Building Collapse: Tackling the Construction Quality Gap in Nigeria

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Abstract
Rationally, a well-constructed building is anticipated to serve as a haven of comfort, shielding individuals from various fears and stressors. A structure deemed standard should possess the resilience to withstand the test of time, contingent upon the absence of any quality gaps in its construction. Adherence to the lean six-sigma methodology and other safety and ethical standards in the construction stage is imperative for ensuring durability. Unfortunately, this ideal scenario is not universally evident, particularly in certain countries. Nigeria, for example, grapples with a disconcerting surge in building collapses, accompanied by tales of grief and loss. In spite of the growth in Nigeria's real estate sector, as reported by the National Bureau of Statistics, with a 1.77% expansion contributing around USD 5.3 billion (5.28% of the real GDP) in the first quarter of 2021, the escalating incidents of building collapses are cause for concern. Data for the study were obtained from survivors, victims, the Building Collapse Prevention Guidance, and other secondary sources. To unveil the root causes of recurrent building collapses, the research investigates the lived experiences of victims, experts, and stakeholders in the sector. The study identifies a disturbing trend of violations of building laws and regulations occurring at various levels and stages of construction for greed or other factors. Lack of regard for human lives, compromise, and corruption emerge as the underlying factors behind the escalating number of tragic incidents. This research aims to equip construction students, professionals, and managers with a comprehensive understanding of potential causes and preventive measures to protect lives and property. The findings underscore the importance of prioritizing quality, honesty, standard, safety, and human life in building construction practices. Furthermore, the study emphasizes to construction engineering students the implications of disregarding construction code of ethics such as integrity, honesty, safety, transparency, competence, accountability, and professionalism.

Keywords: Building collapse, quality gap, construction, distressed

INTRODUCTION

Building collapses pose a significant threat to public safety and socio-economic stability, especially in regions like Nigeria where the construction industry is burgeoning amidst rapid urbanization and infrastructural development. A mere glance at the frequency of structural failure in Nigeria and the devastating impact on the lives of victims underscores the urgency of the matter. The experiences of those affected, along with their families, serve as reminders that those in the construction industry, both present and future, must safeguard against any oversights or shortcuts that could lead to avoidable disasters resulting from structural failures.

"Losing the children, I had suffered to train in the house I labored to build many years ago on the same day was something I couldn’t bear. What could be more tragic than losing a house and four children in a day? [1]" That was an emotional question from a 50-year-old victim of Nigeria’s building collapse. The man lost four children, ages 23, 15, 13, and eight, when his family house, located in Lagos State, Southwest Nigeria, collapsed in the early hours of Saturday, November 7, 2015.

As pitiable as the man’s situation was, it is not an isolated case. A 71-year-old widow had also suffered a similar fate. Her building collapsed on November 21, 2012, at Jakande Estate in Lagos State, Southwest Nigeria. The widow lost not only her building on that fateful day but also her two grown daughters, who were graduates of the University of Lagos [2]. Several other parents

also suffered similar tragedies when a three-story building housing a school collapsed, trapping more than 100 people, including pupils, on March 13, 2019.

The mentioned incidents serve as mere glimpses into the suffering and chaos inflicted upon numerous Nigerians whose loved ones fell victim to collapsed buildings. These events, now frequently recurring, have inflicted immense suffering upon countless families and those affected by such tragedies.
Structural failure incidents have become one of the depressing and yet avoidable occurrences that Nigerians across the globe frequently hear about or see in the media. For nearly three decades, Nigeria, the African continent's most populous nation, has been noted as a source of stories resulting from these preventable disasters, which have claimed lives and livelihoods and rendered hundreds homeless [3]. So frequent is the occurrence of collapsed structures that a month or week hardly passes without the ugly incidence of one partial or complete collapse of a structure in the country.

The incidence rate is so high that the Standards Organization of Nigeria (SON), an organization charged with quality regulation, raised the alarm that the country has the highest number of building collapses in Africa with over 221 cases, adding that Lagos State, the nation's commercial capital, alone constitutes 60 percent of the cases [4]. A building is expected to be a place of comfort and relief when it is properly built. Whatever qualifies as a standard structure should be able to stand for a reasonable period; a building should be a safe haven and not a death trap. This is not the case for some buildings in Nigeria with recurrent cases of collapsed structures, which often leave the victims dead or permanently incapacitated whenever the tragedy strikes.

A Global Issue

Building collapse in Nigeria is a critical issue, but not a uniquely Nigerian issue. Wardhana and Hadipriono [5] tallied a total of 225 building failures in the United States from 1989 to 2000. Seventy percent of the failures were in low rise structures. Of the 225 failures, 178 were distress or partial collapse; the remaining approximately 20% were total collapse. The textbook example for American building collapse is the 1981 collapse of the walkway at the Hyatt Regency in Kansas City that took 114 lives and left 200 injured [6]. More recently, 98 people perished in the 2021 collapse of the Champlain Towers South building in Surfside, Florida [7].

Numerous concerns over building collapse originate from around the globe, including the 1995 collapse of Sampoong Department Store in South Korea, the 2012 collapse of three office high rises in Brazil, the 1993 failure of the Royal Plaza Hotel in Thailand, and the 2023 partial collapse of a three-story apartment complex in Cuba [6] [8]. Eclipsing all these in loss of life is the 2013 Rana Plaza disaster in Bangladesh [6]. A seven-year-old building failed, killing 1134 people and injuring 2500 others. It marked the Bangladesh's worst industrial disaster and the world's deadliest garment factory disaster. Nearly 1300 people died from various building collapses in India throughout 2022 [9].

Nigeria is clearly not alone in the plague of building collapse. Rather, building collapse is a global issue and concern for global society. Investigation into the Nigerian situation provides a

perspective to view the problem at large, serving as a valuable case study to practitioners worldwide.

The Nigerian Construction Industry

In a Gross Domestic Product (GDP) Report published by the National Bureau of Statistics for the first quarter of 2021, Nigeria's real estate sector grew by 1.77%, contributing a total of 5.28% to the real GDP of the country for the period under review (around USD 5.3 billion). In 2023, the Bureau also stated that the contributions of the real estate and construction sectors to Nigeria's real GDP increased by N8.9 trillion in the fourth quarter of 2022. The sector's GDP contribution rose to N28.9 trillion despite high interest rates, inflation, and the cost of building materials, among other challenges faced last year [10].

The construction sector is unarguably considered the major source of economic growth, with the rate of employment generated through the sector offering job opportunities to millions of skilled, unskilled, and semi-skilled workers. The sector also plays a key role in generating income in both the formal and informal sectors and supplementing the foreign exchange earnings derived from trade in construction materials and engineering services [10].

But despite the boon of the sector in Nigeria, the attendant incidents of building collapse seem to be nullifying what could be regarded as gains or contributions of the sector to the nation's economy. The sad experiences resulting from the losses and havoc wrecked on many Nigerians and the like, whose relatives had been victims of collapsed buildings, undoubtedly outweighed its perceived gains. Over the years, building collapse tragedies have claimed the lives of innocent occupants, pupils, residents, hawkers, bystanders, passersby, and site workers. The collapsed building tragedy spares no region, as no one seems to know when and where the next tragedy will strike [1].

Figure 1

Building Collapse image

- A collapsed building [12]

Building Collapse: A self-made or natural disaster?

Building collapses are a global phenomenon, often stemming from natural causes or man-made such as structural failures, faulty or distressed foundations and other causes [13]. Structural failures are observed worldwide, but in developed nations where stringent adherence to building codes and professional ethics is commonplace, the incidence and scale of collapses are generally low [14]. Even in the face of severe natural disasters such as earthquakes, catastrophic destruction is typically mitigated due to these strict standards and practices [13].
In Nigeria, the frequency of building collapses remains source of concerns because of the favorable weather conditions the country enjoys. Unlike regions prone to severe weather events like earthquakes, cyclones, hurricanes, landslide, thunderstorm and tornadoes, Nigeria rarely experiences such extreme conditions associated with building collapses. Nonetheless, these incidents have unfortunately become somewhat recurrent, bringing suffering to many families. The Building Collapse Prevention Guild (BCPG) reports that the first recorded building collapse in Nigeria occurred in October 1974 in Oyo State. It resulted from excessive loading, claiming the lives of 27 people. It is, indeed, a phenomenon that seems to have snowballed into a regular occurrence in Nigeria, particularly in Lagos, Nigeria's commercial center and one of the most populous state in the southwest region of country [2].

Describing how the tragic incident has wreaked havoc and permanently rendered some victims incapacitated, [1] a victim stated the following:

> The building collapse is one tragic incident that has brought so much pain and discomfort to the victims. It often occurs when least expected, though sometimes imagined, dreaded everyone and making even the most organized person or organization confused. It often takes place, and when it does, it comes with stories of lamentations. Fraying nerves are usually difficult to calm, just as the bereaved are hard to console. Those who cherish them are suddenly lost or completely and permanently maimed. It is a disaster that pokes its destructive fingers at helpless people. Like a thief in the night, it intrudes rudely into the victim's world, venting its cruel spleen with abandon. One hardly survives it, and those who manage to do so hardly overcome the lasting trauma.

Figure 2
Images of Trapped Victim

Figure3

A trapped victim of Four-Square Church building collapse in Lagos on August 26, 2013 before and after rescue. **Source: Ayinla [2]**

Methodology

In order to have a clear understanding of the building collapse phenomenon, this study adopts a descriptive content analysis which compiles observations and interviews of stakeholders in Nigerian building construction sector over the researcher's 20+ year career in Nigerian media. Inputs such as building developers or merchants, artisans, engineers, bricklayers, block makers, government regulatory agencies and other experts in the industry as well as the victims of building collapse were included. The researcher's published works and experience along with secondary published works were gathered and analyzed to formulate the thematic concept of this study [11].

Collapsed building Cases: Nigeria's cases

Nigeria stands as the most populous country in Africa and the seventh most populous globally. Situated in West Africa, it thrives with a diverse population distribution that mirrors its rich cultural heritage. With an estimated population of 229,152,217 by the UN, Nigeria is composed of 36 states and a Federal Capital Territory, Abuja. Administratively and politically, the country is segmented into six geopolitical zones: North-Central, North-East, North-West, South-East, South-West, and South-South [11]. These zones are characterized by shared cultures, ethnic groups, and historical narratives. Of all the regions, Lagos, a cosmopolitan city located in the southwest Nigeria is the nation's commercial center.

Tracking the occurrences of building collapses in Nigeria across these six geopolitical zones since 1979, data sourced from the Building Collapse Prevention Guild of Nigeria provides insight into the prevalence of such incidents.

Table 1

The population distribution in Nigeria by geopolitical zones and region

Geopolitical Zone	**Population (2016)**
North West	48,942,307
South West	46,706,662
North Central	29,252,408
South-South	28,829,288
North East	26,2693,866
South East	21,955,414
Total Population	**201,139,589**

Source: National Population Commission, 2016.

Table 2

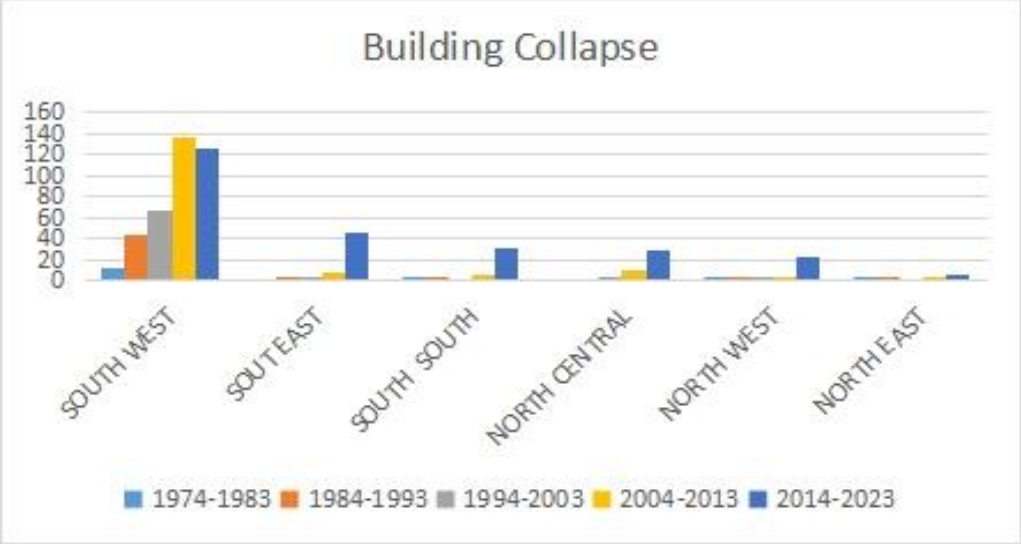
The building collapse across five decades

GEO-POLITICAL ZONES	SOUTH WEST	SOUTH EAST	SOUTH-SOUTH	NORTH CENTRAL	NORTH EAST
1974-1983	11	0	1	0	1
1984-1993	44	4	4	2	1
1994-2003	66	1	0	4	0
2004-2013	136	8	6	10	1
2014-2023	126	46	30	29	5
TOTAL	**383**	**59**	**41**	**45**	**8**

Note: Table showing records of building collapse in decades across Nigeria's geopolitical zones.

Figure 5

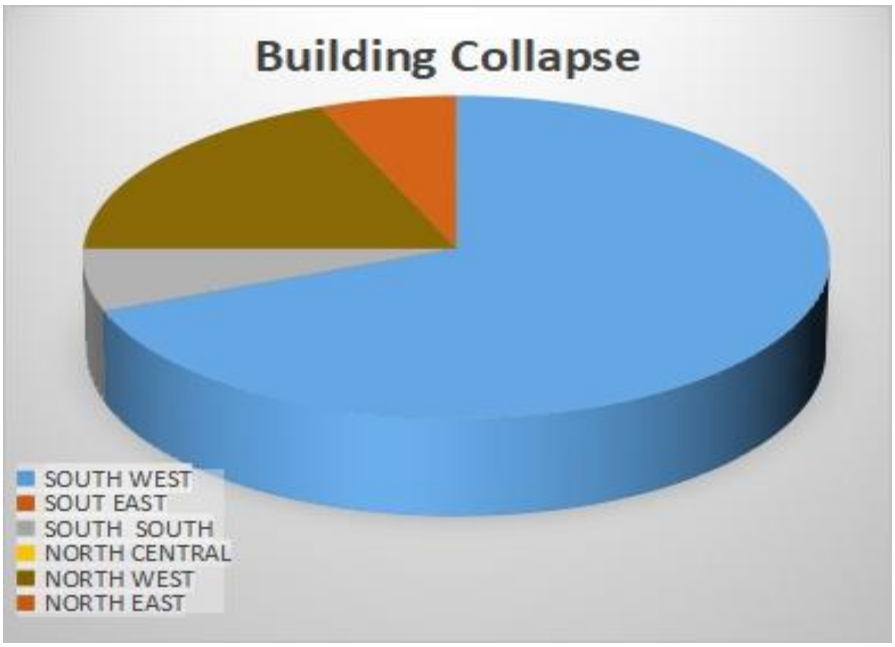
The building collapse between 1974 and 2023



Notes: The Graph showing frequency of building collapse between 1974-2023

Figure 6

Building collapse cases between 1974 and 2023



Note: The pie chart showing records of building collapse cases in Nigeria's geopolitical zones between 1974 and 2023.

Building Collapse Statistics

According to the Building Collapse Prevention Guild [15], 271 buildings have collapsed in Nigeria over the past ten years. The highest numbers of fatalities due to building collapses are recorded in Lagos State, the most developed and populous city in the country. The 271 occurrences of buildings' collapsing account for 58.9% of the over 566 cases that were reported throughout the nation between 1974 and 2023.

As the threat of collapsing structures continues to affect the country's construction sector, there have been at least 531 fatalities out of the 271 collapses recorded in the past 10 years. A large number of the collapses reported during this period were attributed to professional ineptitude, including excessive loading, the use of subpar materials, flawed design, bad craftsmanship, and weak or inadequate foundations, according to the findings. Considering the 271 collapses reported during the past ten years, 115 cases—or 42.4% of all cases—were reported in Lagos State [15].

Despite the COVID-19 economic lockdown in 2020, Nigeria still recorded 45 cases of building collapse, with Lagos accounting for 18. In 2022, the nation experienced the most building collapse cases, with 62 nationwide, with Lagos accounting for 20. Over 26 cases have so far been recorded nationwide in 2023, with Lagos accounting for more than 12 cases. The tallest building collapse happened in Lagos on November 1, 2021, killing 52 people [15].

Figure 6

Building collapse scene in Nigeria

Scene of Ita-faji Building Collapse [16]

Why building Fails

Many scholars and experts have identified a number of factors as reasons for the continued building collapse incidences in the country, but what seems to be the main reason for the recurrent decimal of the avoidable tragedies is a lack of value for human lives by the government and stakeholders in the building sector. In Ayinla [17], the President of the Nigerian Institute of Town Planners and former Lagos State Commissioner for Physical Planning and Urban Development said that most incidences of building collapses are rooted in the collapse of values, morals, and ethics, which the state, and indeed Nigeria, needs to work on to avert needless deaths.

Compromise

As evident in a series of incidents of building collapse, scholars and experts pointed out that negligence and compromise play a major role in the unending disasters of collapsed buildings. The Building Collapse Prevention Guild [18], an amalgamation of experts in the building sector in the country, has seen compromise set in at different stages of building construction. The former Presidents of the Nigeria Institute of Builders (NIOB) stated that Nigeria and Nigerians must stop hasty construction and embrace a scientific approach where all the appropriate and lawful steps in the building will be followed without compromise.

The duo said most Nigerians, including the contractors, embark on hasty construction and, as a result, skip due process when it comes to building. Nigeria, particularly Lagos, continues to witness unfortunate incidents due to the failure of builders who are compromising the standard for selfish reasons or are incompetent. They explained that building construction is scientific and requires due diligence by experts.

Corroborating this sentiment, Tanko, Ilesanmi, and Bella [17] revealed that quackery is the most frequent cause of building failure in Nigeria, while supervision is less frequent. But Ayininuola and Olalusi [18] reasoned that building failures occurred due to inadequate knowledge of building structural performance and unexpected environmental phenomena. Fagbenle & Oluwunmi [19] blamed the high frequency of structural collapse on the low

level of compliance with approved architectural and structural drawings before construction, the ineffective monitoring apparatus used by the concerned government agencies, and the low level of awareness of the existing building regulations by clients and contractors. Ayinla [1] identified compromise at all levels and stages of building construction by artisans, site engineers, and government agencies as the root cause of the problem.

The role of Artisans, professionals in building collapse

When price becomes the only deciding factor in the calculations of the building contractor and financier of the building, compromise sets in. While the building owner wants to minimize costs as much as possible, the contractor wants to maximize profit, thereby pitting one interest against the other. They deliberately opt for substandard or inadequate materials for material gains or from building owners or project financiers who simply want to avoid the high cost of materials and best methods.

A former General Manager of the Lagos State Building Control Agency, LASBCA, said the main reason for building collapse is the non-responsiveness of the building owners to the building agency's regulations and guidelines and the influx of quackery in the building sector.

According to him, people flagrantly flout building regulations and approval, saying that is why buildings collapse, particularly multistory buildings. He added that an investigation always reveals that the builders violated the approved guidelines.
"They don’t always build according to the approved plan, especially when it is a three-story building. There are times residential buildings are converted to six- or seven-story shopping complexes by unscrupulous builders," the former General Manager said.

Corruption

Corruption is another major factor responsible for ceaseless building collapse incidences; like compromise, this also takes place at different stages of building and from different players in the building construction process. Another building developer somehow justified the compromise. He said that for the building developers to maximize profit, they sometimes take loans from banks in a bid to assist the landlord in building, after which they collect the rent for a certain number of years in order to recoup the expenses incurred in the course of building.

Justifying that corruption is inevitable among the builders, the prominent builder said:

> Since most landlords lack the wherewithal to rehabilitate their distressed buildings on their own, the only option available to them is to hand the buildings over to the developers to rehabilitate or rebuild with a certain agreement on how to recoup costs. So, in this kind of arrangement, there is no way the property owner will have a say on the

> quality of the material to be used. Hence, we go for the cheapest possible materials that are affordable to us. There is no way one can make it if one doesn't 'know the way' (compromise) because their conditions are usually difficult for us if we must go by the proper building standard.

Beyond the hunger for profit, there seems to be a psychological dimension to the hunger for greed and corruption among Lagos developers, as many of them believe it is natural to cheat in order to survive.

A popular female developer on Lagos Island said it is a taboo for a developer to handle the construction work of two buildings without building another one from the profits made from the first two buildings. She said:

> Building contractor shouldn't be able to build additional houses from the contract for two buildings, no matter what. He or she must find a way around it. It is not corruption; it is where one works that one designs ways to succeed. If you call it corruption, what will you call those leaders who steal billions of Nigerian dollars with their pens?

Poor enforcement of regulations

Like any other country, Nigeria and its federating states have some laws regulating building construction in the country, but low adherence to these building regulations is usually blamed on the government's weak enforcement and lack of political will at various levels to deal decisively with the issue of building collapse. To confirm this, various tribunals of inquiry and committees set up to investigate building collapse incidences have also, at one time or another, fingered 'top' government officials or weak implementation of the building laws as the bane of building collapse in the country.

This is why several buildings are marked and declared distressed, but people still inhabit them. While those under construction and sealed for violating the approved plan are allowed to continue construction even when the conditions for unsealing them are not met, sometimes demolition of some of the buildings identified as distressed is carried out just to play to the gallery or to show the world that the government is enforcing the law in the wake of a recent building collapse tragedy.

A tenant in one of the identified distressed buildings on Lagos Island said that the tenants contributed money to give some officials in order to prevent them from being evicted from the building.

Building right with Lean

In the realm of Lean Six Sigma, the widely embraced management methodology across commercial and manufacturing domains, the primary objective is to achieve peak quality goods through the systematic reduction of variability and elimination of production defects over extended periods [20]. Embedded within Lean Six Sigma is the fundamental principle of continuous improvement. Considering the multifaceted nature of construction projects, characterized by their complexity and involvement of various variables and stakeholders, instilling a culture of continuous improvement is paramount. This cultivates the ability of

construction firms to adeptly navigate evolving circumstances, unearth avenues for innovation, and ultimately steer projects towards resounding success. To realize defect-free objectives with utmost precision, practitioners rely on the application of statistical models. This is synonymous to prioritizing quality and safety of the building above selfish reasons.

This approach entails reducing process variability and identifying and rectifying issues through statistical methodologies and tools. In the construction sector, Six Sigma can be leveraged to enhance key performance indicators (KPIs) such as cost, schedule, safety, and quality. By implementing Six Sigma, construction companies not only save costs and improve project timelines but also ensure timely and budgeted project delivery, along with heightened levels of quality and safety through the identification and elimination of inefficiencies.

To guaranty a building that will stand the test of time, there is need to define and measuring process performance in construction. Process performance in construction refers to the effectiveness and efficiency with which a construction project is planned, executed, and completed. It is an important aspect of construction management as it determines the success of a project in terms of cost, time, and quality. To improve process performance, construction organizations can implement best practices such as project management methodologies, use of technology, and effective communication and collaboration among team members. Additionally, regular monitoring and analysis of the key performance metrics can help identify areas for improvement and inform decision-making.

System wide introduction and support of Lean building in Nigeria would offer novelty and a fresh approach, allowing stakeholders to change without forcing them to acknowledge wrongdoing or culpability for past actions. Success would be measured in terms of implementation of data driven decision-making rather than ‘fixing’ the current quid pro quo. In a culture driven by relationships and face-saving, Lean systems offers a constructive way to break the cycle of corruption and compromise [21].

Discussion

This paper examines the far-reaching implications of disregarding established guiding principles and ethical standards within the realm of building construction in any given society. Building laws, ethics, and regulations are put in place to uphold unparalleled safety and quality standards in construction endeavors. When these crucial regulations are flouted or compromised for any reason, the consequence is often an avoidable disaster resulting from structural failure, with unimaginable repercussions.

Every profession operates within a framework of its own code of conduct and acceptable practices, which must consistently be upheld to ensure the delivery of quality services and maintain a positive reputation. This study serves as a valuable lesson, particularly for students in construction engineering, emphasizing the sanctity of ethical practice within the building construction sector.

Just as in any other profession, the safety of buildings must never be compromised. Precision in measurement, thorough supervision, strict adherence to the standard, coupled with consistently high levels of reliability in construction work, must always be maintained to safeguard the well-being of construction workers, users, and the professional reputation of those involved in construction projects.

Conclusion

There is an urgent call for everyone to be fully involved in ensuring quality and safety in building construction. A distressed building poses a great risk to all hence, the task of ensuring strict adherence to safety of and structural integrity should be a collective responsibility of everyone. Since building collapse could occur time, location, and magnitude are usually unpredictable, everyone owns the responsibility of acting to avert collapsed structure disaster. Strict adherence to the building codes must be enforced possibly with more stringent penalties. Beyond just a rhetoric, the lives of the government to undertake a nationwide reorientation, prioritizing the sanctity of human lives. Given the alarming number of lives lost to building collapse incidents, and the potential for further loss if prompt action is not taken, professionals and building owners must prioritize the quality and safety of structures.

The government also bears the responsibility of leading by example, swiftly and impartially implementing the findings and recommendations of previous tribunals or committees established to investigate building collapse issues. According to the findings of the six-member committee on building collapse in Lagos, stricter penalties are warranted for those found responsible in cases of building collapse, aiming to reduce such occurrences.

Based on the insights gleaned from this study, there emerges an urgent imperative for collective engagement in upholding quality and safety standards within building construction. The precarious nature of distressed buildings underscores the grave risk they pose to all individuals, highlighting the collective duty to rigorously uphold safety measures and structural integrity.

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