**RESIDENTIAL BUILDING COLLAPSE IN NIGERIA: CAUSES, EFFECTS AND SOLUTIONS**

**TITLE PAGE**

Certification

Dedication

Acknowledgement

Table of Content List of Tables

**ABSTRACT**

**CHAPTER ONE: INTRODUCTION**

* 1. Background of the study
  2. Statement of the problem
  3. Objective of the study
  4. Research Questions
  5. Significance of the study
  6. Scope of the study
  7. Limitation of the study
  8. Definition of terms

**CHAPTER TWO: REVIEW OF LITERATURE**

Literature Review

**CHAPTER THREE: RESEARCH METHODOLOGY**

3.1 Research Design

3.2 Population of the study

3.3 Sample size determination

3.4 Sample size selection technique and procedure

3.5 Research Instrument and Administration

3.6 Method of data collection

3.7 Method of data analysis

3.8 Validity and Reliability of the study

3.9 Ethical Consideration

**CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS**

4.1 Data Presentation

4.2 Answering Research Questions

**CHAPTER FIVE: SUMMARY CONCLUSION AND RECOMMENDATION**

5.0 Summary

5.1 Conclusion

5.2 Recommendation

**References**

**Appendix**

**ABSTRACT**

This study was carried out on the residential building collapse in Nigeria: causes, effects and solutions. To achieve this 3 research questions were formulated. The survey design was adopted and the simple random sampling techniques were employed in this study. The population size comprise 352 contractors in Imo state. In determining the sample size, the researcher randomly selected 50 contractors while 50 respondents were validated. Self-constructed and validated questionnaire was used for data collection. The collected and validated questionnaires were analyzed using frequency tables and percentage. The result of the findings reveals that; Collapse of buildings leads to death and loss of properties in Nigeria, Incompetence of contractors is a major reason to building collapse, Quality of building materials has a lo do to with the collapse of buildings, Cost of building materials contribute to building collapse in Nigeria. The paper recommends that Proper planning, supervision and monitoring of construction activities should be institutionalized by policy makers to ensure that all buildings are constructed according to design, specifications and planning regulations; Professionals in the building industry should maintain their integrity and professional ethics and work in accordance to standard practice procedures laid down by the standard form of building contracts especially when they play in the hands of ignorant clients; Urban or Town development agencies at various levels of government (commission, Board, Authority) should enforce control of building works in their localities as laid down in urban and regional planning decree 88, of 1992 and as in section 13 of National Building Code 2006; There is need to organize periodic public awareness campaign through electronic and print media to sensitize the public on advantages of using professionals as the way of realizing safe buildings; Standard organization of Nigeria should be vigilant to ensure that building materials imported into the country conforms to standard requirements.

**CHAPTER ONE**

**INTRODUCTION**

**1.1 BACKGROUND TO THE STUDY**

Since independence, the Nigeria government has desperately continued to make concerted effort in the area of quantitative (but not qualitative) supply of mass housing through huge budgetary and policy provisions but, surprisingly, the rate at which existing ones are collapsing calls for an urgent attention. The site of building collapse scattered across the length and breadth of Nigeria is quite alarming that it is unimaginable what effects it will have on the building industry and Nigeria economy as a whole. One could imagine what edifices these buildings would have been if only they were constructed accordingly. It has been reported that Nigeria, especially Lagos State has become the “world’s junk-yard” of collapsed buildings worth billions of naira (Famoroti, 2005). It is quite unimaginable that a county blessed with so great potentials in its construction industry can experience such magnitude of building collapse Fadamiro in 2002 defined building as “an enclosure for spaces designed for specific use, meant to control local climate, distribute services and evacuate waste”. Buildings can be defined as structural entities capable of securing self by transmitting weights to the ground. More so, buildings are defined “as structures for human activities, which must be safe for the occupants”(Odulami, 2002). However, these same buildings have been posing treats and dangers to people either during or after construction as a result of its collapse. Collapse as a whole occurs when part or whole body of a structure fails and suddenly gives way, the structure, as a result of this failure, could not meet the purpose for which it was meant for. Building collapse is an extreme case of building failure. It means the super-structure crashes down totally or partially (Arilesere, 2002). Building failure occurs when there is a defect in one or more elements of the building caused by inability of the material making up the components of such building elements to perform its original function effectively, which may finally lead to building collapse. Buildings are meant to provide conveniences and shelter to the people, but the same building has been a danger trap to the same people. Building is expected to meet certain basic requirements such as buildability, design performance, cost effectiveness, quality, safety and timely completion (Olusola, Atta & Ayangade, 2002). Generally, buildings are expected to be elegant and functional but many projects are constructed that do not meet any of these basic requirements. The recurring incidence of building collapse, some of which claimed innocent lives is a consequence of this. Many studies has been carried out and various workshops organized in major cities of the country by various bodies, government agencies and institution in order to look into causes of the incidence of building collapse in Nigeria, but none has been able to come out with how each of the determined factors directly lead to building collapse in the country. There are many factors that cause building collapse in Nigeria and they are structural design and quality management according to Olusola (2002).The quality management entails material variability, testing variability, judgment factor, contractors’ variability, poorly skilled workmen and unprofessional conduct. The study aimed at examining the cases of residential building collapse in Nigeria with a view of identifying the causes, effect and solution.

**1.2 STATEMENT OF THE PROBLEM**

Building collapse is a defect or imperfection, deficiency or fault in a building element or component. It may also be as a result of omission of performance. The degree of building collapse can therefore be related to the extent or degree of deviation of a building from the “as – built” state which is in most cases represent the acceptable standard within the neighborhood, locality, state or country. (Ikpo, 1998). However, building collapse can simply be defined as a total or partial/progressive failure of one or more components of a building leading to the inability of the building to perform its principal function of comfort, satisfaction, safety and stability. The incessant buildings collapse in Nigeria has become a great concern to all the stakeholders – the professionals in building industry, government, private developers, clients and users, as well as the neighborhood residents. Fall out of the researcher’s concern about the increasing incidents of collapse building nation-wide form the basis for this study to find out the major causes, effects and probable remedial measures to collapse of buildings in Nigeria.

**1.3 OBJECTIVES OF THE STUDY**

The following are the objectives of this study:

1. To examine the causes of building collapse in Nigeria.
2. To identify the effects of building collapse in Nigeria.
3. To identify the remedial measures or approaches to building collapse in Nigeria.

**1.4 RESEARCH QUESTIONS**

1. What are the causes of building collapse in Nigeria?

2. What are the effects of building collapse in Nigeria?

3. What are the remedial measures or approaches to building collapse in Nigeria?

**1.5 RESEARCH HYPOTHESIS**

**H0:** quality of buildings materials does not have anything to do with building collapse in Nigeria.

**H1:**  quality of buildings materials has anything to do with building collapse in Nigeria.

**1.6 SIGNIFICANCE OF THE STUDY**

The following are the significance of this study:

The outcome of this study will educate the general public and the government of the day on the causes, effect and solutions to the cases 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.

**1.7 SCOPE/LIMITATIONS OF THE STUDY**

This study on residential building collapse in Nigeria with careful examination of the causes and the effects with a view of finding a lasting solution to the issue of incessant building collapse in Nigeria.

**1.8 LIMITATION OF STUDY**

**Financial constraint:** Insufficient fund tends to impede the efficiency of the researcher in sourcing for the relevant materials, literature or information and in the process of data collection (internet, questionnaire and interview).

**Time constraint:** The researcher will simultaneously engage in this study with other academic work. This consequently will cut down on the time devoted for the research work.

**CHAPTER TWO**

**LITERATURE REVIEW**

1. **INTRODUCTION**

The occurrence of building failure and collapse has become a great concern and a serious issue in the development and growth of this nation as the magnitudes of this incident is becoming very alarming Ademoroti, G. (1991). The building failure and collapse in Nigeria originated principally from 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 e.t.c. (Folagbade, 2001 and Badejo, 2009).. It has been revealed that more than 70% of the reported cases of building collapse in Nigeria temmed from the informal sector. It further showed that 70-0%, 23-3% and 6.7% of the reported cases occurred in private, public and corporate organizations respectively.

Building collapse, though a regular occurrence all over the world is more rampant and ruinous in the developing countries. The incidence of building failures and collapses has become serious problem 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. Amusan, J. O. (1991). Cases of building collapse are not restricted by climatology or level of urbanization as they cut across cultural and ethnical barriers. Many cases of building collapse have been reported in Nigeria. For instance, Folagbade (2001) and Chinwokwo (2000) enumerated forty-two (42) cases of building collapse as occurring between 1980 and 1999 in Nigeria while Makinde ( 2007) listed fifty-four (54) cases occurring between January 2000 and June 2007 alone. Building collapse has also been observed to cut across the different categories of building – private, corporate or public. Folagbade (2001) showed that of the twenty-five (25) reported cases of building collapse between 1980 and 1999 in Lagos State, private (76%), corporate (12%) and government or public buildings (12%) accounted for these proportions. Also, building collapse is no respecter of size of the structure. Amusan (1991) reported that Barnawa flat disaster in 1977 was a three-storey building, a public building (Secondary School) which collapsed in March 1988 at Ibadan was two-storey building, the collapsed show-room for cars in Lagos in 1987 was just a storey building while that of the Primary School in IIoabuchi, River State in July 1991 was a bungalow building. Folagbade (2001) also reports that the Abuja building which collapsed in March, 1993 and the one at Ojuelegba in 1999 were both multi-storey buildings. The memory of the incidents of two separate building collapses that occurred at Ebute-Meta area of Lagos State and Kano State which killed several people in 2007 still lingers on.

Furthermore, Our focus in this chapter is to critically examine relevant literature that would assist in explaining the research problem and furthermore recognize the efforts of scholars who had previously contributed immensely to similar research. The chapter intends to deepen the understanding of the study and close the perceived gaps.

Precisely, the chapter will be considered in two sub-headings:

* Conceptual Framework
* Chapter summary

**2.1. CONCEPTUAL FRAMEWORK**

Buildings as structures which serve as shelters for man, his properties and activities are expected to be properly planned, desired and erected to acquire desired satisfaction from the environment. Factors considered here include; durability, adequate stability to prevent its failure or discomfort to the residents, resistance to weather, fire out break and other forms of accident. Badejo, E. (2009).

The frequency of building collapse in Nigeria in the recent past has become a major problem and concern in the development of the frequencies of their occurrences and the magnitude of the losses being recorded in terms of lives and properties are becoming worrisome and alarming. Even though, the proportion of building that collapse is very small compared with the vast majority that are in use, but there are human and material wastes associated with such buildings collapse. Apart from psychological wounds often inflicted on both the affected residents of such houses, the owner and the environment also constitute huge loss to the nation at large Chinwokwu, G. (2000).

The essence of environment management is to reduce the chances of vulnerability of the environment to disaster through prevention, mitigation, preparedness and capacity building. Going by this, it can be deduced that environmental management has the following components: Disaster management, Hazard management and capacity building. Because of the incessant disaster that is ravaging his world, agencies to undertake environmental management functions have been put in place in many parts of the world. Several causes of building failure had been attributed to their natural or man-made phenomena. A natural phenomenon may be attributed to earthquakes and landslides while man-made phenomenon consists of disasters which may be borne out of man’s negligence in areas such as soil type, building design and planning for extra loads and stress, foundation works, quality of building materials, lack or inadequate monitoring of craftsman and poor quality of workmanship. (Adebanjo .K :2005)

**Causes Of Residential Building Collapse In Nigeria**

In recent times, building collapse in Nigeria has been sources of major concern to so many people especially those associated with the building industry. It is so because there are so many cases of building collapse all over the world, Nigeria precisely. Most of these cases had resulted into massive economic losses in terms of lives and property. Building collapse is some of the cardinal issues which have created serious concern to all the professionals like Architects, Structural Engineers, and the Builders. The government also is worried about the frequency of collapse of buildings in Nigeria. However, Badejo, E. (2009) as quoted in Fakere et al (2012) admitted that the recurring event of collapse of building has forced some state governments to enforce and enact some laws recommending forfeiture of such buildings and prosecution of their owners.

Generally, causes of building collapse can be classified under seven major factors, namely;

* Bad design
* Faulty construction
* Poor quality of materials and construction methods
* Foundation failure
* Fire problem
* Natural phenomena
* Inadequate Maintenance

**Bad Design:** Bad design does not only mean poor architectural design, but it involved some other professional’s design inputs. The Architect may contribute by starting design without adequate visibility study. This may include the authenticity of the land and nature, soil adequacy, site inventory and analysis. Others may include, inadequate or poor design details, poor supervision, sub-standard material specification and faulty or lack of maintenance schedule. Engineers may also contribute through failure to carry required tests such as foundation and soil analysis. It may also be through errors of computation, use of inaccurate data, improper choice of materials and ignorance of the effects of repeated stresses.

**Faulty Construction:** Studies have revealed that faulty construction contributed up to 40% to structural failures in building collapse occurrences. In many occasions, failure of contractors to build according to the plans and specifications or poor mixing and placement of concrete contributes largely to structural failures. Others may include formworks vertical or lateral overloading, unstable bearing support and premature removal, all these often leads to collapse of many on-going construction projects. Example of this is the collapse of the on-going construction of one-storey building, Benjamin Opara Street, Port-Harcourt, River State (2006) as a result of failure of structural members. These actions are often attributed to contractors’ inexperience, lack of care or high profit pursuits. On the other hand, poor inspection of construction materials and mix ratio by the Engineers may also aid the contractors to perpetrate some of their evils that often lead to incessant structural failures. In this case, contractors may use salty sand to make concrete, substitute inferior steel for the original specified, bad riveting or improper tightening of nuts, bad welding and so on, and all these may lead to collapse of building, if not properly done.

**Poor Quality of Materials and Construction Methods:** Use of inferior material is said to be up to 10% contributory factor to building collapse cases in Nigeria (Oyewande, 1992). Likewise, the use of blocks made by most block industries in Nigeria needs to be discouraged, due to failure of many block industries to use required measures. Mohammed (2004), asserted that while it is good to mix a certain quantity of cement by weigh t with an appropriate quantity of sand, also by weight, most block moulding industries in Nigeria prefer to mix these materials by volume. He further stated that most block making industries in the country use the same mixture of sand and cement to produce different sizes of blocks. In some cases, the steel reinforcement used for some project construction may be substandard. For instance, a batch of structural steel, which appear sound might have evaded the quality control checks and in fact could be of substandard quality. (Onyemachi and Uji, 2005). This attitude though very bad, but it is very common among the contractors who likes to cut corners by not using adequate materials as specified. The use of inferior materials and untested local building construction methods often leads to structural failure and eventual building collapse, if not adequately checked.

**Foundation Failure:** A building structure can collapse, if constructed on faulty foundation. Foundation of a building is that part of walls, piers or columns in direct contact with and transmitting loads to the ground. Building collapse as a result of foundation failure can be caused by construction of foundation on poor sub-soil, building not uniformly loaded/inadequate foundation, soil erosion and earth movements.

**Fire Problem:** Today, most of the available building materials in the developing countries are not only flammable but also encouraging the spread of fire (Adedoyin, 1983, Olagunju, 2002). This situation often makes a little fire ignition to spread very fast into a large scale fire development in buildings. Fire when fully blown out, both the

Structure’s reinforcements and concrete will be weakened. It is even worse, when the steel reinforcements are exposed to the naked fire, they may fail in the process to provide the necessary support for both the live and dead loads. In the event, it may lead to partial or total collapse of the building. It is therefore pertinent to use high fire resistant materials for building construction and for professionals in building industry to be fire safety conscious, most especially in material specification.

**Natural phenomena:** These may occur in the form of storm, flood, exceptionally high wind or hurricane, thunder, lighting, volcanic eruption and earthquake. These natural phenomena are referred to as “natural disaster” or “the act of God” (Onyemachi and Uji, 2005). Some of the aforementioned are possible factors that are largely responsible for most of the building collapse cases in Nigeria. From a newspaper survey conducted by Arayela and Adam (2001) on the reported cases of incidents of collapse buildings in Nigeria, it was revealed that many buildings collapsed as a result of rain storm. Example of these include, residential building, Ojuelegba road, Lagos (July, 1986), commercial building, ikorodu road, Lagos (September, 1987), 3-storey residential building, Iju-Ishaga, lagos (September, 1999) and so on. No one has power or control over natural occurrence , but may be minimized if Environmental Impact Assessment (EIA) is made mandatory to be made available by all developers or building approval applicants before commencement of any building project construction. This will help to determine the feasibility of constructing the building on the proposed site.

**Poor Maintenance:** Buildings start to deteriorate from the time they are completed and from that time begin to need maintenance in order to keep them in good condition. This process of gradual deterioration is unavoidable, but the speed at which it proceeds can be reduced through the manner in which buildings are maintained, (Olagunju, 2011). Thus, the rate of building deterioration depends largely on nature and manner of maintenance. Poor building maintenance can cause weakening of the building structure; most especially when unplanned maintenance type is the building maintenance culture or practice of the building owner/user.

**Effects Of Building Collapse**

Physical damage and psychological trauma are the aftermath effects of building collapse, the degree of which is often beyond easy prediction. Depending on the nature and extent of damage of building collapse incidents, the effects are felt almost in all human endeavours. These effects sometimes include loss of human life, and loss of materials and capital investments, as well as psychological pains.

**Loss of Human Life:** Loss of human life has become a common report of most of the collapse building incidents in Nigeria. From the newspaper survey conducted by Arayela and Adam (2001), about two hundred and seventeen (217) people were reported dead with many injured from only fifteen selected cases of building collapse between 1974 and 2001. It is an irreparable loss to both the victims’ relatives and the nation at large and thus called for the need to find a lasting solution to forestall its incessant occurrence.

**Loss of Materials and Capital Investments:** When building collapsed, most of its structural components and materials will be damaged often beyond re-use, while capital investments in most cases are not recoverable. This kind of situation, more than often leads to bankruptcy on the part of the investor and high economic implications on the nation’s economy.

**Remedial Measures**

The frequent collapse of buildings in Nigeria can be minimized if not curbed through adherence to some of the following measures, namely; Soil test, Environmental Impact Assessment (EIA) and structural analysis needs to be made mandatory to be submitted along with the building plans to planning authorities by all the developers or building approval seekers/applicants, especially for all institutional, commercial and industrial buildings.

2. All plans for approval must be made to pass through all the professionals associated with building industry working in every State/Local Government Development Control Boards before its final approval.

3. All plans for approval must be ensured to be in compliance with the Nigeria’s new building code and all the affected local government’s byelaws.

4. Inspection team must be made to regularly be on themove to inspect all construction works in their locality with the aim of enforcing the building code and the local byelaws.

5. All the professional bodies associated with the building industry in Nigeria, should jointly embark onenlightenment campaign for the public to be aware of the evils behind quarks involvement in building construction activities and the use of low quality materials, untested building materials and local construction methods.

**OTHER REVIEWS**

Structural failure has a much longer history than other types of buildings failures. [Cowan (1989)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib3) investigated and stated that in the ancient world structural failures were often severely punished. For example, the legal code promulgated by Hamurabi, a Babylonian king (1792–1750 bc), stated among other things that if a builder has built a house for a man and his work is not strong, and if the house he has built falls in and kills the occupant then that builder shall be slain. This shows that there were building collapses in very distant time past and the government then set Code of Laws, first in history. It was a very harsh code dealing with the social structure, industries, law, economic conditions and family life. On the contrary, the Romans attitude to building collapses was not quite harsh. [Cowan (1989)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib3) affirmed that there was also a tendency to make sure important structures do not fail by using materials generously, and that is, of course, one reason why so many of the Roman architecture survived till today.

In the European Middle Ages, structural materials were often used far more sparingly. The reasons were partly religious and partly economic. People were more inclined to look for supernatural causes of structural failure. With traditional materials, buckling was not a major structural problem, and multi-storey structures were rare. The emphasis was therefore on size of horizontals spans. In the Roman times, the arch and dome came into use for horizontal spans, with a consequent increase of several hundred per cent in the predictable length of spans. Arches, vaults and domes remained an important part of European structure thereafter.

[Cowan (1989)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib3) further revealed that there was no structural theory of any sort before the fifteenth century, and none that was practically useful before the seventeenth century. How did the builders formulate their factors of safety? One may ask. The failure of arches, vaults and domes of bricks, stones or concrete occurred through the opening up of a sufficient number of joints or cracks to form a collapse mechanism. Collapse occurs when the line of thickness to span (where‘*t*’ is the thickness or depth of the structure and ‘*l*’ is its span), *t*/*l*, which depends on the dome. The minimum safe ratio of *t*/*l* could be determined by observing collapses. If the structures fell down, the ratio was too small. It would require a lot of observations, but structural innovation was slow. Egyptian temple structure hardly changed over 3000 years, and the structure of Ancient Roman domes and vaults and of the Gothic cathedrals developed slowly, in each case over a period of several centuries. Columns were usually grossly oversized, but comparatively long horizontal spans for collapse, that is, those that survived, many undoubtedly did collapse.

Scientific concepts began to play a role in structural design from the sixteenth century onwards, but the sizing of buildings remained predominantly empirical until, and well into nineteenth century. The main causes of structural failure were the inadequacies of these empirical rules, although there were other causes as well. Surprisingly, outright mistakes are still a major cause of failure today, they presumably always have been a cause, although one that might get lost within the inaccuracies of empirical rules. Poor construction has always been, and still is a cause of structural failure. A major cause of structural failure in the developing countries of the world is an inadequate understanding of the structural consequences of a new building technology. This would have been regarded as a minor cause before the eighteenth century when building technology changed very slowly, so that there was ample time to study the consequences of new methods and materials. Thus, there has been a very major change in the causes of structural failure. Lack of adequate theories and inadequate factors of safety had been the main cause of failure before the eighteenth century. No major failure since the end of the Second World War in 1945 can be attributed to that as asserted by [Cowan (1989)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib3). In that area, the developed countries have therefore been spectacularly successful. Major structural failures are remarkably rare these days in the developed countries of the world; exceptions are, however, noticed in cases of man-made disasters such as terrorist attacks like the September 11, 2001 attack on the twin towers of the World Trade Centre in New York ([Gjelten, 2008)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib7), or natural disasters such as the Tsunami disaster of December 26, 2004 ([Tsunami, 2008](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib12)).

According to [Oyewande (1992](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib9)), causes of building failures in Nigeria are attributed as follows; 50 per cent of the causes being owing to design faults, 40 per cent to fault on construction site and 10 per cent to product failure. Building failures could be as a result of defects under any or all of the stages in design approval of drawings and the supervision/construction stage. Almost all the tragic incidents recorded in Nigeria have been blamed on either the developers for failure to comply with building regulations, or professional builders, architects and engineers, as well as government agencies whose duty is to ensure compliance. [Fredericks and Ambrose (1989)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib4) suggested that the overturning of structures owing to heavy wind loads, sliding of structures due to lateral loads are major types of failures of buildings. In addition, [Akinpelu (2002)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib1) categorised the following as the major causes of structural failures: environmental changes, natural and man-made hazards, improper presentation and interpretation in the design. [Richard (2002)](http://www.palgrave-journals.com/jba/journal/v6/n3/full/jba20111a.html" \l "bib10) opined that deterioration of reinforced concrete could occur as a result of: corrosion of the reinforcement caused by carbonation and chloride ingress, cracking caused by overloading, subsidence or basic design faults, and construction defects.

Those that are usually first accused of professional negligence are the architect, structural engineer, the contractor and planning authority officials. The inability of the architect and especially the structural engineer to properly carry out his own part of the work to see to the fact that the right number and sizes of reinforcements are used often times lead to collapse of buildings. The inability of the Town Planning Authorities to ensure that architectural and structural designs (and structural calculations) conform to design principles before approvals are given can also be attributed to structural failures. From past occurrences, the town planning authority that ought to enforce its development control regulations can hardly be seen to be firm in enforcing its regulations, so that the incidences of collapsed buildings are prevented or abated. Some officials of the planning authorities sometimes compromise their position and allow developers/landlords to recklessly contravene development control regulations. Added to this dimension is the very slow pace at which the planning authorities enforce the law. During construction, the consultants and the contractors must have competent persons on site to monitor work as it progresses, failure to do so could lead to bad or poor workmanship and therefore results in structural failure. Often, developers and landlords of collapsed building try to cut corners in the use of materials for construction. They deliberately deviate from what was approved for them and begin to contravene in the process of construction.

**CHAPTER SUMMARY**

In this review the researcher has sampled the opinions and views of several authors and scholars on residential building collapse, its causes and effects. The works of scholars who conducted empirical studies have been reviewed also. The chapter has made clear the relevant literature.

**CHAPTER ONE**

**RESEARCHMETHODOLOGY**

**3.0 INTRODUCTION**

This chapter covers the description and discussion on the various techniques and procedures used in the study to collect and analyse the data as it is deemed appropriate.

It is organized under the following sub-headings:

* Research Design
* Area of the Study
* Population of the study
* Sample and sampling procedure
* Instrument of Data Collection
* Validation of the Instrument
* Reliability of the Instrument
* Method of Data Collection
* Method of Data Analysis

**3.1 RESEARCH DESIGN**

According to Asika (2009), research designs are often referred to as the structuring of investigation aimed at identifying variables and their relationships to one another. In this study, questionnaire serves as useful guide to the effort of generating data for this study. The questionnaire is a survey method and it is an exploratory research.

**3.2 AREA OF THE STUDY**

The study area for this research is Imo state in eastern Nigeria.

The choice of Imo state as the study area is because since the creation of the state in 1967 and in spite of the movement of Abia state in the state creation exercise of 1991, it naturally enjoys the benefits of being the fulcrum of the eastern part of the country. Imo state is built with many roads, estates , government establishments, all kinds of private developments, schools, hospitals, theaters, shopping malls, hotels to mention a few. All these infrastructures are the handiwork of construction. As such there cannot be a better place to obtain data for this study.

**3.3 POPULATION OF THE STUDY**

The population of study consists of public and private contractors involving civil engineers and quantity surveyors in Imo State. According to the Imo state ministry of Works, Corporate affairs Commision data, total registered contractors” amount to 352.

**3.4 SAMPLE OF THE STUDY**

Random sampling technique was used in selecting 50 contractors from the entire population. This was chosen due to the financial strength of the researcher coupled with time constraints.

**3.5 INSTRUMENT FOR DATA COLLECTION**

These are the tools or methods used in getting data from contractors. In this study, questionnaires and interview are research instruments used. Questionnaire is the main research instrument used for the study to gather necessary data from the sample contractors. The questionnaire is structured type and provides answers to the research questions and hypotheses therein.

This instrument is divided and limited into two sections; Section A and B. Section A deals with the personal data of the contractors while Section B contains research statement postulated in line with the research question and hypothesis in chapter one. Options or alternatives are provided for each respondent to pick or tick one of the options.

**3.6 RELIABILITY AND VALIDITY OF INSTRUMENT**

Reliability means the accuracy of precision of a measuring instrument while validity means the extent to which the research instrument measures what it is supposed to measure. In order to determine the reliability and validity of the study, the test-retest method was used. To have a valid instrument, the questions in the questionnaire will be free from ambiguity (i.e the questions will not be too complex). To have reliable instrument, the questionnaire will be followed with interview of sample of contractors to know whether their view on the subject.

**3.7 TECHNIQUES OF DATA ANALYSIS**

Having gathered the data through the administration of questionnaire, the collected data will be coded, tabulated, and analyzed according to the research question and hypothesis.

In order to analyze the data collected effectively and efficiently for easy management and accuracy, the simple percentage method was the analytical tools used for this research project and a sample size of two hundred (200) will be represented by 100% for easy analysis of the responses.

Also, Chi-square statistical analytical method will be used in the research work chi-square as a statistical technique is used in testing of hypothesis so as to predict what the relationship between two variables should be. It is used in drawing and reaching conclusion by collecting the observed values from the questionnaire administered to contractors, testing the degree of freedom and carrying out a decision in determining the critical value of the hypothesis.

The formular being

X2 = (F0-FE)2

FE

Where O = Observed Frequency

E = Expected Frequency

The X2 value obtained from the formular is compared with the value of tabulated X2 for a given significance level and degree of freedom.

**CHAPTER FOUR**

**DATA PRESENTATION, ANALYSIS AND INTERPRETATION**

This chapter is devoted to the presentation, analysis and interpretation of the data gathered in the course of this study. The data are based on the number of copies of the questionnaire completed and returned by the contractors. The data are presented in tables and the analysis is done using the chi-square test.

**4.1 Data Presentation and Analysis**

**BIO DATA OF CONTRACTORS**

| **TABLE 1 gender of contractors** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | male | 30 | 60.0 | 60.0 | 60.0 |
| female | 20 | 40.0 | 40.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

**Source: field survey, November, 2015.**

Table 1 above shows the gender distribution of the contractors used for this study.

30 contractors which represent 60.0 percent of the population are male.

20 contractors which represent 40.0 percent of the population are female.

| **TABLE 2 age grade of contractors** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | below 20 years | 5 | 10.0 | 10.0 | 10.0 |
| 21-30years | 15 | 30.0 | 30.0 | 40.0 |
| 31-40years | 15 | 30.0 | 30.0 | 70.0 |
| 41-50years | 5 | 10.0 | 10.0 | 80.0 |
| 51-60years | 5 | 10.0 | 10.0 | 90.0 |
| 61-70years | 3 | 6.0 | 6.0 | 96.0 |
| above 70 years | 2 | 4.0 | 4.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

Source: field survey, November, 2015.

Table 2 above shows the age grade of the contractors used for this study.

5 contractors which represent 10.0 percent of the population are below 20yrs.

15 contractors which represent 30.0percent of the population are between 21-30yrs.

15 contractors which represent 30.0 percent of the population are between 31-40yrs.

5 contractors which represent 10.0 percent of the population are between 41-50yrs.

5 contractors which represent 10.0 percent of the population are between 51-60yrs.

3 contractors which represent 6.0 percent of the population are between 61-70 years.

2 contractors which represent 4.0 percent of the population are above 70 years.

| **TABLE 3 marital status of contractors** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | single | 25 | 50.0 | 50.0 | 50.0 |
| married | 15 | 30.0 | 30.0 | 80.0 |
| divorced | 8 | 16.0 | 16.0 | 96.0 |
| widowed | 2 | 4.0 | 4.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

**Source: field survey, November, 2015.**

**Table 3 above shows the marital status of the contractors used for this study.**

‘Out of the total number of 50 contractors, 25 contractors which represent 50.0 percent of the population are single.

15 contractors which represent 30.0 percent of the population are married.

8 contractors which represent 16.0 percent of the population are divorced.

2 contractors which represent 4.0 percent of the population are widowed.

**TABLES BASED ON RESEARCH QUESTIONS**

| **Table 5 cost of building materials contribute to building collapse in Nigeria** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | strongly agree | 25 | 50.0 | 50.0 | 50.0 |
| agree | 10 | 20.0 | 20.0 | 70.0 |
| undecided | 5 | 10.0 | 10.0 | 80.0 |
| disagree | 6 | 12.0 | 12.0 | 92.0 |
| strongly disagree | 4 | 8.0 | 8.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

**Source: field survey, November, 2015.**

**Table 5 shows that the cost of building materials contributes to building collapse in Nigeria.**

Responses from the contractors show that 25 of the contractors representing 50.0 percent strongly agree that the cost of building materials is on the high side.

10 of the contractors representing 20.0percent agreed.

5 of the contractors representing 10.0percent were undecided.

5 of the contractors representing 10.0percent disagreed.

While the remaining 4 contractors representing 8.0percent strongly disagree that the cost of building materials is on the high side.

| **Table 6 quality of building materials has nothing to do with the collapse of buildings in Nigeria.** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | agree | 5 | 10.0 | 10.0 | 10.0 |
| undecided | 5 | 10.0 | 10.0 | 20.0 |
| disagree | 10 | 20.0 | 20.0 | 40.0 |
| strongly disagree | 30 | 60.0 | 60.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

**Source: field survey, November, 2015.**

**Table 6 shows that the quality of building materials has a lot to do with the collapse of buildings in Nigeria.**

5 of the contractors representing 10.0percent strongly agreed that the cost of building materials has nothing to do with housing development in Nigeria.

5 of the contractors representing 10.0percent agreed.

10 of the contractors representing 20.0percent were undecided.

10 of the contractors representing 20.0percent disagreed.

30 of the contractors representing 60.0percent strongly disagreed.

| **Table 7 incompetence of contractors is a major reason for collapse of buildings** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | strongly agree | 26 | 52.0 | 52.0 | 52.0 |
| agree | 14 | 28.0 | 28.0 | 80.0 |
| disagree | 5 | 10.0 | 10.0 | 90.0 |
| strongly disagree | 5 | 10.0 | 10.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

Source: field survey, November, 2015.

**Table 7 shows that incompetence of contractors is a major reason for the collapse of buildings.**

26 of the contractors representing 52.0percent strongly agreed.

14 of the contractors representing 28.0percent agreed.

5 of the contractors representing 10.0percent were undecided.

5 of the contractors representing 10.0percent disagreed.

While the remaining 5 of the contractors representing 10.0 percent strongly disagreed.

| **Table 8 collapse of buildings leads to death and loss of properties in Nigeria** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | strongly agree | 10 | 20.0 | 20.0 | 20.0 |
| agree | 19 | 38.0 | 38.0 | 58.0 |
| undecided | 10 | 20.0 | 20.0 | 78.0 |
| disagree | 6 | 12.0 | 12.0 | 90.0 |
| strongly disagree | 5 | 10.0 | 10.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 |  |

Source: field survey, November, 2015.

**Table 8 shows that collapse of buildings leads to death and loss of properties in Nigeria.**

10 of the contractors representing 20.0percent strongly agreed.

19 of the contractors representing 38.0percent agreed.

10 of the contractors representing 20.0percent were undecided.

6 of the contractors representing 12.0percent disagreed.

5 of the contractors representing 10.0percent strongly disagreed.

**RESEARCH HYPOTHESIS**

**H0:** quality of buildings materials does not have anything to do with building collapse in Nigeria.

**H1:**  quality of buildings materials has anything to do with building collapse in Nigeria.

**Level of significance**: 0.05

**DECISION RULE:** Reject the null hypothesis if the p-value is less than the level of significance, accept the null hypothesis if otherwise.

| **Test Statistics** | |
| --- | --- |
|  | Quality of building materials has a lot to do with the collapse of buildings in Nigeria. |
| **Chi-Square** | **173.474a** |
| **df** | **4** |
| **Asymp. Sig.** | **.000** |
| a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 46.4. | |

**Conclusion based on the decision rule:**

Since the p-value (0.000) is less than the level of significance (0.05), we reject the null hypothesis and accept the alternative thereby concluding that the quality of building materials affects housing development in Nigeria.

**CHAPTER FIVE**

**SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS**

**5.1 Summary of the Findings**

The objectives of the study were to

* To examine the causes of building collapse in Nigeria.
* To identify the effects of building collapse in Nigeria.
* To identify the remedial measures or approaches to building collapse in Nigeria.

Findings from the study revealed the following:

* Collapse of buildings leads to death and loss of properties in Nigeria.
* Incompetence of contractors is a major reason to building collapse.
* Quality of building materials has a lo do to with the collapse of buildings.
* Cost of building materials contribute to building collapse in Nigeria.

**5.2 CONCLUSION**

It is a concluding fact that Nigeria has witnessed collapsed buildings in various dimensions, either those under construction or those already in existences. Causes were identified as mainly man-made but less often by forces of nature. Corruption as man-made factor manifest in greedy contractors and the tendency of clients or landlords to cheat resulting to the use of substandard materials, use of quacks and poor remuneration for building works and services. The building consultants are guilty of negligence, incompetency, poor supervision and the tendency to allow defective works intentionally for a fee or due to ignorance or inexperience. There should therefore be a review of existing building laws that should guide standard code of practice and that should cover all grey areas in order to guarantee safety of buildings.

**5.3 RECOMMENDATION**

Base on the findings and conclusion respectively, the researcher made the following recommendation.

1. Proper planning, supervision and monitoring of construction activities should be institutionalized by policy makers to ensure that all buildings are constructed according to design, specifications and planning regulations. 

2. Professionals in the building industry should maintain their integrity and professional ethics and work in accordance to standard practice procedures laid down by the standard form of building contracts especially when they play in the hands of ignorant clients 

3. Urban or Town development agencies at various levels of government (commission, Board, Authority) should enforce control of building works in their localities as laid down in urban and regional planning decree 88, of 1992 and as in section 13 of National Building Code 2006. 

4. There is need to organize periodic public awareness campaign through electronic and print media to sensitize the public on advantages of using professionals as the way of realizing safe buildings. 

5. Standard organization of Nigeria should be vigilant to ensure that building materials imported into the country conforms to standard requirements. 

6. All building professionals play key roles to actualize their respective obligations during building production, using the wrong professionals at any stage of the building process put the building in danger. It is the duty of the architect as the prime consultant to direct the client to use the right professionals. This he achieves by ensuring that the structural and services drawings brought to his office are stamped and signed by professionals registered by their respective professional bodies before proceeding to planning authority for “building permit”. 

7. Soil investigation, material tests and environmental impact assessment (E.I.A) should be made compulsory for all institutional, industrial and commercial buildings.

8. All building plans tendered by any developer for approval must comply with the Nigeria’s new building code and local bye laws and regulations. 

9. Standard organization of Nigeria, (SON) should monitor the standard of blocks moulded in block industries and impose minimum standard in terms of sand-cement ratios. 

10. There is need to empower and restructure available materials testing laboratories in the country. 

11. The National Assembly to make speedy passage of the bill on National Building Code.

**REFERENCES**

Adebayo, S. O. (2000). Improving Building Techniques, Proceedings of a Workshop on Building Collapse: Causes, Prevention and Remedies.The Nigerian Institute of Building, Lagos State Chapter, April.

Ademoroti, G. (1991). Minimizing the Collapse of Buildings in Lagos State. Proceedings of the National Seminar on effective Contract Management in Construction Industry, Nigerian Institute of Building, 22-23 August, pp 174-187.

Adebanjo, K.(2005) “A Position Paper by the Nigerian Institution of structural Engineers (NIStruct), A Division of the Nigeria Society of Engineers (NSE) on Recent Structural Collapses in Nigeria and thePrevention of Future Incidence”. Downloaded on 24/8/2013 from <http://www.nistructe.org/publications-detail.PhD?site-id=3&resolution>.

Amusan, J. O. (1991). Strategies for Enhancing the Local Governments Roles in Minimizing the Collapse of Buildings. Proceedings of the National Conference on Effective Contract Management in the Construction Industry. Nigerian Institute of Building, 22-23August, pp188-200.

Badejo, E. (2009). Engineers, Others Urge Multi-Disciplinary Approach to Curb Building Collapse, The Guardian Newspaper, 13 July, pp 15-17.

Chinwokwu, G. (2000). The Role of Professionals in Averting Building Collapse, Proceedings of a Seminar on Building Collapse in Nigeria. The Nigerian Institute of Building, Lagos. Pp12-28.

Dare, S. (2001). Building Design, Buildability and Site Production.Proceedings of a Workshop on Building Collapse: Causes, Prevention and Remedies,The Nigerian Institute of Building, Ondo State, 23-24October.

Fadamiro, J. A. (2001). An Assessment of Building Regulations and Standards and The Implications for Building Collapse in Nigeria. Proceedings of a Workshop on Building Collapse: Causes, Prevention and Remedies The Nigerian Institute of Building, Ondo State, 23-24 October.

Folagbade, S. O. (2001). Case Studies of Building Collapse In Nigeria. Proceedings of a Workshop on Building Collapse, Causes, Prevention and Remedies, The Nigerian Institute of Building, Ondo State Chapter, 23-24October.

Honby, A.S. (2000). Oxford Advanced learner’s Dictionary. Oxford University Press, 6thEd. P. 952.

Makinde, F. A. (2007). Minimizing the Collapse of Building in Nigeria. Seminar Paper, Faculty of Environmental Studies, Osun State College of Technology, Esa-Oke, 20-21 August.

Makinde, R. (1998). Building Collapse in Nigeria. A Workshop Paper on Building Collapse, Nigerian Institute of Building, Osun State Chapter, 22- 24 November.

Olagunju, R. E. O. (2002). Fire Safety Problems In the Tropics: A Study of The Pharmaceutical Industry in Nigeria, Journal of Science, Technology and Mathematics (JOSTMED), Federal University of Technology, Minna, Vol. 5, No. 1

Olagunju, R. E. (2011): Development of Mathematical Models For The Maintenance of Residential Building s In Niger State, Nigeria, Ph.D (Architecture) Thesis, Department of Architecture, Federal University of Technology, Minna, Nigeria.

Onyemachi, T. C. and Uji, Z. A. (2005). Building Failure and its Implication On Real Estate Investments In Nigeria, Journal of the Association of Architectural Educators in Nigeria (AARCHES), Vol. 4, No. 1, pp. 57 – 63

Oyewande, B. (1992). A Research for Quality in the Construction Industry, Builder’s Magazine, June/July Ed, lagos.

Uwakweh, B.O. (2000). Conceptual Framework for Motivating Construction workers in Developing Countries. Proceedings of the 2nd International Conference of the CIB Task Group on Construction in Developing Countries, Faculty of Engineering and Technology, University of Botswana, Botswana, 15-17 Nov., pp31-37.

Ward, P.A (1979). Organizing and Proceedings in the Construction Industry, Plymouths MacDonald and Evans Ltd, pp 135-137.

Mohammed, S. M. (2004). Appraisal of Sandcrete Bloc k As Walling Unit in Nigeria, Environmental Watch Journal Federal Polytechnic, Bida, Vol. 1, No. 1, pp. 251 –257.

**QUESTIONNAIRE ADMINISTRATION**

**INSTRUCTION:** Please endeavor to complete the questionnaire by ticking the correct answer (s) from the options provided or supply the information required where necessary.

**SECTION A: Personal Information**

1. **Gender**
2. Male [ ]
3. Female [ ]
4. **Age range**
5. Below 20yrs [ ]
6. 21-30yrs [ ]
7. 31-40yrs [ ]
8. 41-50yrs [ ]
9. 51-60yrs [ ]
10. 61-70yrs [ ]
11. Above 70yrs [ ]
12. Marital status
13. Single [ ]
14. Married [ ]
15. Divorced [ ]
16. Widowed [ ]

**SECTION B**

Questions on residential building collapse in Nigeria : causes, effects and solutions.

1. Collapse of buildings leads to death and loss of properties in Nigeria.
2. Strongly agreed [ ]
3. Agreed [ ]
4. Undecided [ ]
5. Disagreed [ ]
6. Strongly disagreed [ ]
7. Incompetence of contractors is a major reason to building collapse.
8. Strongly agreed [ ]
9. Agreed [ ]
10. Undecided [ ]
11. Disagreed [ ]
12. Strongly disagreed [ ]
13. Quality of building materials has a lot to do with the collapse of buildings.
14. Strongly agreed [ ]
15. Agreed [ ]
16. Undecided [ ]
17. Disagreed [ ]
18. Strongly disagreed [ ]
19. Cost of building materials contribute to housing collapse in Nigeria.
20. Strongly agreed [ ]
21. Agreed [ ]
22. Undecided [ ]
23. Disagreed [ ]
24. Strongly disagreed [ ]
25. What are the factors responsible for high cost of building materials in Nigeria?

………………………………………………………………………………………………………………………

1. What are the solutions reducing the cost of building material to ensure adequate housing development in Nigeria.

………………………………………………………………………………………………………………………