily during their intended life''

A structure is therefore safe if its able to withstand all the loads applied on it during its life-span. If it continues to serve the functions for which it was designed (that is, if it is serviceable), and does so to the satisfaction of it users and owner, without causing danger or undue discomfort to the general public and in the extreme case, without collapsing, BS8110 requires that a structure must not reach a limit state. There are two limit states-namely ultimate state and serviceability limit state. The former is the most critical limit state for most building structure and it includes the limit state of collapse, overturning and buckling, all of which had to do with structural stability of the structure. The serviceability limit state include among others, the limit state of deflection, cracking and vibration.

The goal of structural design is to ensure that the structure designed and constructed is able to safely sustain and transmit all the loads and deformations of normal construction and use from the highest supported level to the foundations. The various interacting variables are

1) Use of suitable structural materials (of adequate stiffness, strength, durability and resistance to effects of misuse and fire.
2) Poor choice of structural form
3) Correct structural conception
4) Adequate layout and planning of the structure
5) Consideration of non-structural factors in design

6) Adequate design and detailing of members and connections of joints
7) Adequate quality control
8) Good supervision

At all times, it should be borne in mind that structural design does never aim at perfect safety rather it is concerned with assessing degrees of safety measured in some cases by the probability and cost of failure during the life of the structure (Pugsley 1965).

2.3.6 Behavior of Structural Systems

There are certain basic concepts that provide aid to understanding the overall behavior of any structural system. Once these concept are taking care of one is sure of the overall stability of the structure. These basic ideals are

a) A structure is subject to loads/forces
b) A structure is an assembly of elements. An understanding of the behaviour of the structural elements is essential to the understanding of the behavior of the whole structural form.
c) The load path for each load should be identified. Besides, the load path geometry should be established.
d) The building geometry knowledge is important
e) Correct choice of materials and elements.
f) Efficient design of connections and joints.
g) Interaction of the building structure with the overall building construction.

2.3.7 Conceptual load paths

The load paths reveal the way a structural system resolves the forces acting on a building and channel them to suitable load bearing capacity subsoil. This implies the idea of conceptual load paths is to establish a path through a building structure for every load case. By definition the structure and load paths, question such as-what carries the loads, how are the loads transferred to the foundations?

The load path joins the load form the its point of application to the final support point-wo things are obvious here

a) All loads must bind will have a load path from their point of application to the final support. The designer of a building structure must be able to identify load path for each load-the load path is what carries the load that is it is the structure for the load it is transferring. Thus the definition of structure will very for each load. In other words there are usually different structures resisting the different loads. Identifying the sequences of structural actions in the path is synonymous with determining how the load is carried.

b) All loads path must be completed from the highest supported level to the foundation. Such paths must not be interrupted by non-structural requirements. Incomplete load path lead to structural instability. Further questions could be asked. For example is the structure capable of withstanding accidental loads? Could lateral wind forces be effectively withstood? Could local damage to any component or connection caused by accident or deterioration endanger the stability of the whole structure? Thus two other factors is relation to load path concept, come into play.

c) The layout and planning of the structure should be done such that damage to a small area of the building structure should not lead to collapse to major parts of the structure. BS8110 recommends that for five or more storey buildings, key elements should be identified within the layout of the building. A key element is that, the failure of which would cause collapse of more than a limited portion close to the element in question.

d) Generally, for all building structures, the concept of multiple independent load paths should be adopted so that the building is resistant to the effect of local damage and over load. However, this should be minimized.

2.3.8 Structural actions of structural element

Structure are usually conceived and designed as assemblies of structural elements. This means the structural behavior can be quantified by considering the behavior of each structural element in each load path. A structural element carries the load on it to an adjoining structural element by a system of bending moment shear force and axial forces acting in one, two or three directions depending on the nature of the structural element. Conceptual load paths. The geometry of the load path will determine the type of structural behaviour of the load path-beam frame, truss or funicular behaviour. Other structural elements include slabs, arches, cables and columns. The choice of load path geometry depends on many other factors of building designer must be aware of what type of structural behaviour will result from the chosen load path geometry.

2.3.9 Beams

These are horizontal structural members carrying lateral loads which cause bending and shearing in them. A beam breath is very small relative to its span (that is the slender beam) will also be subjected to buckling. Besides the presence of large eccentric applied loads, can cause twisting in the beams. Bending or flexural stresses are critical in accounting for the depth of a beam.

2.3.10 Slab

They are horizontal plate elements subject to lateral loads cause bending in them. Bending stresses are the basic determining factors in the estimation of the depth of slab. Since concrete beams and slabs are primarily subjected to flexure, they are classified as flexural members.

2.3.11 Columns

A column is a vertical member primarily carrying axial load but may be subjected to a combination of axial load and bending moment. A column that is subjected to large

compressive force such as its resistance to such applied loads becomes ineffective is said to be overloaded. When overloaded, a short column will fail by crushing while a long column will fail by buckling or crippling. A column usually will buckle along the plane that is least able to resist the crippling load. This is usually the plan dimension of a column. Thus the plan size of a column will be determined by buckling consideration. A column can be internal or external in a building. It can also occupy the corner of a building.

2.3.12 Walls

A wall is a vertical plate element subjected to vertical concentric (axial) lateral or in-plane loads. The wall may support floor beams consequently, such a bearing wall will be required to support or carry axial loads which result from the reaction from the floor beams. A bearing wall may in addition be required to resist lateral loads from wind or earthquake forces. Shear wall are capable of resisting both lateral loads and in-plane loads. Since columns are bearing walls carrying primarily large compressive loads, they are classified as compression members. At points of instability these members are usually out of plumb-they bow out.

2.3.13 Structural Geometry

Each part of a structure must have a shape or form. Stability is a measure of the ability of a structure to maintain its design structural geometry. The bigger the building is, the more the geometry of the total structure becomes critical in determining the buildings responsible tp the loads on it. The ability of structure to maintain its design structural geometry is affected more by the relative stiffness and flexibility of structural components and their connections than by the stiffness and strength of the structural materials themselves. If the relative stiffness of larger components and sub-assemblies with an overall structural system are not compatible, the structure may suffer distress

from differential movements. At the same time, excessive flexibility of the overall structure or its major components invalidates the geometric assumptions made in design e.g. that compression members remain straight o that plane trusses have no lateral movements.

2.3.14 Choice of materials

i) For any structure, all the element that makeup each load path must be strong enough to resist the internal structural actions caused by the loads the stresses in the structural elements that are in the load path must be less that the maximum stress allowed for the structural material being used.

ii) The structural material must be compatible with the structure, the choice of materials which are resistant to effects of time and weathering should be used. If he structural material is not durable and not of the right quality there will be deterioration in structural strength such that failure occurs under normal loads.

Elements connections

Research has shown that the second largest causes of structural failures are defective detail design of the joints between members (Seward 1994). Hence the importance of sound connection design cannot be overemphasized. To ensure stability, the integrity of the connections must not be in doubt. The manner in which forces are transferred from one structural element to next and how a structural system performs a whole depend to a great extent on the types of construction of joints and connection used. The connection must be complete and bearing surfaces adequate. Where there is a correct design, the construction may not conform to the design assumptions, hence resulting in a weak, unstable structure. Choosing the position and types of joints is part of the process of conceiving structures. The structural designer has to introduce joints to allow the transport and erection of the different structural elements. What structural behaviour this joint need is determined by how the structure is

expected to behave at the joint positions and the practical considerations of the joint details (Millais 1997).

2.3.15 Structures related with construction

Structure not planned considering construction will result to instability of building. Structure should be planned in such a way that it is compatible with other aspects of the building design. For example where openings are to be created in beams, floors and columns to accommodate services, this should be taken care of in the design and not seen as an alteration as the introduction of a flour duct in a floor should change the reinforcement pattern around the duct area.

2.3.16 Soil failure/collapse

Modern technology in building has deem it necessary to embark of various kinds of soil test prior to embarking on construction project. Especially on huge structures which will invariably accrue to large dead loads. This however resulted in the use of other professionals called the geologist. These are professionals that study geology an aspects of science that deals with the study of soil and its mineral constants.

It is important to note that the soil itself has it own strength just like any other material for construction. The test and analysis carried out on these soils shows the strength of the soil and this determines the maximum load that can be impose on it without outrageous reaction from the soil. Test carried out by these professionals will determine the following associated with the soil and sub soil conditions:

Porosity of soil

Grain size and particles

Soil texture

Air content of soil

Water table of soil

Sub-soil water movement

The information gather from the above will be supplied to the foundation engineer for designing the adequate foundation for the soil type which will be able to carry the building for its whole life.

2.3.17 Soil stability

Soil stability can be defined as the ability of a soil to posses similar characteristics continuously when subjected to different conditions. The stability of soil determines the amount of failure likely to emanate from soil. This often results to settlement in buildings which is a major cause of building collapse. In the event of unstable soil, the geologist can proffer methods of stabilizing the soil in other to enable the soil carry the anticipated load of the building.

2.3.18 Settlement

Settlement refers to the ground movement of soil from its present level to another level below its original level. It can also be seen as the rearrangement of soil particles in order to attain a degree of compaction.

Soil are known to be very in strength. Others are relatively weak. All of these consolidate under load. This consolidation of soil causes a vertical downward movement of the foundation and wall.

2.3.19 Settlement in building

This is referred to as the vertical downward movement of buildings as a result of arrangement of soil particles under load.

Settlement in buildings can be of various types and can occur act various stages of the life of the building.

There are two major types of settlement. These are

I. Uniform settlement
II. Differential settlement

2.3.20 Uniform settlement

Uniform settlement occurs when the entire building area under load react in the same way. This involves the downward movement of building throughout its whole area. The effects of uniform settlement is not so devastating as loading to collapse but the original floor level of the building may be varied based on the compression downward.

Differential settlement

Differential settlement occurs when parts of a building area under load react to load differently. This different level of reaction creates instability in the building which could lead to collapse.

Due to load effect measure with respect to the soil strength, the soil may be unstable such that load on a particular part tend to compress that area why other area which are stable remain undisturbed. This brings about the realignment of the super structural members of which leads to cracks, and subsequently deformations and if not taken care of leads to collapse.

However, the pace at which settlement occurs in building life could come a different stage. This leads to another categorization of settlement, which are;

I. Immediate settlement
II. Consolidated settlement

Immediate settlement

Immediate settlement occurs during the process of construction of the building. This is as a result of rapid rate of change in soil stability. If often resulted to collapse of building under construction. This type of settlement does not leave any sign of warning before collage.

2.3.21 Consolidated settlement

This is a kind of building settlement which takes place over a period of time at a very slow pace. It is normally detected by appearance of cracks on walls and structure

members of building. Base on this, a building can be protected form collapse when detected that it is experiencing consolidated settlement.

2.3.22 Causes of settlement in building

Building settlements can be caused by the following.

Mining Subsidence

Area where mining of mineral resources have taken place, and building built on or adjacent to such places could experience settlement due to collapse of soil or as a matter of rearrangement of soil particles.

2.3.23 Shrinkage and swelling of clay

Clay is a type of soil which shrinks under dry condition and expands under wet condition due to its fine particle nature.

The expansion and shrinkage of clay create a slight movement on the building foundation and can result in cracking of building walls.

2.3.24 Vibration and sudden shock

Vibration may be caused by machinery or traffic. The continuous movement of traffic and the operation of machineries will cause the soil particles to rearrange themselves thereby creating voids between soil and foundation base which is the filled by foundation.

2.4 Summary of the chapter

Collapsed of building is as a result of using sub-standard materials, adding load that differ from the original design and non-compliance on the professional ethics these and many more lead to destruction of lives in several forms and degrees of injuries, and also properties. This study has been able to review several causes of building failure in Nigeria. It has highlighted several case studies of building failure in Nigeria including casualties of those incidents. In Nigeria, all the policy statements are good and well stated, but the implementation is poor. There is need for urgent review of these policies

by government so that Nigeria can be a safe place to live in. This paper recommends that the policies should be reviewed and implemented but if otherwise not adhere to, should face the law.

Building collapse, though a common phenomenon all over the world is more rampant and devastating in the developing countries. The incidence of building failures and collapses has become major issues of concern in the development of this nation as the frequencies of their occurrence and the magnitude of the losses in terms of lives and properties are now becoming very alarming. In fact, building collapse has now become a familiar occurrence, even to layman on the street in Nigeria.

Failure in building can be described as the inability of the building components not being adequate to perform what are normally expected or required of those components. On the other hand, when part or whole structure has failed and suddenly gave way in a way that as a result of this failure, the building could not meet the purpose for which it was intended, the building has collapsed. Failures in building can occur during different stages of construction process itself, as well as after. In Nigeria, the common causes of building collapse have been traced to bad design, faulty construction, use of low quality materials, hasty construction, foundation failure, lack of proper supervision, ineffective enforcement of building codes by the relevant Town Planning Authorities, lack of proper maintenance (Folagbade, 2001 and Badejo, 2009).

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter shall deals with the procedure and pattern of the research/ investigation. It shall focus on Research Design, Population of the Study, Sample of the Study, Method of data collection, and Instrument of data collection and Method of data analysis.

3.1 Design of the Study

The design of this study is the survey research design through questionnaires to seek the opinion of individuals to achieve the required goals. The quantity surveyors, builders, architects, the structural engineers and House owners.

3.2 Population of the Study

The population of this study shall be collected from different field of specialist such as the quantity surveyors 12, builders 15, architects 13, the structural engineers 14 and Private body 11. 80 questionnaires were distributed and 78 retrieved.

3.3 Sample/sampling technique

The study shall implore non probability sampling method. Techniques use is the simple percentage method.

3.4 Method of Data Collection

The questionnaire shall be used for data collection for this study.

3.4.1 Sources of Data Collection

The source of data collection of this study is primary and secondary sources of data collection.

3.4.2 Primary Sources of Data Collection

This information shall be obtained by visiting some construction firms, houses with defects, observation, interviews and reaching out to some professionals in building project on site.

3.4.3 Secondary Sources of Data Collection

This shall be gathered through professional journals or seminar papers and textbooks, lecture notes and internet research to obtain information which will further enlighten the readers and help to achieve the goals.

3.4.4 Instrument for Data Collection

The questionnaire is an instrument for gathering data beyond the reach of the research, literature review is a written subject of other authors and research as a guide for data collection and observation as physical sight of subject to obtain the information.

3.5 Techniques for Data Analysis

The techniques us is the simple percentage method where by the responses obtained from respondents are converted into percentages using this formula below;

Number of respondent ("positive or negative) x 100

Total number of respondents 1

With the help of this formula, the responses of each of the questions, the respondents answered in the questionnaire were calculated from question to questio

CHAPTER FOUR

DATA ANALYSIS

The purpose of this chapter is to analyze the data from the returned questionnaires that the various respondents correctly completed.

Eighty questionnaires in all were distributed to respondents in different locations, Private Consultancy Firms, various Governmental Ministries in charge of Building Construction Regulation, Private Individuals/Owners, and Estate Developers make up the respondent.

There were 78 surveys returned in all.

Below is an analysis of the data using statistical tables and percentages.

4.1 Analysis of questionnaires

4.1.1 Professional responses

Profession	**No of response**	**Total**	**Percentage**
Structural Engineer	14		20.22
Architect	13		18.67
Builder	15		27.77
Quantity Surveyor	12		11.12
Estate Developer	13		16.67
Private body	11		5.55
		78	100%

Source: Field Survey, 2022

From Table 4.1 above shows that respondents who returned completed questionnaires, 20.22% were structural engineers, 18.67% were architects, 27.77% were

builders, and 11.12% were quantity surveyors, 16.67 where Estate development, 5.56, private body.

4.2 PROJECT EVALUATION AND INTERPRETATION

4.2.1 Number of building collapses in their various locality in the past years and causes of collapses (2002-2022)

Places	**No of Occurrence**	**Collapses**	**Percentage**
Benin City	1	Natural	9.10
Auchi	1	Design Error	9.10
Bode	1	Natural	9.10
Okpella	1	Poor Supervision	9.10
Jattu	1	Poor Supervision	9.10
Sabo	1	Overloading	9.10
Igberra Camp	1	Overloading	9.10
Ekpoma	1	Overloading	9.10
Auchi	1	Fault Design	9.10
Afuze	2	Poor Supervision	18.1
	11		100%

Source: Field Survey, 2022

Frequency of Occurrence

$$\text{Total Occurrence} = \frac{11}{\text{No of years}} = \frac{11}{5} = 2.2$$

.: Average of two buildings collapse every year.

4.2.3 **Major Causes of Collapse**

Data based on table below

Causes	**No**	**Percentage**
Overloading	3	27.2%
Poor Supervision	4	36.36%
Poor Structural Design	2	18.8%
Natural Occurrence	2	18.8%
Total	**11**	**100%**

Source: Field Survey, 2022

From Table 4.2.3 above shows that overloading, or the illegal modification of a structure by a client who was ignorant, was to blame for 27.27% of collapses and that poor contractor oversight was to blame for 36.36%. Poor structural design accounts for 18.18% why Natural occurrence is responsible for 18.18%

4.2.4 Performance rating of indigenous contractor

Rating	**No of Respondents**	**Percentage**
Very Good	17	11.11%
Good	19	22.22%
Fair	23	44.44%
Poor	19	22.22%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.4 above shows that only 11.1% of native contractors had their performance evaluated, according to the results. The are good, according to 22.22%. 44.44% of respondents said they were being fair, while 22.22% said they are doing poorly. This demonstrates that the largest group, 44.49%, who believe they are performing fairly, stood out from the rest.

4.2.5 Assessment of the Design and Detailing of Drawings Prepared by Architects and Structural Engineers.

Assessment	**No of Respondents**	**Percentage**
Explicit	0	-
Ambiguous	22	11.11%
Not Detailed	26	33.33%
Absent of Joint Detail	30	55.56%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.5 above shows that Architectural and structural design and detailing assessment followed with 0% agreeing that their design are explicit while 11.11% claimed their designs were ambiguous. 33.33% signified their interest that the designs are not well detailed while 55.55% claimed that their design especially that of structures lack joint details which was suppose to show the details of bends and hook at joints.

4.2.6 Rating of Performance of Town Planning and Building Approval Authorities

Ratings	**No of Respondent**	**Percentage**
Fair	29	50%
Poor	25	27.78%
Good	24	22.22%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.6 above shows that performance of town planning and building approval authorities, 50% said their performance is fair. 27.78% had their view and claimed their performance is poor. Those that accepted their performance as good was only 22.22%

4.2.7 Assessment of Government as Major Contribution to Building Collapses

Assessment	**No of Respondents**	**Percentage**
Partially	31	61.11%
Not at all	22	11.11%
Fully	25	27.78%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.7 above shows that the assessment of Government as major contributor to building collapses was analyzed and 61.1% that Government is partially

responsible for collapsed building due to improper setting of machinery in place to deal with the situation. 11.11% did not support the idea that government is a major contributor of building collapses. 27.78% claimed that Government is fully a major contributor.

4.2.8 Would Empowering CORBON to Monitor and Control Building Standard Curb the Menace of Building Collapses?

Assessment	**No of Respondents**	**Percentage**
Partially	25	33.33%
Not at all	24	22.22%
Full Curb	28	44.44%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.8 above shows that Empowerment of CORBON to monitor and control building standard was also analyzed and found that 33.33% agreed that it would partially curb building collapses while 22.22% was of the opinion that, it would not curb the scourge. A percentage of 44.44% agreed that if CORBON is Empowered it will fully curb building collapses

4.2.9 Are Foreign Contracting Experts Better Than Local Contracting Firms?

Assessment	**No of Response**	**Percentage**
Better	42	66.67%
Not Better	36	33.33%
Total	**78**	**100%**

4.2.10 Are our Professionals Skilled Enough to Handle Complex Buildings?

Assessment	**No of Respondents**	**Percentage**
Well Skilled	39	50%
Not Skilled	39	50%
Total	**78**	**100%**

4.2.11 what is Responsible for the Constructional Setbacks by our Indigenous Contractors?

Factors	**No of Respondents**	**Percentage**
Lack of Construction Equipments	16	33.33%
Lack of Skilled Professionals	12	11.11%
Inadequate Government Support	12	11.11%
Lack of Funds for Building	11	5.56%
Corruption in the Country	14	22.22%
Greed on the Part of Consultant/Contractor	13	16.67%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.11 above shows that the factor responsible for constructional set-back in this country was tied to lack of construction equipments which was 33.33%, corruption in the country also a factor with 22.22% from respondent, lack of skilled professionals, and lack of Government support each with 11.11% while greed I on the part of consultants/contractors took 16.67%.

4.2.12 Enactment of Laws and Severe Punishment Attached Thereof to Punish Owners Users, and Professionals Responsible for Building Collapses

Interest	No of Respondents	Percentage
Partially in Support	26	33.33%
Not in Support	23	16.67%
Fully in Support	29	50.00%
Total	**78**	**100%**

Source: Field Survey, 2022

From Table 4.2.12 above shows that The enactment of laws by the Government to punish owners, users and professionals responsible for collapse receive boost of 50% from respondents while those not in support 16.67% and those partially in support was 33.33%. This shows a clear indication that Government should enact laws to punish offenders.

4.3 DISCUSSION OF RESULT OBTAINED FROM QUESTIONNAIRES

Analysis definitely demonstrates that from the 78 numbers of dejected respondents who returned completed questionnaires, 22.22% were structural engineers, 16.67% were architects, 27.78% were builders, and 11.11% were quantity surveyors.

Others included private building owner (5.56%) and estate developer (16.67%).

Thus, it can be claimed that the construction industry as a whole is well represented.

The examination of the number of building collapses in various localities over the previous five years and their frequency annually can also be observed clearly.

This further demonstrates that two buildings collapse on average each year.

The main reasons of building collapses were also examined, and it was discovered that overloading, or the illegal modification of a structure by a client who was ignorant, was to blame for 27.27% of collapses and that poor contractor oversight was to blame for 36.36%. Poor structural design accounts for 18.18% why Natural occurrence is responsible for 18.18%

Only 11.1% of native contractors had their performance evaluated, according to the results. The are good, according to 22.22%. 44.44% of respondents said they were being fair, while 22.22% said they are doing poorly. This demonstrates that the largest group, 44.49%, who believe they are performing fairly, stood out from the rest.

Architectural and structural design and detailing assessment followed with 0% agreeing that their design are explicit while 11.11% claimed their designs were ambiguous. 33.33% signified their interest that the designs are not well detailed while 55.55% claimed that their design especially that of structures lack joint details which was suppose to show the details of bends and hook at joints.

On the assessment of performance of town planning and building approval authorities, 50% said their performance is fair. 27.78% had their view and claimed their performance is poor. Those that accepted their performance as good was only 22.22%

The assessment of Government as major contributor to building collapses was analysed and 61.1% that Government is partially responsible for collapsed building due to improper setting of machinery in place to deal with the situation. 11.11% did not support the idea that government is a major contributor of building collapses. 27.78% claimed that Government is fully a major contributor.

Empowerment of CORBON to monitor and control building standard was also analysed and found that 33.33% agreed that it would partially curb building collapses while 22.22% was of the opinion that, it would not curb the scourge. A percentage of 44.44% agreed that if CORBON is Empowered it will fully curb building collapses.

The comparison of foreign contracting firms and local contracting firms reveal that foreign contracting firms perform better than local contracting firms base on a percentage of 66.67% to 33.33%.

The analysis also reveals that 50% of respondent agreed that our professionals are skilled enough to handle complex building while the other 50% disagreed. This show that it cannot be ascertained truly whether our professionals can handle complex building because of the tie is degree of comparison. The factor responsible for constructional set-back in this country was tied to lack of construction equipments which was 33.33%, corruption in the country also a factor with 22.22% from respondent, lack of skilled professionals, and lack of Government support each with 11.11% while greed I on the part of consultants/contractors took 16.67%.

The enactment of laws by the Government to punish owners, users and professionals responsible for collapse receive boost of 50% from respondents while those not in support 16.67% and those partially in support was 33.33%. This shows a clear indication that Government should enact laws to punish offenders.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 SUMMARY OF FINDINGS/ CONCLUSION

The principal reasons of building collapses, however, cannot be attributed to just one cause, as was demonstrated in the previous chapter based on the analysis of the returned questionnaire.
It involves the accountability of a team of individuals who contribute to the creation or use of the structure.

The following categories best describe the main causes:

i) Poor Construction Supervision

After carefully reviewing the information, it was discovered that the poor quality of workmanship from indigenous contractors was caused by the hiring of the incorrect specialist to oversee construction. In the state, this building collapse case represents around 37% of all cases.

ii) Natural Occurrence

When none of the aforementioned causes can be identified as the origin of a collapse, natural occurrences such as soil failure or collapse brought on by an earthquake, storm, or wind must be to blame.

iii) Overloading building

The illegal conversion of building especially where additional floors are added without corresponding increase in the strength of the structural member is a major cause

of building collapse. This particular cause of collapse can be trace down to the activities of ignorant client who do not consider the use of professionals important and accounts for about 27% building collapses.

iv) Poor Structural Design

About 18% of building collapses is caused by poor design from the structural engineers. This complicate issue for the supervising officer on site as there is no enough details to represent or to adequately express the Engineers intensions

5.2 Recommendations

After closely examining the reasons of building collapses, it was discovered that for each cause, certain individuals must be accountable, and these individuals must provide guidance on how to stop building collapses.

Thereafter, the following suggestions are made:

i) Eradication of Corruption

All other recommended avenues to prevent building collapse will fail until corruption is eliminated. If corruption is not completely eradicated, the issue of kickbacks on contracts granted and bribes collected from offenders by agents supposed to arrest certain ugly situations will continue to be sources of assistance to miscreants involved in this act, thus encouraging the practice of bad behavior.

ii) Empowerment of CORBON by Government

The Nigerian Federal Government should delegate supervision and oversight of building construction to the Council of Registered Builders of Nigeria (CORBON).

This will guarantee the use of qualified professionals in each area of specialization and do away with the use of quacks to oversee building construction. A qualified site builder will be required to manage site supervision.

iii) Enactment of laws by the Government

Laws should be enacted and penalties prescribe thereof to punish those responsible for building collapses as this will deter owner that engage in illegal conversion of buildings without obtaining permission from appropriate authorities. It will also deal with incompetent or careless professional who engage in building construction.

iv) Availability of Construction Equipment

Government and well meaning Nigerians should embrace the importation of modern construction equipments in other to be commensurate with our foreign counterparts.

Modern equipments are design to facilitate construction process in order to obtain better quality products at a minimal human stress.

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QUESTIONNAIRE

Department of Building Technology

Auchi Polytechnic, Auchi

Edo State

19th Oct, 2022.

Dear Respondent,

QUESTIONNAIRE ADMINISTRATION

I am a final year Higher National Diploma (HND) student of the above mentioned Department carrying out a research on the topic: "AN INVESTIGATION INTO THE CAUSE OF BUILDING COLLAPSE IN EDO STATE"

In view of this, you are please requested to complete the attached questionnaire to enable me achieve the objectives of this study.

Please note that the information required is strictly for academic purpose and will be treated as such.

Thank you in anticipation of your favorable response.

SECTION A:

RESPONDENTS CHARACTERISTICS

Tick appropriately in front of each correct option.

1. Tick your sex: Male ☐ Female ☐
2. Tick your age range: 15 – 30 years ☐ 30 – 50 years ☐
   60 years and above ☐
3. Tick your Nationality: Nigerian ☐ Non Nigerian ☐

4. Tick your position on the project: Project Manager ☐

Production Manager ☐ Project Architect ☐ Project Q/S ☐

Project Structural Engineer ☐

5. Tick your profession: Architect ☐ Builder ☐ Quantity Surveyor ☐

Carpenter ☐ Civil Engineer ☐

6. Tick your educational qualification: OND ☐ HND ☐ B.Sc M.Sc Ph.D ☐

7. Tick your professional Affiliation: NIA ☐ NIOB ☐ NSE ☐ NIQS

PMI ☐ NIESV ☐

8. Tick your membership status in your professional ☐ y: Student ☐

Technician ☐ Licentiate ☐ Associate ☐ Graduate ☐ Corporate

9. Tick your regulatory body which you fully registered with ARCON ☐

CORBON ☐ COREN ☐ ESVARBON ☐ QSRBN ☐

10. How long have you been in practice? 1 – 5 years ☐ 6 – 10 years ☐

11 – 15 years ☐ 16 – 20 years ☐ 20 years and above ☐

SECTION B

Please thick the appropriate box.

1) Have you ever experience the collapse of building either as owner or as professional handling supervision/construction

Yes ☐ No ☐

2). How many building collapses have happened within your locality in the past five years?

3). was an investigation carried out in any of the known cases?

Yes ☐ No, ☐

4). Have you been privileged to investigate the causes of any collapsed building?

Yes ☐ No ☐

5). which of the following was the cause/causes of such collapse Over loading

Poor Supervision ☐

Use of quacks ☐

Poor Structure Designed ☐

Poor architectural designed ☐

Natural Occurrence ☐

6). How would you rate the performance of our indigenous contractors?

Very good ☐

Good ☐

Fair ☐

Poor ☐

7). which do you considered as the major interest of the contractors?

Safety of users ☐

Profit making ☐

Durability of building ☐

8). Do you have adequate personnel to handle the various aspect of building production in your firm or the firm you know?

Yes ☐

No ☐

9). Do you think the various professionals involved in building production are allowed to execute their own part of the job diligently?

Yes ☐ No ☐

10). what is your assessment of the designing and detailing of drawings prepared by the architects and structural engineering's?

Explicit ☐ Not detailed ☐

Ambiguous ☐ No joint details ☐

11). In you own opinion, what level of qualification should be minimum standard for professional In the construction industry to enable them handle a major building project?

B.Sc/B. tech/H.N.D ☐ OND ☐

M.Sc ☐ Provided recognized by its professional body ☐

12). How would you rate the performance of the town paining and building approval authorities?

Fair. ☐ poor. ☐ Good. ☐

13). Do you think that government is a major contributor to the collapse of building?

Partially. ☐ Not at all. ☐ Fully. ☐

14). Do you thick empowering "CORBON" to monitor and control building standard, curb the menace of building collapses?

Yes ☐ No ☐

15). Do your firm have a way of showing appreciation to client representative prior to or after contract execution? Yes ☐ No ☐

16). If yes in what way do you show such appreciation?

Cash ☐ Kind ☐

17). As a major building consultant, contractor or developer, which the professionals in the construction industry do you engage in your project?

Architects ☐

Builders ☐

Structural engineering ☐

Quantity surveyor ☐

18). What yardstick do you employ in selecting the professional?

Cost Charged ☐

Status ☐

Physique ☐

Previous ☐

19). Do you think foreign contracting firms are better than d contracting firm?

Yes ☐

No ☐