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Causes of Building Failure And Collapse In Nigeria: Professionals' View

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ABSTRACT: *Shelter or housing is the first thing humans need for living in this world even before food. The construction sector is the provider of physical infrastructure essential for human sustenance and economic development. Moreover, the advancement in vertical city expansion is enormous and to be celebrated; however in Nigeria, such development comes with huge human and material losses. For over three decades, Nigeria has been experiencing collapse of multi-story buildings. To investigate this phenomenon, primary data were collected through a questionnaire survey from professional construction consultants, contractors and clients. 150 structured questionnaires were randomly distributed of which 99 number were successfully retrieved for analysis. The 99 number questionnaires were analysed using simple statistics and charts. The result reveals that the frequency of building collapse in Nigeria is at an alarming rate and the impact is moderately major; substandard reinforcement, structural steel and cement used for the production of foundations, columns, beams and slabs are the main causes of building collapse (in descending order). While all these are associated with lapses in construction supervision with a relative importance index (RII) of 0.812 (ranked 1st) followed by construction process with RII of 0.709. Professions / professionals linked to the problems were also examined and recommendations are made based on the findings of the research.*

Keywords: *Building Collapse, Causes, Civil/Structural Engineering, Nigeria, Professionals*

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I. INTRODUCTION

Engineering businesses are recognizing that the effective and integrated management of design information is a vital component to achieving engineering and business goals. This study is an opportunity to contribute to re-shaping the thoughts regarding building failure and collapse in Nigeria. This agenda can be realized through research and industrial practice in the Nigerian construction industry. This is done within the context of the huge housing shortage in Nigeria for which there is, currently, no substantial measures in place to address this challenge [34].Construction industry in Nigeria has been facing challenges; housing shortages plus frequent building collapse. Collapse according to Oxford Dictionary refers to an instant of a structure falling down or giving away because of being weak. In architecture and construction, collapse can be considered as mechanical failure of building. Globally, building collapse is considered to be caused by one of the two major factors: the natural or man-made factors [12, 4]. These natural factors include but not limited to: landslide, earthquake, flood & erosion, mud-flow, thunder-storm and hurricane [4]. While the man-made factors are as a result of human errors within the entire process of planning, design, construction and maintenance of building [12, 4].

Structural failures are noticed all over the world. The rate of collapse and the magnitude of destruction are low in developed nations where strict adherence to building codes and ethics of professionalism are obtainable; even under severe natural hazards like earthquakes, catastrophic destructions are often contained [17]. Moreover, in developed nations, natural factors are the predominant causes of building collapse, and perhaps progressive collapse where a particular cause leads to consequent collapse [18]. Subsequently, the natural factors are now considered during planning and design to accommodate possible natural effect on building (especially for locations prone to such natural factors).

Since 1970s, developed countries are working to tackling building collapse due to accidents that involve major structural system; these accidents are the abnormal loads not considered in design (e.g., sabotage

and gas explosions), extreme environmental effects as well as severe fires [18]. Ellingwood [18] asserted that: "No building system can be engineered and constructed to be absolutely risk-free in the presence of numerous sources of uncertainties that arise in the building process or from potential failure initiating events. However, building codes and standards provide tools for structural engineers to manage risk in the public interest" [18, p195] On the other hand, developing nations have suffered from frequent collapse of buildings; a country like Nigeria has suffered catastrophic building collapse over the years due to predominantly man-made factors [4, 6, 12]. However, there are very rare cases where collapse is caused by natural factors considering the country's geographical location, except few cases of erosion and flood [4], and these are generally effecting low-rise (bungalows) buildings.

For over three decades, Nigeria has experienced frequent building failure and collapse; 64 buildings were reported collapsed between 1974 and 2011 with fatality of about 300 [39]. Amongst the recent building collapse was a church pavilion collapse in Uyo, Akwa Ibom State which claimed about 200 lives on 10th December, 2016 [35]. Investigations are ongoing to ascertain the main causes of such failures and find a solution to them. However, not much has been achieved in tackling this kind of menace [31].The studies by Dimuna [12]; [2, 5, 7, 11] describes sub-standard building materials as the cause of building failure and collapse in Nigeria. Moreover, [2, 5, 6, 15, 32] attribute building collapse to faulty design as well as lack of proper supervision [9]. Therefore, most of the issues/problems could be attributed to actions and inactions of the parties involve from design down to construction stage. These parties include client, designers and constructors with the following professionals: architects, civil/structural mechanical and electrical engineers, quantity surveyors as well as builders. Most of the arguments and findings revolve around the sub-standard building materials, design and construction supervision as well as the local authorities that are responsible for design approvals and monitoring on compliance [2, 15]. Building failure and collapse has been lingering for over a decade in Nigeria and has been increasing at an alarming rate while the impact has been significant with multiplying effect. The primary data of this investigation were gathered through questionnaire survey, targeting the Nigerian contractors, consultants and the clients in the following disciplines: architects, engineers, builders and quantity surveyors; the approach to the research was quantitative in nature. The research aimed at confirming the most significant causes to the building failure and collapse; critical components prone to failure; critical elements to building stability and re-direct investigations on building failures to the appropriate parties for successful resolution.

II. LITERATURE REVIEW

2.1. Building Construction: the framework

A building is constructed to provide shelter to carry out normal (day and night) activities for mankind. Mankind has advanced in providing safe and more conducive shelter for continuous human existence. The essential principle of building design is to produce a building that meets a client's requirements [12] and be fit for purpose. Although owner's requirements are the term of reference, standards in terms of architectural considerations, building services requirements, structural provisions and safety issues must be fully considered. Therefore, the most economically safe, functional, and aesthetic building is expected; and to produce these, three major professionals are involved: Architect, Structural/Services Engineers and Contractors. Architect is the first professional who get involve with a client, drafting building design from a client's brief (needs and requirements). He/she is responsible from inception of design, architectural materials' quality control and physical look for both structural and services elements. In a nutshell, the Architect is responsible for the building to finally be faithful to the original design, hence trends to lead the design-construction team.

The structural engineer is a professional that works based on the architect's layout and provisions to make sure the building stands, and be safe both at ultimate and serviceability limit states with the most economical structural members [26, 18]. The structural stability of a building is fully dependent on in-depth design and construction of the following structural elements: Slabs, Beams, Columns, walls and Foundations. The design process must be thorough, starting with analysis (to calculate bending moments and shear forces) of the structural elements; to the design (at ultimate state) for sections and reinforcements required considering the adopted code of practice (BS 8110 in the UK). Several checks are done at serviceability limit states; and often structural performance simulations are also done. Therefore, to achieve sound structural carcass of a building, proper design and implementation (at construction stage) of structural element must be achieved. These include specification of materials (i.e. reinforcement steel, concrete aggregate, cement, structural steel etc.) and adequate site supervision. Sound design and proper implementation (at construction stage) of the design from all angles is the role of the structural engineer and anything short of that, is a potential risk to building stability. Building Services engineers, also known as Mechanical, electrical and plumbing (MEP) engineers are responsible for design of services in a building, such as heating/cooling systems, electrical and communication installations, fire suspensions safety etc. They are much inclined to the provision of services that aid functionality as well as mitigating equipment against disaster in a building. Hence, have no responsibility to ensuring building structural

stability. A succinct definition of a contractor and their under role is provided by the UK Health and Safety Executive (HSE) under the Construction Design Management (CDM) regulations as follows: A contractor is anyone who directly employs or engages construction workers or manages construction work. Contractors include sub-contractors, any individual self-employed worker or business that carries out, manages or controls construction work. They must have the skills, knowledge, experience and, where relevant, the organisational capability *to carry out the work safely and without risk to health* [44]. Delivering a construction project of any scale requires not only expertise and experience but most critically an ethical responsibility to the client, design team and society as a whole. Beyond the professional and legal requirement, all of which are enshrined into Law as well as professional codes of conduct, a building must be completed to design specifications, established standards and rules of health and safety during construction and throughout the building life cycle. Supervision and quality control (materials, workmanship, performance, testing etc.) are key the process of construction, a role normally shared between the relevant design team members and main contractor as defined in contract and the relevant legislation.

2.2. Nigerian Construction Industry

Construction is considered amongst the world's biggest industries, and is estimated to account for about 13% of world output, while about 15% is estimated to be the global gross domestic product of the construction industry by 2020 [8]. Similarly, by the end of 2011, the Nigerian construction industry contributed about 2% (1.99%) to the country's Gross Domestic Products (GDP), which is statistically low compared to its record in 1981 of 5.8% (a difference of 3.81% in 30 years [1]). Moreover, the Central Bank of Nigeria's financial report of first quarter of 2015 revealed that the construction industry contributed only 0.45% of the country's GDP [20]; it could be justifiable to connect this with the industry's inefficiency and lack of competency. The construction industry is amongst the important industries that contribute toward a nation's socio-economic development, particularly in developing countries. The nature of the Nigerian construction industry is disjointed [11], exclusive and complex, and continuously facing lingering problems such as project time overrun (late delivery of projects), project cost overrun, and risk/safety management issues [40].

National public sectors are the major or nearly the only client for major construction works in Nigeria, and typically procure construction works using a "traditional" contract type, whereas the procurement routes that promote integration or collaboration are Design and Build (integrated), Management and Co-operative contract types [40]. However, for over a decade housing sector development has proven contrary, where private production arrangement continues to supply the majority of housing to the populace [21]. Furthermore, statistics show that the majority of urban housing units for rent in Nigeria are provided by moderate private property-owners.

2.3Procurement of Construction works in Nigeria

Procuring building construction work in Nigeria comes in two to three different ways: public (government), established private developers (registered) and private/owned individuals (unregistered). The government approach is generally via one of these two methods of procurement: *Traditional* or *Design and Build;* established private developers generally procure building work by *Design and Build* or in a form of *novated* way (adopt designs from designers and be responsible for construction based on the adopted design). While the private/owned individual operates a sort of direct labour which means the owner takes direct ownership of every aspect of works (engaging individuals for every work).

2.2.1.1. Traditional Procurement Route

Traditional procurement route is a method of contracting where a client appoints an architect to lead the design team (consultants) which comprises structural, electrical and mechanical engineers. Rowlinson [37] prescribed that the architect typically receipts the client's brief then develop that to architectural form of drawing, from preliminary to detailed architectural drawing. The same applied to the structural, electrical and mechanical designs (from preliminary to detailed); the various elements and items of the building can subsequently be taken-off and come up with bill of quantities by the quantity surveyor appointed by the client. All the above processes are done at pre-contract stage; after which contractors are invited to tender for the construction part (post contract stage). Their tenders are to be examined, compared and the successful contractor (the feasibly lowest bidder) is appointed for the construction works under the supervision of the consultants headed by the architect. It can be observed that a successful contractor is expected to mobilize to site and start work within some few days with limited knowledge or understanding of the building to be built [37,38]. Moreover, perhaps not reasonably acquainted with the client and other project participants especially the consultants; in this process, the standard forms of contract is used which has been adopted by federal ministry of works, traditional building contract based on '*joint contract tribunal – JCT'* [30]. This standard form of contract clearly defines what is to be built, the various parties' roles and the terms of bargain between them. Similarly, it stipulates the requirements by the client, specifies the measures to be taken to guarantee compliance and available remedies to each party in an

incident of default [38]. The traditional procurement method is widely used in Nigeria [28]. It is not that, the traditional method of contracting is completely ineffective, but other procurement methods could be better and suitable when used on similar projects [29].

2.4 Design and Build Method

The design and build method of procurement is also referred to as integrated procurement approach in which a contracting firm takes obligation for all aspects of the project [25]. Rowlinson [37] outlines the features of design and build contract as:

1. a contract that is signed before the building has been defined by full documents;
2. a contract in which design is not fully completed before construction commences;
3. a contract where bill of quantities is not normally prepared so variations are priced according to a schedule.

The continues growth of the design and build (integrated) method in the UK and elsewhere as an alternative procurement method to the traditional method is as a result of the new paradigm shift from fragmented method to integrated system as well as the belief pointing to integrating the design and construction [23]. Despite all the claimed potential benefits of time and cost overrun, reduction of errors and omissions, less misunderstanding, rapid reaction to scope changes, as well as production of buildable designs [23, 24], the client has reduced his professional representation and also tend to have fewer checks on cost and quality [24] and therefore quality assurance in all aspect could be compromised [3].

2.5Building failure in Nigeria

Thirty-seven (39) year records of building collapse in Nigeria show that most of the structures affected happened to be privately owned (more than 80%) and commonly more than 50% were residential buildings [39, 42]. This menace happened to be mostly with private residential buildings built by local contractors [7]. The compiled history of building failure in Nigeria by Tanko *et al* [39] found that quackery recorded the highest frequency against poor supervision as minimum occurrence. However, it was not clear where the quackery resides, was it with engineers or architects or contractors? Furthermore, is the collapse of buildings caused by structural failure noticed in the documented building designs or happened due to faults at the construction stage. It was noticed that buildings of 2 to 4 floors are common to building collapse in Nigeria [42, 14]; this may be attributed to less attention given at approval and supervision stages. Building collapse in Nigeria has often been associated with structural failure [19]. Besides, no structure can stand without fulfilling conditions of structural stability. For a building to be safe and fully stand, all its structural members must be certified okay at ultimate (collapse) and serviceability (deflection, cracking and vibration) limit states [12, 36, 26, 19]. Table 1 below is the summary of common causes of building failure in Nigeria between 1974 and 2011.

Table 1. Building failure and their causes in Nigeria from 1974 – 2011 [39]

Failure Causes	Frequency of Failure	Prevalence	Expected
Structural Failure (SF)	16	05	48
Carelessness (CLSS)	05	02	15
Poor Workmanship (PW)	05	02	15
Poor Supervision (PS)	03	01	09
Poor Materials (PM)	11	04	33
Quackery (Q)	26	08	78

Olagunju *et al* [31] classified causes to building collapse under seven major factors that could be related to: poor design; fault at construction; poor material quality and method of construction; foundation failure; fire disaster; natural phenomena, and inadequate maintenance. However, fire disaster and natural phenomena are known causes with certainty when failure happens. There are five major causes that are man-made, where Architecture, Engineering and Construction (AEC) are quite relevant; the causes are connected or fall under one of the following:

1. Construction supervision
2. Construction process
3. Monitoring/enforcement
4. Design supervision
5. Design process.

Furthermore, many investigation reports revealed issues at construction stage. In 2006, the Nigerian government regulatory body of engineers (COREN) reported an outcome of an investigation panel for three cases of collapsed buildings in 2005. It was discovered that no registered engineer was involved and amongst those culpable is a pharmacist. The pharmacist had supervised the construction of the collapsed building [31]. In 2010 Ede [14] traced disturbing factors causing building failure in Nigeria which are not obtainable in several developing countries. Moreover, Ayedun [5] compiled findings on collapsed buildings in Lagos state between year 2000 and 2010 (10years), out of the 54 collapsed buildings 37 (68.52%) failed and collapsed due to structural related issues.

2.6 Literature findings

Tanko *et al* [39] revealed that quackery is the most frequent cause of building failure in Nigeria while supervision is a lesser cause. However, the majority of investigations revealed the contrary; that sub-standard or poor quality of building materials (wholly linked to poor construction supervision) as the main cause of building failure and collapse in Nigeria (refer to Table 2.)On the other hand, most investigations as well as research on the causes of building failure tended to focus on Architects, Engineers, Surveyors and Builders; hence several architectural and design elements are seen to be mentioned in many articles and linked to failure causes. However, many has no connection with building stability or otherwise; building (itself) can only collapse when one or more of its essential components failed and these components are part of the structural carcass [19]. What brings about those elements' failure should be the subject of investigation not less structurally significant components such as blocks, lintel as claimed by [12, 41, 5, 19, 31]. Amadi [4] proclaimed that architects and engineers who are involved in building construction are held responsible for building failure and feels that geologist's role is mostly ignored, however one could see how building under-construction are collapsing due to failure of the building carcass [31, 5, 16].

Table 2. Summary of the main causes of building collapse in Nigeria (compiled by the author)

S/No.	Source	Major/prevalence cause of building collapse
1	[6] Ayininuola and Olalusi, 2004	Poor building materials
2	[33] Orie, and Aniekwu 2006	Poor building materials
3	[42] Windapo, A. 2006	Carelessness and greed
4	[12] Dimuna KO. 2010	Poor building materials
5	[41] Usman *et al*. 2010	Poor quality of materials
6	[4] Ayedun *et al*. 2011	Sub-standard building materials
7	[7] Ayodeji, O. 2011	Poor quality of materials
8	[19] Fakere *et al*. 2012	Poor quality of materials
9	[43] Windapo and Rotimi, 2012	Poor construction supervision
10	[16] Ede, AN. 2013	Poor quality of materials
11	[31] Olagunju *et al*. 2013	Design fault & construction fault
12	[39] Tanko *et al*. 2013	Quackery
13	[2] Agwu, MO. 2014	Poor construction supervision

III. RESEARCH METHODOLOGY

The purpose of the survey was to determine the professionals' view to causes of building failure and collapse in Nigeria. The primary data for the investigation was developed from key professionals in the Nigerian construction industry through a questionnaire survey. The survey was limited to stakeholders of the industry (clients, consultants and contractors) in the fields of Architecture, Building, Engineering and Surveying. To evade bias, the respondents were chosen randomly from amongst consultants, contractors and clients. Clients are construction professionals from government agencies and private developers. 150 questionnaires were distributed randomly to architects, builders, engineers and quantity surveyors in several organizations. Ninety-nine (99) of the distributed questionnaires were returned for analysis and thereby representing 66% response rate which is considered adequate for the study [9]. The respondents were tasked to rank the main causes of building failure and collapse as well as to identify the building elements that fail to cause building collapse. The simple descriptive statistics and ranking were used to analyse the collected data.

3.1 Questionnaire design

Previous investigations in this area of research were generally done in one of these three ways:

1. Questionnaire survey,
2. Case study, and
3. Literature review based

For this piece of work, the questionnaire design is based on literature findings. It is directed towards confirming/validating some lingering causes of building failure as identified in the literature review above such

as poor or sub-standard building materials as well as exploring new dimensions yet unexplored by researchers in this area. It is aimed that the validation or otherwise be based on quantifiable evidence from constructions professionals.

3.2. Research Instrument

The type of questions used were close-ended and multiple choice. The following section shows the result of a survey that examined varieties of causes of building failure in Nigeria by building professionals in the country. The questionnaires were sent to contractors, consultants and clients mostly from general building category in Nigeria, mainly from the following zones: North-west, North-central and South-west in sliding order of quantity then with very few from North-east and South-east; therefore the result may not reflect the true picture of the entire country but most of its parts. The surveys were set up and distributed in hardcopy. A total of 150 hardcopies of the questionnaires were distributed, out of which a total of 99 responses were collated; this represents 66% response rate, hence this justified the 55% for paper-based response rate according to Ballantyne [9]; and also beyond 12% (liberal condition) according to Nulty [27]. The responses were distributed based on profession as well as role in the industry. The responses received from builders were 6 which represents 6.1%, architects returned 15 (15.2%), quantity surveyors returned 12 (12.1%) and engineers returned 66 (66.7%).The outcome of this survey is a snapshot in time (2017) and the data generated are guided by previous studies [31, 39]. Yamane's formula of 1967 $\{n=N/(1+N(e)^2\}$ is adopted to calculate the sample size [22]. Considering a population size from 3,000 to 15,000 with ±10% precision level, 95% confidence level and P=.5 has 99 response as sufficient for a sample size [10; 22, p.3]; then, the 99 responses is pretty adequate for this study.

The questions adopted categorical and two main scales of:

1. A five-point Likert rating scale with 5 the highest rank; and
2. A scale of "Never" "Rare" "Sometimes" "Often" & "Always" plus another one of "Insignificant" "Minor" "Moderate" "Major" and "Catastrophic".
3. Based on the five-point Likert rating scale, a standard method of ranking was used which is the relative importance index (RII).

RII is defined by the relationship below [13]:

$$\text{Relative Importance Index (RII)} = \frac{\Sigma W}{A \times N} \quad (0 \leq \text{index} \leq 1)$$

where:

W is the weighting given to each element by the respondents.

This will be between 1 and 5, where 1 is the least significant impact and 5 is the most significant impact;

A is the highest weight; and

N is the total number of respondents.

While the remaining are evaluated by simple descriptive statistics (in percentages).

IV. Analysis And Discussion

4.1. Survey Findings

The survey results were analyzed and the findings are presented below. An initial observation was a substantial difference in the response rates for the surveys, where same method of notification and delivery was used. The difference may potentially credited to the relevance of the investigation to the parties involved: engineers can be seen more interested and highly linked to the subject (building failure and collapse), it could also be associated with the number of disciplines involve in the field of engineering; followed by architects, quantity surveyors then builders. The tables below presented the response percentages as well as roles' distribution.

Table 3a: Response Distribution

S/No.	Profession	No. of Respondents	Response Percentages
1	Architects	15	15.2%
2	Builders	6	6.1%
3	Engineers	66	66.7%
4	Quantity Surveyors	12	12.1%
	TOTAL	99	100%

Table 3b: Respondents' Roles

S/No.	Affiliation	No. of Respondents	Response Percentages
1	Client	23	23.2%
2	Contractor	31	31.3%
3	Consultant	45	45.5%
	TOTAL	99	100%

It is very interesting to realize that over 90% holds bachelor's degrees and above; and about 50% of the respondents have over ten years practicing experience and 33.3% are between 5-10years experience. This could portray clearer indication to competency level of the respondents. Below are charts presenting the educational and experiences of the respondents.

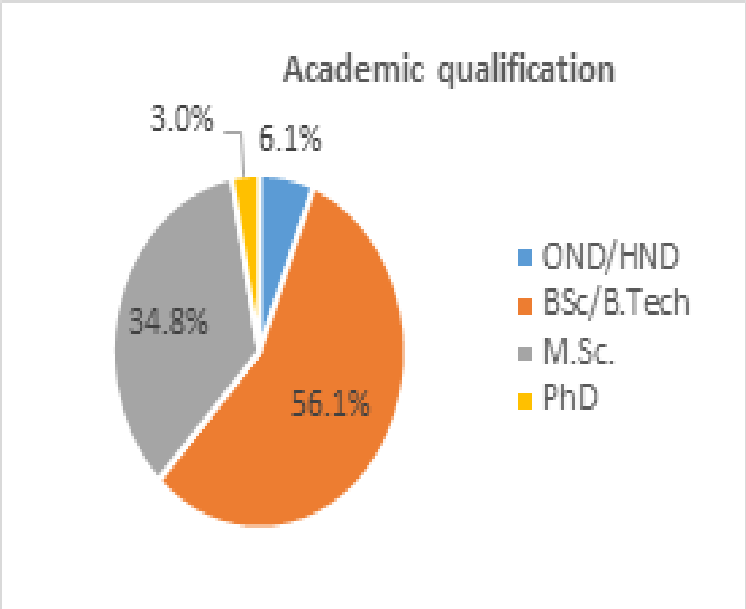

Figure 1. Respondents' Educational qualification

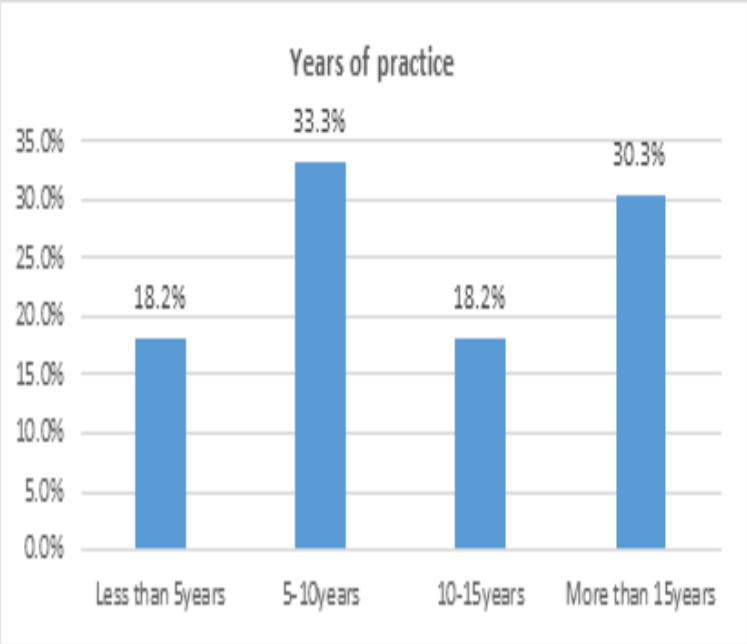

Figure 2. Respondents' experiences

4.2. Frequency of Building Failure and Impact

The survey revealed that over 45% disclosed that buildings fail and collapsed 'often' while the remaining majority (45.5%) believed it does but 'sometimes'. Buildings collapse in Nigeria is not just limited to buildings in operation but even buildings under construction [32, 31, 5, 6, 16]. Subsequently, 48.5% considered the impact of this menace as moderate while the second majority (36.4%) believed to have major impact. Below are charts describing the frequency and the impact of the collapsed due to structural failure.

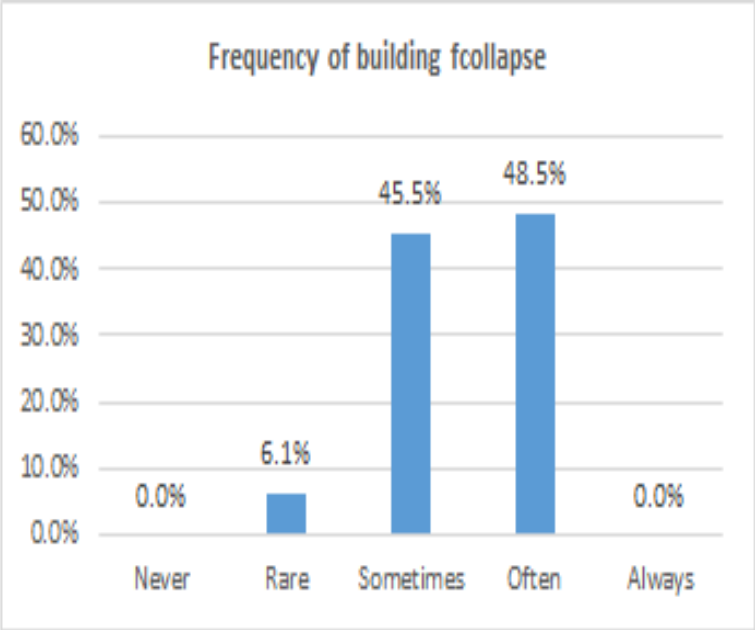

Figure 3. Frequency of building collapse

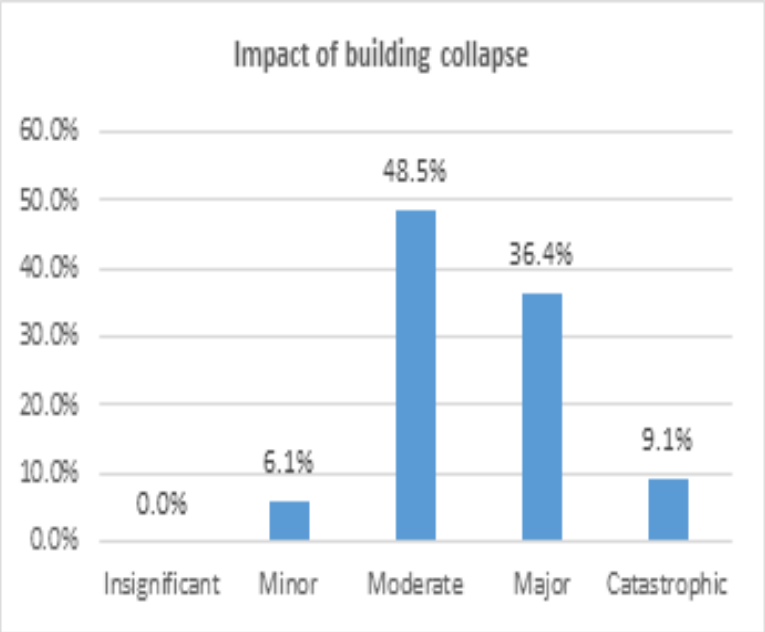

Figure 4. Impact of building collapse

4.3. Quality of Building Materials

It was gathered from the literatures that sub-standard building materials, faulty design as well as lack of proper supervision as the main causes of building failure and collapse in Nigeria. In reply to the above findings, 90.9% over warmly agreed that sub-standard building materials is amongst the causes and also ranked three as the major materials (reinforcement steel, structural steel and cement) responsible. Moreover, lack of proper construction supervision is rated the most substantial cause followed by construction process and monitoring/enforcement. The result of poor supervision is simultaneously linked with inability to inspect building materials (90.9% agreed; *figure 5*) used in producing the critical building/structural elements (foundation, column, beam and slab; *figure 8*) whose determine the building stability; and their failure is tantamount to building failure and consequently collapse. On the other hand, faulty design is rated very low to causing collapse of buildings in Nigeria. Below are descriptive charts to the above findings:

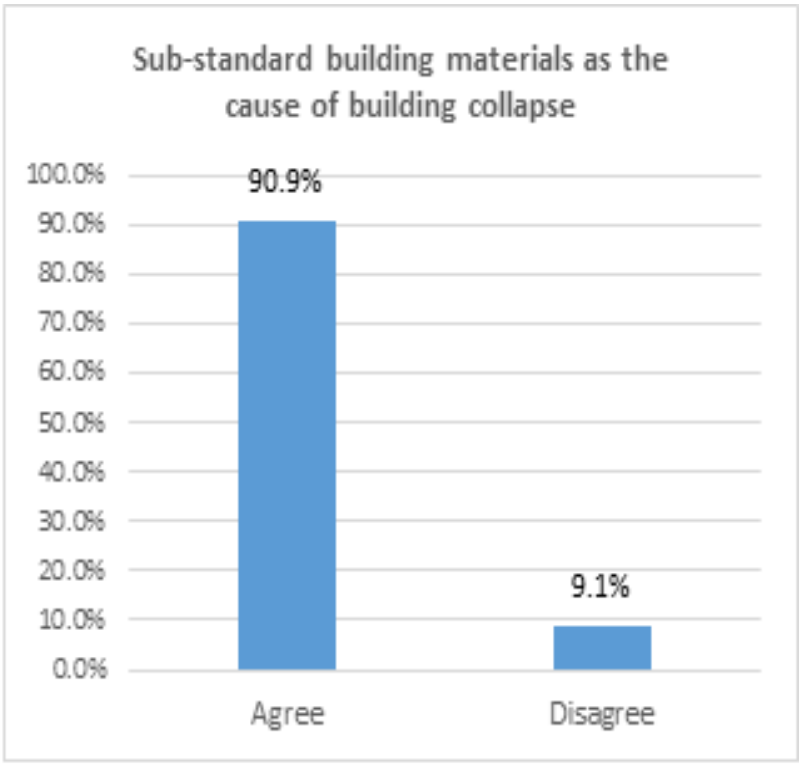

Figure 5. Sub-standard building materials as the cause of building collapse

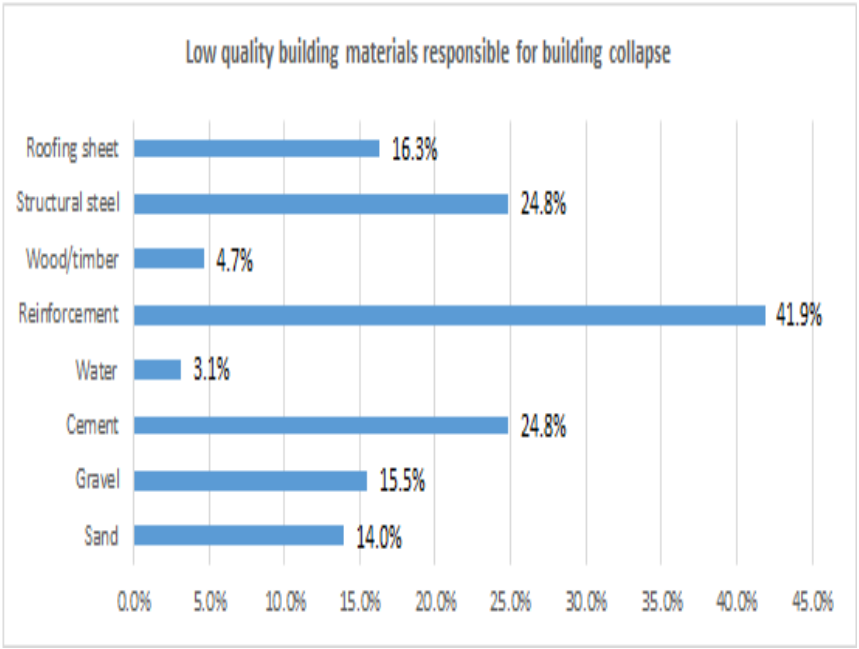

Figure 6. Low quality building materials responsible for building collapse

4.4. Who is responsible and the critical elements associated with building collapse?

It can been seen (from the literatures) that most findings relates to whether the process or the materials; however identifying the main elements of the building associated with the collapse would help to determining who is responsible to that and where attention needed to be focus on. This finding reveals that *civil/structural engineering's* actions or inaction is heavily responsible for structural failure (see *figure 7*) that leads to building collapse; furthermore, *'structural elements'* were evenly (between 20% and 28%) received percentages (see *figure 8*) as *critical elements* to failure and collapse of buildings; these elements are: foundation, column, beam and slab in descending order; below are charts representing the findings.

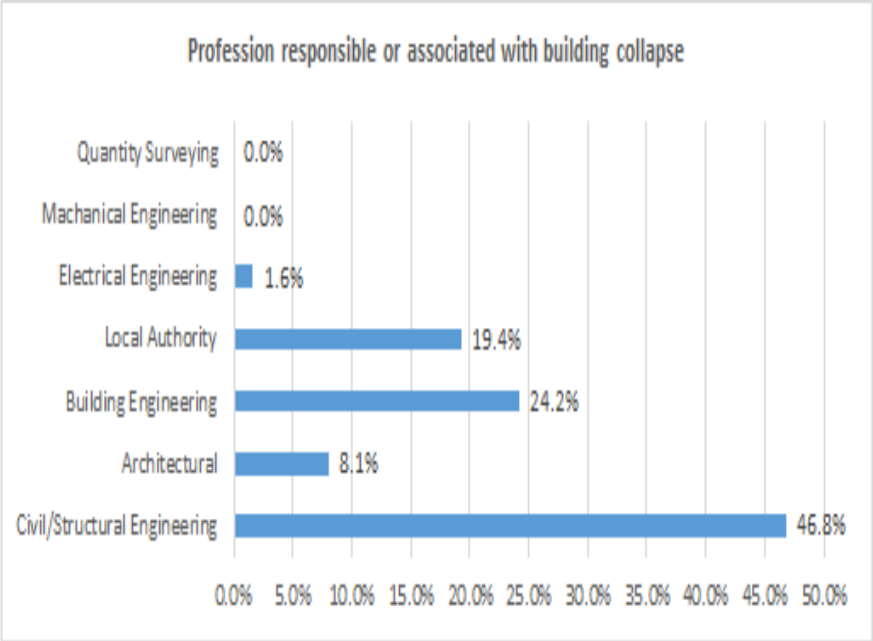

Figure 7. Profession responsible to causes of building collapse

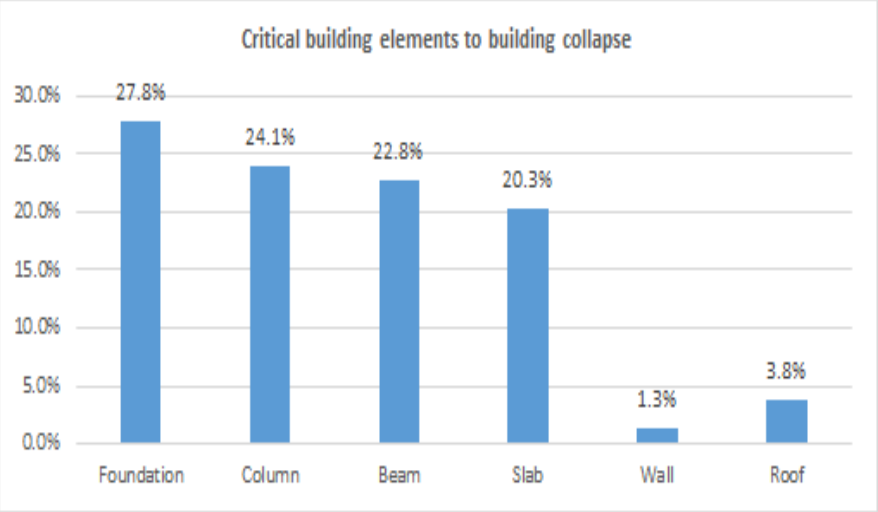

Figure 8. Building elements associated with building collapse

Going by the computed Relative Importance Index (RII) in table 4 below, It can been seen that the construction supervision is the most (ranked 1st) cause to building failure followed by construction process (ranked 2nd); all these relates to how and with what the building was made up of. It is obvious that building materials are checked before use at construction stage and primarily by supervisor. Therefore supervision is very necessary and critical to achieving whatever is in the design.

Table 4. Rating to causes of building failure and collapse

Number of Rank *R* & Weighted value *W* impact	Weight 5	Weight 4	Weight 3	Weight 2	Weight 1	∑ *W*	RII	Rank
Construction supervision	195	168	27	6	6	402	0.812	1
Construction process	150	84	72	42	3	351	0.709	2
Monitoring/enforcement	105	84	72	18	24	303	0.612	3
Design supervision	45	36	90	96	3	270	0.545	4
Design process	0	24	36	36	63	159	0.321	5

IV. CONCLUSION

The objectives set for this piece of research were to confirm the most significant causes of building failure and collapse in Nigeria; to determine the critical components prone to failure as well as stability of building and to determine the professional(s) solemnly responsible for the critical components. This investigation reveals that:

1. The frequency of building collapse is "*Often*" with impact as "*moderate*" and sometimes "*major*"
2. Poor (sub-standard) building material remained a major issue to building collapse
3. Steel reinforcement, structural steel and cement are the major compromised building materials
4. Foundations, columns, beams and slabs are the critical building components prone to failure that leads to collapse
5. Civil/structural engineer is solemnly associated with the critical components to building stability leading to failure

The frequency of building collapse in Nigeria is at an alarming rate and the impact is moderately major (moderate and major). Despite all the previous investigations, no serious and justifiable development is recorded to avert this happenings. The finding has justified that use of sub-standard (poor) building materials is still a major cause of building failure and collapse in Nigeria. Furthermore, the findings ascertained that steel reinforcement, structural steel and cement (in descending order) as the major building materials contributing to building collapse. It was identified that the critical components to building stability are foundation, column, beam and slab. The production of weak structural (critical) elements by using sub-standard (poor quality) building materials due to poor supervision perhaps by quacks is generally the cause of building collapse in Nigeria. Moreover, lapses at construction supervision (ranked number 1) is considered high and very high in contribution to building failure and collapse. It may be concluded that the professionals' views directed the lapses to civil/structural engineering (*figure 7*) aspect of building works in terms of lacking proper supervision. Hence, civil/structural engineers (at design and construction) are fully responsible for managing the production of structural elements and quality of the materials used in producing these elements for building stability.

V. RECOMMENDATION

It is highly recommended that subsequent investigations (if any) should focus on the civil/structural engineering aspect of works from design to construction down to the enforcement; more importantly, redirect investigations to supervisory responsibilities at construction stage with portfolios than concentrating on architects or others in the building industry. Moreover, the finding here associated lack of proper construction supervision as the prime cause. Therefore, "to solve a problem, the solution lies on identifying the source of the problem" and parties involved (as identified here). An action plan is expected from the government to enforcing a strict construction supervision.

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